

# Question Paper Preview

## Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

Question Paper Name :	M Sc Chemistry 04th Oct 2021 Shift 1
Subject Name :	M.Sc. Chemistry
Creation Date :	2021-10-04 12:34:05
Duration :	90
Total Marks :	100
Display Marks:	No
Calculator :	None
Magnifying Glass Required? :	No
Ruler Required? :	No
Eraser Required? :	No
Scratch Pad Required? :	No
Rough Sketch/Notepad Required? :	No
Protractor Required? :	No
Show Watermark on Console? :	Yes
Highlighter :	No
Auto Save on Console? ( SA type of questions will be always auto saved ) :	Yes

## M.Sc. Chemistry

Group Number :	1
Group Id :	96835587

Group Maximum Duration :	0
Group Minimum Duration :	90
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	100
Is this Group for Examiner? :	No

PART A

Section Id :	968355125
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	100
Number of Questions to be attempted :	100
Section Marks :	100
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	968355156
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 9683559091 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

The magnetic moment of  $[\text{Fe}(\text{CO})_5]$  complex is zero. The hybridization of metal in the complex and shape of the complex is

$[\text{Fe}(\text{CO})_5]$  సంశ్లిష్టము యొక్క అయస్కాంత భ్రామకం విలువ సున్న (0), అయిన ఆ సంశ్లిష్టములో లోహము యొక్క సంకరీకరణము మరియు సంశ్లిష్టము యొక్క ఆకృతి,

Options :

$SP^3 d$ ; trigonal bipyramidal

1. ✖  $SP^3 d$ ; ట్రిగోనల్ బైపిరమిడల్

$dSP^3$ ; square pyramidal

2. ✖  $dSP^3$ ; చతురస్ర పిరమిడల్

$d^2SP^3$ ; octahedral

3. ✖  $d^2SP^3$ ; అష్టముఖీయ

$dSP^3$ ; trigonal bipyramidal

4. ✔  $dSP^3$ ; ట్రిగోనల్ బైపిరమిడల్

Question Number : 2 Question Id : 9683559092 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The compound 'X' on treatment with hydroxyl amine followed by  $H_2SO_4$  forms acetanilide. Identify the 'X'

'X' అనే సమ్మేళనాన్ని హైడ్రాక్సిల్ అమైన్ తో చర్య నొందించి ఆ తర్వాత  $H_2SO_4$  తో చర్య నొందించిన ఎసిటానిలైడ్ ఏర్పడును అయిన 'X'

Options :

Benzophenone

1. ✖ బెంజోఫీనోన్

Acetophenone

2. ✔ ఎసిటోఫీనోన్

3. ✖

Acetamide

ఎసిటమైడ్

Benzonitile

4. ✖ బెంజోన్లైట్రైల్

Question Number : 3 Question Id : 9683559093 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Radiation of  $1000 \text{ \AA}$  passed through 10 ml 2M oxalic acid, after absorption of 0.02 moles of photons the concentration of oxalic acid reduced to 1 M. The quantum yield of the reaction is

10 ml, 2 M అక్సాలిక్ ఆమ్ల ద్రావణం గుండా  $1000 \text{ \AA}$  ల కాంతి వికిరణమును ప్రసరింప చేసినపుడు, 0.02 మోల్ల ఫోటాన్లను శోషించుకొనిన ద్రావణ గాఢత 1 M కు తగ్గినది. అయిన చర్య యొక్క క్వాంటం దక్షత

Options :

1. ✔ 0.5

2. ✖ 0.1

3. ✖ 0.2

4. ✖ 0.4

Question Number : 4 Question Id : 9683559094 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The major product formed from 2,4-dinitrotoluene on treatment with ammonium bisulphide followed by nitrous acid at 0°C.

2,4-డైనైట్రో టోలీన్, అమోనియం బైసల్ఫైడ్ తో చర్యనొంది ఆ తర్వాత నైట్రస్ అమ్లముతో 0°C ఉష్ణోగ్రత వద్ద చర్యనొందిన ఏర్పడు ఉత్పన్నము

Options :

2-methyl-5-nitroaniline

1. ✖ 2-మిథైల్-5-నైట్రోఎనిలిన్

4-methyl-3-nitrophenol

2. ✔ 4-మిథైల్-3-నైట్రోఫినాల్

2-methyl-5-nitrophenol

3. ✖ 2-మిథైల్-5-నైట్రోఫినాల్

4-methyl-3-nitroaniline

4. ✖ 4-మిథైల్-3-నైట్రోఎనిలిన్

Question Number : 5 Question Id : 9683559095 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The equivalent conductance values of sodium acetate, HCl and sodium chloride at infinite dilution are 91, 426 and 126 mho.cm<sup>2</sup> / gr.eq.wt respectively. Calculate the equivalent conductance of acetic acid at 10% dissociation in mho.cm<sup>2</sup>/gr.eq.wt.

అనంత విలీనత వద్ద సోడియము ఎసిటేట్, HCl మరియు సోడియం క్లోరైడ్ యొక్క తుల్యాంక వాహకత విలువలు వరుసగా 91, 426 మరియు 126 mho.cm<sup>2</sup>/gr.eq.wt. 10% విఘటనము చెందిన ఎసిటిక్ అమ్లము యొక్క తుల్యాంక వాహకత విలువ

Options :

1. ✖ 461

2. ✖ 46.1

3. ✖ 391

4. ✔ 39.1

Question Number : 6 Question Id : 9683559096 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Precursor used to synthesize alanine in Strecker synthesis is

స్ట్రెక్కర్ సంశ్లేషణంలో ఎలనైన్ సంశ్లేషణకు ఉపయోగించు మూలపదార్థము

Options :

Propanal

1. ✖ ప్రొపనాల్

Ethanal

2. ✔ ఇథనాల్

Formalin

3. ✖ ఫార్మాలిన్

Benzaldehyde

4. ✖ బెంజాల్డిహైడ్



Question Number : 7 Question Id : 9683559097 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The active species of catalyst involved in homogeneous catalytic hydrogenation of olefins is

అల్కీన్ల సజాతీయ ఉత్పేరక హైడ్రోజనీకరణములో ఉపయోగపడు క్రియాశీలక కారకము.

Options :

1. ✖  $\text{Rh}^{+3}$

2. ✖ Ni

3. ✔  $\text{Rh}^{+1}$

4. ✖ Pd

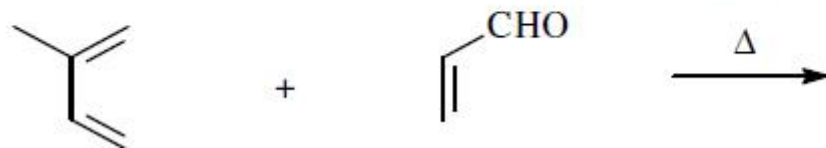
Question Number : 8 Question Id : 9683559098 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

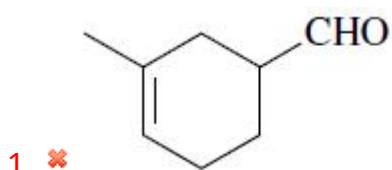
Correct Marks : 1 Wrong Marks : 0

The major product formed in the following reaction is :

క్రింది చర్యలో అధికమొత్తములో ఏర్పడు ఉత్పన్నము

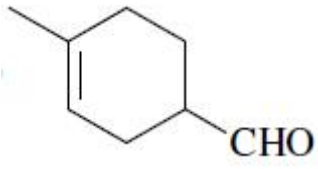


Options :

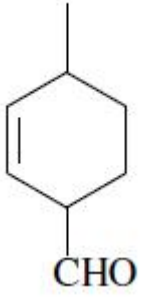


1. ✖

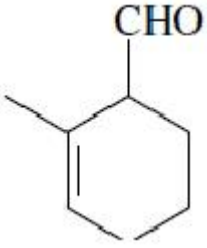
2. ✔



3. ✖



4. ✖



Question Number : 9 Question Id : 9683559099 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The decomposition of  $\text{H}_2\text{O}_2$  is an endothermic but spontaneous. The driving force for the reaction is

$\text{H}_2\text{O}_2$  విఘటనము ఉష్ణగ్రాహక చర్య మరియు స్వచ్ఛంద ప్రక్రియ. ఈ చర్యకు ప్రోత్సాహకము.

Options :

Positive free energy change

1. ✖

సేవ్చా శక్తి మార్పు ధనాత్మకము

Negative entropy change

2. ✖

ఎంట్రోపీ మార్పు ఋణాత్మకం

3. ✖



Negative enthalpy change

ఎంథాల్పి మార్పు ఋణాత్మకం

Positive entropy change

4. ✓ ఎంట్రోపి మార్పు ధనాత్మకము

Question Number : 10 Question Id : 9683559100 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In a chemical reaction, the half life is 50 min when the concentration is 10 M. The half life is 25 min when the same reaction starts with 20 M. The order of the reaction is

ఒక రసాయన చర్యను 10 M గాఢతతో ప్రారంభించినపుడు అర్థాయువు 50 ని॥ అదే చర్యను 20 M తో ప్రారంభించినపుడు అర్థాయువు 25 ని॥ అయిన ఆ చర్య యొక్క క్రమాంకము

Options :

1. ✗ Zero (0)

2. ✗ 1

3. ✓ 2

4. ✗ 3

Question Number : 11 Question Id : 9683559101 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following catalyst is used in polymerization of alkenes ?

అల్కీన్ల పాలీమెరీకరణంలో ఉపయోగించు ఉత్ప్రేరకము ఏది ?

Options :

Ziegler-Natta catalyst

1. ✓ జీగ్లర్-నట్టా ఉత్ప్రేరకం

Lindlar's catalyst

2. ✗ లిండ్లార్స్ ఉత్ప్రేరకం

Wilkinson catalyst

3. ✗ విల్కిన్సన్ ఉత్ప్రేరకం

Adam's catalyst

4. ✗ అడమ్ ఉత్ప్రేరకము

Question Number : 12 Question Id : 9683559102 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Number modes of vibration possible for benzene molecule

బెంజీన్ అణువులో సాధ్యమయ్యే కంపన పరిమితుల సంఖ్య

Options :

1. ✗ 15

2. ✗ 20

3. ✗ 31

4. ✓ 30

Question Number : 13 Question Id : 9683559103 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The number of stereo isomers possible for  $[\text{Co}(\text{NH}_3)_2\text{Cl}_2\text{Br}_2]^-$  are

$[\text{Co}(\text{NH}_3)_2\text{Cl}_2\text{Br}_2]^-$  సంశ్లిష్ట అయాన్ కు సాధ్యమయ్యే ప్రాదేశిక సాదృశ్యాల సంఖ్య

Options :

1. ✗ 4

2. ✓ 6

3. ✗ 8

4. ✗ 12

Question Number : 14 Question Id : 9683559104 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Number of signals possible for benzaldehyde in proton NMR spectroscopy.

ఫ్రోమాన్ NMR వర్ణపటంలో బెంజాల్డిహైడ్ అణువు ఏర్పర్చే సిగ్నల్ల సంఖ్య

Options :

1. ✗ 6

2. ✓ 4

3. ✖ 2

4. ✖ 3

Question Number : 15 Question Id : 9683559105 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In which of the following reaction free radical intermediate is formed

ఈ క్రింది ఏ చర్యలో స్వేచ్ఛా ప్రాతిపదిక మాధ్యమిక పదార్థముగా ఏర్పడును

Options :

Aldol condensation

1. ✖ ఆల్డల్ సంఘననం

Claisen condensation

2. ✖ క్లైజన్ సంఘననం

Dieckmann condensation

3. ✖ డీక్మన్ సంఘననం

Acyloin condensation

4. ✔ ఎస్సైలాయిన్ సంఘననం

Question Number : 16 Question Id : 9683559106 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The decreasing order of chemical shift values in proton NMR spectroscopy

ప్రోటాన్ NMR వర్ణపటంలో రసాయన స్థానాంతర విలువ తగ్గేక్రమం

Options :

Aldehyde proton > Aromatic protons > Olefinic protons > Acetylinic protons

1. ✓ అల్డిహైడ్ ప్రోటాన్ > అరోమాటిక్ ప్రోటాన్ > ఓలిఫినిక్ ప్రోటాన్ > ఎసిటిలినిక్ ప్రోటాన్

Aromatic protons > Aldehyde proton > Olefinic protons > Acetylinic protons

2. ✗ అరోమాటిక్ ప్రోటాన్ > అల్డిహైడ్ ప్రోటాన్ > ఓలిఫినిక్ ప్రోటాన్ > ఎసిటిలినిక్ ప్రోటాన్

Acetylinic protons > Aromatic protons > Aldehyde proton > Olefinic protons

3. ✗ ఎసిటిలినిక్ ప్రోటాన్ > అరోమాటిక్ ప్రోటాన్ > అల్డిహైడ్ ప్రోటాన్ > ఓలిఫినిక్ ప్రోటాన్

Olefinic protons > Aromatic protons > Aldehyde proton > Acetylinic protons

4. ✗ ఓలిఫినిక్ ప్రోటాన్ > అరోమాటిక్ ప్రోటాన్ > అల్డిహైడ్ ప్రోటాన్ > ఎసిటిలినిక్ ప్రోటాన్

Question Number : 17 Question Id : 9683559107 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The B-H-B bond in diborane is

డైబోరేన్ లో B-H-B బంధము

Options :

Two center two-electron bond

1. ✗ రెండు ఎలక్ట్రాన్ల ద్వికేంద్రక బంధం

Three-center four-electron bond

2. ✗ నాలుగు ఎలక్ట్రాన్ల త్రి కేంద్రక బంధం

3. ✗



Two-center four-electron bond

నాలుగు ఎలక్ట్రాన్ల ద్వికేంద్రక బంధం

Three-center two-electron bond

4. ✓ రెండు ఎలక్ట్రాన్ల త్రి కేంద్రక బంధం

Question Number : 18 Question Id : 9683559108 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Among the given compounds, the compound absorbs longer wave length radiation from U.V – Visible region is

ఈ క్రింది వానిలో అతినీలలోహిత-దృశ్యకాంతి ప్రాంతము నుండి అధిక తరంగదైర్ఘ్యము శోషించుకొనే అణువు

Options :

1,3,5-Hexatriene

1. ✓ 1,3,5-హెక్సాట్రైయిన్

1,3-Butadiene

2. ✗ 1,3-బ్యూటడైయిన్

1,4,7-octatriene

3. ✗ 1,4,7-అక్టాట్రైయిన్

Cyclohexene

4. ✗ సైక్లోహెక్సీన్

Question Number : 19 Question Id : 9683559109 Question Type : MCQ Option Shuffling : Yes Is



Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The product obtained on reduction of propanenitrile with DIBAL-H at low temperature followed by hydrolysis:

అల్ప ఉష్ణోగ్రత వద్ద ప్రొపేన్ నైట్రైల్ DIBAL-H తో క్షయకరణము చెంది తదుపరి జల విశ్లేషణ చెందితే ఏర్పడు ఉత్పన్నం

Options :

Acetaldehyde

1. ✖ ఎసిటాల్డిహైడ్

Propanone

2. ✖ ప్రొపనోన్

Propanal

3. ✔ ప్రొపనాల్

Isopropyl alcohol

4. ✖ ఐసోప్రోపైల్ అల్కహాల్

Question Number : 20 Question Id : 9683559110 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

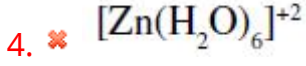
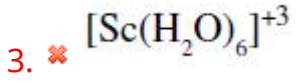
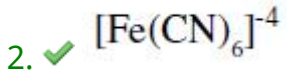
Correct Marks : 1 Wrong Marks : 0

Among the following, the most inert complex is

ఈ క్రింది వానిలో అధిక రసాయనిక జడత్వాన్ని ప్రదర్శించు సంక్లిష్టము

Options :

1. ✖  $[\text{FeCl}_6]^{-4}$



Question Number : 21 Question Id : 9683559111 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

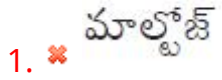
Correct Marks : 1 Wrong Marks : 0

Which of the following can't act as reducing agent

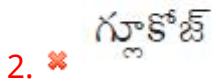
ఈ క్రింది వానిలో ఏది క్షయకరణిగా పని చేయదు

Options :

Maltose



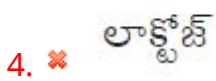
Glucose



Sucrose



Lactose



Question Number : 22 Question Id : 9683559112 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is examples for soft acid ?

ఈ క్రింది వానిలో మృదు అమ్లమునకు ఉదాహరణ

Options :

1. ✓  $\text{Pd}^{+2}$

2. ✗  $\text{K}^{+1}$

3. ✗  $\text{Fe}^{+3}$

4. ✗  $\text{Al}^{+3}$

Question Number : 23 Question Id : 9683559113 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following can give microwave spectrum

ఈ క్రింది వానిలో సూక్ష్మతరంగ వర్ణపటం ఇచ్చునది.

Options :

1. ✗  $\text{H}_2$

2. ✗  $\text{CO}_2$

3. ✓  $\text{CO}$

4. ✗  $\text{Br}_2$

Question Number : 24 Question Id : 9683559114 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following molecule can produce the isotopic peaks M and M+2 in mass spectrum with almost equal abundance.

క్రింది వానిలో ఏ సమ్మేళనము M మరియు M+2 ఐసోటోపిక్ శిఖరములను దాదాపు సమలభ్యత (సమనిష్పత్తి)లో ఏర్పర్చును

Options :

Chlorobenzene

1. ✖ క్లోరోబెంజీన్

Dichlorobenzene

2. ✖ డైక్లోరోబెంజీన్

Benzene

3. ✖ బెంజీన్

Bromobenzene

4. ✔ బ్రోమోబెంజీన్

Question Number : 25 Question Id : 9683559115 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

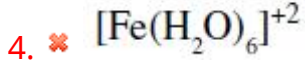
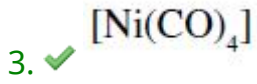
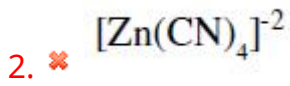
Correct Marks : 1 Wrong Marks : 0

Among the following, the back bonding is possible in

క్రింది వానిలో దేనిలో దాంతిక బంధం (Back bond) సాధ్యపడును

Options :

1. ✖  $[\text{NiCl}_6]^{-4}$



Question Number : 26 Question Id : 9683559116 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Identify the relative reactivities of the pyrrole, furan, thiophene and benzene towards electrophilic substitution reaction.

ఎలక్ట్రోఫిలిక్ ప్రతిక్షేపణ చర్యలో పిర్రోల్, ఫ్యూరాన్, థయోఫీన్ మరియు బెంజీన్ల చర్యాశీలత క్రమము

Options :

Pyrrole > Furan > Thiophene > Benzene

1. ✔ పిర్రోల్ > ఫ్యూరాన్ > థయోఫీన్ > బెంజీన్

Furan > Pyrrole > Thiophene > Benzene

2. ✖ ఫ్యూరాన్ > పిర్రోల్ > థయోఫీన్ > బెంజీన్

Benzene > Furan > Thiophene > Pyrrole

3. ✖ బెంజీన్ > ఫ్యూరాన్ > థయోఫీన్ > పిర్రోల్

Thiophene > Benzene > Furan > Pyrrole

4. ✖ థయోఫీన్ > బెంజీన్ > ఫ్యూరాన్ > పిర్రోల్

Question Number : 27 Question Id : 9683559117 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following reaction is stereospecific

క్రింది వానిలో ఏది త్రిమితీయ విశిష్ట చర్య (స్టీరియోస్పెసిఫిక్)

Options :

Hydrolysis of 3<sup>0</sup>-butyl bromide.

1. ✖ 3<sup>0</sup>-బ్యూటైల్ బ్రోమైడ్ జల విశ్లేషణ

Addition of HCN to acetaldehyde

2. ✖ ఎసిటాల్డిహైడ్ మరియు HCN ల మధ్య సంకలన చర్య

Hydrolysis of 2-bromobutane

3. ✔ 2-బ్రోమోబ్యూటేన్ జల విశ్లేషణ

Bromination on benzene

4. ✖ బెంజీన్ మరియు బ్రోమిన్ ల మధ్య చర్య

Question Number : 28 Question Id : 9683559118 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In which of the following reaction diastereomers are formed

క్రింది ఏ చర్యలో డయాస్టీరియోమర్లు ఏర్పడును

Options :

Acetaldehyde + HCN

1. ✖ ఎసిటాల్డిహైడ్ + HCN



Glyceraldehyde + HCN

2. ✓ గ్లిసరాల్డిహైడు + HCN

Formaldehyde + HCN

ఫార్మాల్డిహైడ్ + HCN

3. ✗

Glyceraldehyde + NaBH<sub>4</sub>

గ్లిసరాల్డిహైడ్ + NaBH<sub>4</sub>

4. ✗

Question Number : 29 Question Id : 9683559119 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The major product formed in the reaction between 4-aminophenol and acetic anhydride when taken in 1:1 ratio

4-అమైనోఫినాల్ మరియు ఎసిటిక్ అన్ హైడ్రైడులను 1 : 1 నిష్పత్తిలో కలిపిన ఏర్పడు సమ్మేలనము

Options :

Aspirin

1. ✗ అస్పిర్న్

O-acetyl-4-aminophenol

2. ✗ O-ఎసిటైల్-4-అమైనోఫినాల్

Paracetamol

3. ✓ పారాసెటమాల్

4. ✗

Oil of wintergreen

అయిల్ ఆఫ్ వింటర్ గ్రీన్

Question Number : 30 Question Id : 9683559120 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

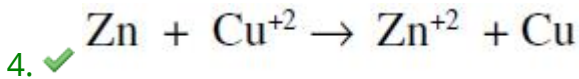
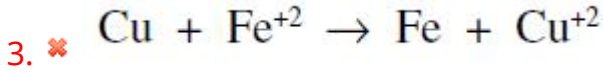
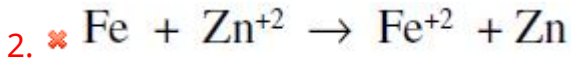
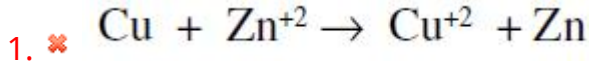
Correct Marks : 1 Wrong Marks : 0

Predict the spontaneous reaction based on the given electrode potentials

ఇవ్వబడిన ఎలక్ట్రోడ్ పొటెన్షియల్ విలువల ఆధారంగా ఏ చర్య సాధ్యపడును

$Zn / Zn^{+2} = +0.763 \text{ V}$   $Cu / Cu^{+2} = -0.340 \text{ V}$  &  $Fe / Fe^{+2} = +0.440 \text{ V}$ .

Options :



Question Number : 31 Question Id : 9683559121 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

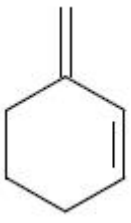
Correct Marks : 1 Wrong Marks : 0

Which of the following molecule participate in electrocyclication

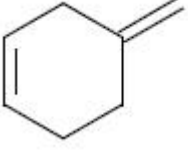
క్రింది వానిలో ఏది ఎలక్ట్రోసైక్లైజేషన్లో పాల్గొనును

Options :

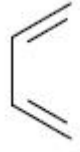
1. ✖



2. ✖



3. ✔



4. ✖

All of these

అన్నీ ఐచికాలు

Question Number : 32 Question Id : 9683559122 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The major product formed in the Chichibabin reaction of pyridine is

చిచిబబిన్ చర్యలో పిరిడిన్ ఏర్పర్చు ప్రధాన ఉత్పన్నము

Options :

3-Aminopyridine

1. ✖

3-అమైన్‌పిరిడిన్

2-Aminopyridine

2. ✔

2-అమైన్‌పిరిడిన్

3. ✖

4-Aminopyridine

4-అమైనోపిరిడిన్

2,3-Diaminopyridine

4. ✖ 2,3-డైఅమైనోపిరిడిన్

Question Number : 33 Question Id : 9683559123 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Joule Thomson experiment is

జౌల్ థామ్సన్ ప్రయోగము \_\_\_\_\_ ప్రక్రియ

Options :

Isobaric and isothermal process

1. ✖ స్థిరపీడన మరియు సమోష్ణగ్రత

Isochoric and isothermal process

2. ✖ స్థిరఘనపరిమాణ మరియు సమోష్ణగ్రత

Adiabatic and isoenthalpic process

3. ✔ స్థిరోష్ణక మరియు సమఎంథాల్పి

Isothermal and isoenthalpic process

4. ✖ సమోష్ణగ్రత మరియు సమఎంథాల్పి

Question Number : 34 Question Id : 9683559124 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Among the following which compound can produce the enolate ion with high rate

ఈ క్రింది వానిలో సులభంగా ఈనోలేట్‌ను ఏర్పరుచునది

**Options :**

Acetyl acetone

1. ✓ ఎసిటైల్ ఎసిటోన్

Ethyl acetate

2. ✗ ఇథైల్ ఎసిటేట్

Acetonyl acetone

3. ✗ ఎసిటోన్‌నైల్ ఎసిటోన్

Acetaldehyde

4. ✗ ఎసిటాల్డిహైడ్

**Question Number : 35 Question Id : 9683559125 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 1 Wrong Marks : 0**

The product obtained when propanoic acid treated with thionyl chloride, diazomethane, silver oxide and water is

ప్రోపనోయిక్ ఆమ్లముకు థయోసైల్ క్లోరైడ్, డయజోమీథేన్, సిల్వర్ ఆక్సైడ్ మరియు నీటిని కలిపిన ఏర్పడు సమ్మేళనము

**Options :**

Acetic acid

1. ✗ ఎసిటిక్ ఆమ్లము

2. ✗

Acetyl chloride

ఎసిటైల్ క్లోరైడ్

Butanoic acid

3. ✓ బ్యూటనోయిక్ ఆమ్లము

Propiolic acid

ప్రోపియోలిక్ ఆమ్లము

4. ✗

Question Number : 36 Question Id : 9683559126 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The oxidation state of iron in hemin is

హీమ్లో ఐరన్ యొక్క ఆక్సీకరణ స్థితి

Options :

1. ✗ +1

2. ✓ +3

3. ✗ +2

4. ✗ Zero

Question Number : 37 Question Id : 9683559127 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No



Correct Marks : 1 Wrong Marks : 0

The product obtained when 2-nitropropane treated with NaOH followed by  $H_2SO_4$  is

2-నైట్రోప్రోపేన్ మొదట NaOH తో తదుపరి  $H_2SO_4$  తో చర్యనొందిన ఏర్పడు ఉత్పన్నము

Options :

Acetaldehyde

1. ✖ ఎసిటాల్డిహైడ్

2-Aminopropane

2. ✖ 2-ఎమైనోప్రోపేన్

Acetone

3. ✔ ఎసిటోన్

Propionic acid

4. ✖ ప్రొపియోనిక్ ఆమ్లము

Question Number : 38 Question Id : 9683559128 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In a first order reaction, 10 moles of reactant convert to 5 moles in the period of 1.5 hrs. After what time the reactant becomes 0.01 mole.

ఒక ప్రథమ క్రమాంక చర్యలో 10 మోల్ల క్రిమాజనకము 1.5 గం॥ లలో 5 మోల్గా మారినది. అయిన 0.01 మోల్లుగా మారుటకు పట్టుకాలము.

Options :

1. ✖ 10 hrs

2. ✔ 15 hrs

3. ✖ 5 hrs

4. ✖ 21 hrs

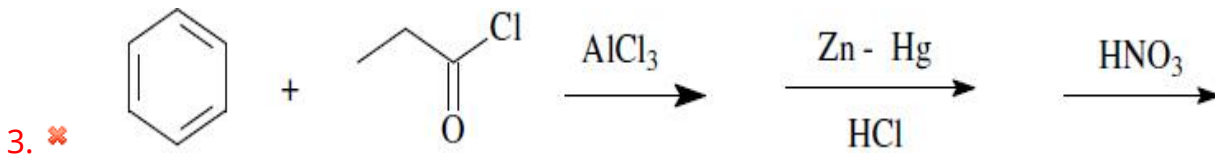
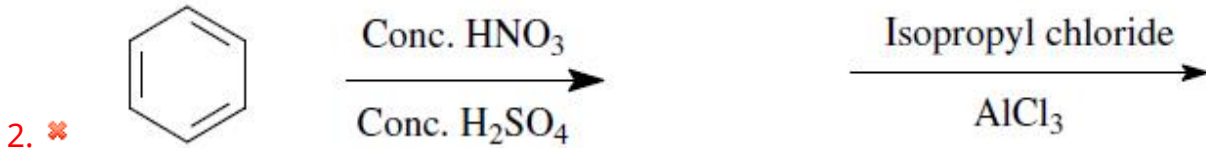
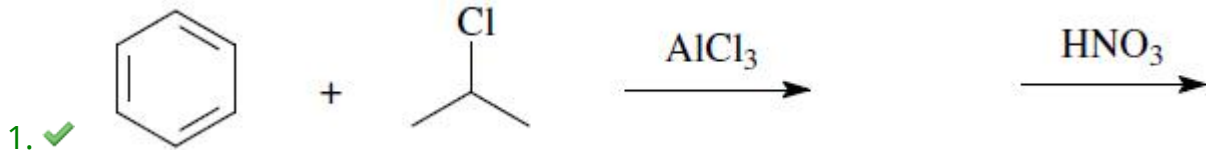
Question Number : 39 Question Id : 9683559129 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In which of the following reactions p-nitrocumene is formed

క్రింది ఏ చర్యలో p-నైట్రోక్యుమీన్ ఏర్పడును

Options :



4. ✖ All of these  
అన్నీ ఐచికాలు

Question Number : 40 Question Id : 9683559130 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In sucrose glycosidic bond present between

సూక్రోజ్‌లో గైకోసిడిక్ బంధము వేటి మధ్య ఏర్పడును

Options :

C-1 of glucose and C-1 of fructose

1. ✖ గ్లూకోజ్ C-1 మరియు ఫ్రక్టోజ్ C-1

C-1 of glucose and C-4 of fructose

2. ✖ గ్లూకోజ్ C-1 మరియు ఫ్రక్టోజ్ C-4

C-2 of glucose and C-1 of fructose

3. ✖ గ్లూకోజ్ C-2 మరియు ఫ్రక్టోజ్ C-1

C-1 of glucose and C-2 of fructose

4. ✔ గ్లూకోజ్ C-1 మరియు ఫ్రక్టోజ్ C-2

Question Number : 41 Question Id : 9683559131 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following solution has same osmotic pressure with 6% glucose solution.

క్రింది వానిలో ఏ ద్రావణము 6% గ్లూకోజు ద్రావణంతో సమ ద్రవాభిసరణపీడనాన్ని కల్గియుండును.

Options :

6% urea solution

1. ✖ 6% యూరియా ద్రావణం

2. ✖

34.2% sugar solution

34.2% చక్కెర ద్రావణం

2% urea solution

2% యూరియా ద్రావణం

3. ✓

5.85% NaCl solution.

5.85% NaCl ద్రావణం

4. ✗

Question Number : 42 Question Id : 9683559132 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is paramagnetic

క్రింది వానిలో పారా అయస్కాంత ధర్మాన్ని ప్రదర్శించునది

Options :

1. ✓  $O_2$

2. ✗  $CN^-$

3. ✗  $N_2$

4. ✗  $O_2^{-2}$

Question Number : 43 Question Id : 9683559133 Question Type : MCQ Option Shuffling : Yes Is

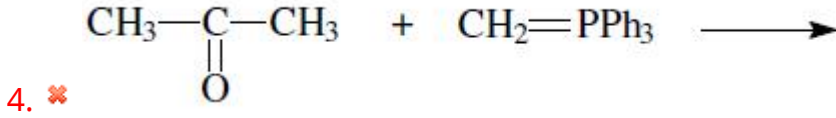
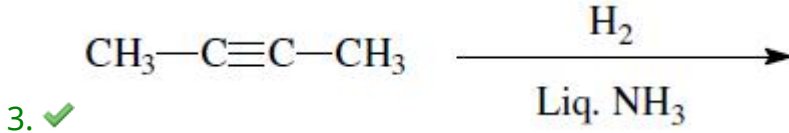
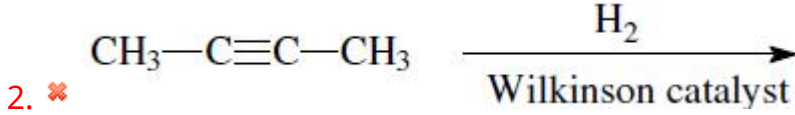
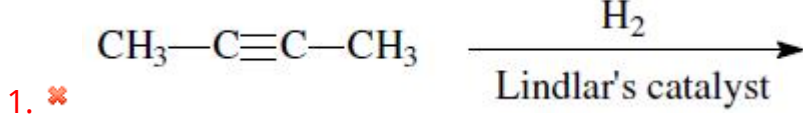
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In which of the following reaction trans 2-Butene is formed

క్రింది వానిలో ఏ చర్యలో ట్రాన్స్ 2-బ్యూటీను ఏర్పడును.

Options :



Question Number : 44 Question Id : 9683559134 Question Type : MCQ Option Shuffling : Yes Is

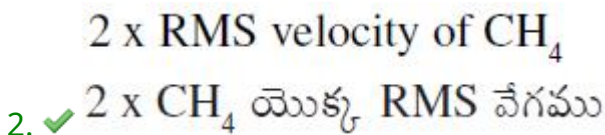
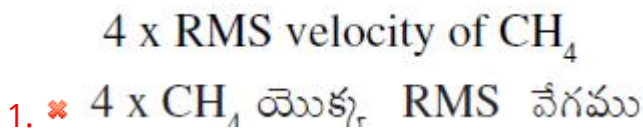
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

RMS velocity of the He molecule at given temperature is equal to

ఇవ్వబడిన ఉష్ణోగ్రత వద్ద He అణువు యొక్క RMS వేగము దేనికి సమానము

Options :



8 x RMS velocity of CH<sub>4</sub>

8 x CH<sub>4</sub> యొక్క RMS వేగము

3. ✖

$\frac{1}{2}$  x RMS velocity of CH<sub>4</sub>

$\frac{1}{2}$  x CH<sub>4</sub> యొక్క RMS వేగము

4. ✖

Question Number : 45 Question Id : 9683559135 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Boran nitride is isoelectronic with

క్రింది వానిలో ఏది బోరాన్ నైట్రైడ్‌తో సమ సంఖ్యలో ఎలక్ట్రాన్‌లను కలిగియుండును

Options :

Diamond

1. ✖ వజ్రము

Borazole

2. ✖ బోరజోల్

Graphite

3. ✔ గ్రాఫైట్

B<sub>3</sub>N<sub>3</sub>H<sub>3</sub>Cl<sub>3</sub>

4. ✖

Question Number : 46 Question Id : 9683559136 Question Type : MCQ Option Shuffling : Yes Is



Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The active species involved in Fenton's oxidation

ఫెంటాన్స్ ఆక్సీకరణములో పాల్గొనే క్రియాశీల కారకము

Options :

1. ✓  $\text{Fe}^{+3}$

2. ✗  $\text{Fe}^{+1}$

3. ✗  $\text{Fe}$

4. ✗  $\text{Fe}^{+2}$

Question Number : 47 Question Id : 9683559137 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following statement is correct

క్రింది వానిలో సరియైనది

Options :

Smaller the gold number, higher the protective power of a colloid

1. ✓ గోల్డ్ సంఖ్య తక్కువ అయిన కొల్లాయిడ్ రక్షణ సామర్థ్యము అధికం.

Lyophilic colloids are less stable than lyophobic colloids

2. ✗ ద్రవప్రియ కొల్లాయిడ్లు ద్రవవిరోధ కొల్లాయిడ్ల కన్న తక్కువ స్థిరమైనవి

3. ✗

Tyndal effect is high in lyophilic colloids

ద్రవప్రియ కొల్లాయిడ్లలో టిండాల్ ప్రభావము అధికంగా ఉండును

Lyophilic colloids are irreversible in nature

4. ✖ ద్రవప్రియ కొల్లాయిడ్లు అనుక్రమణీయ కొల్లాయిడ్లు

Question Number : 48 Question Id : 9683559138 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Radii of  $\text{Cs}^+$  and  $\text{Cl}^-$  ions are 0.169 nm and 0.181 nm respectively. The coordination number of  $\text{Cs}^+$  ion in  $\text{CsCl}$  is

$\text{Cs}^+$  మరియు  $\text{Cl}^-$  అయానుల వ్యాసార్థాలు వరుసగా 0.169 nm మరియు 0.181 nm అయిన  $\text{CsCl}$  లో  $\text{Cs}^+$  అయాన్ సమన్వయ సంఖ్య

Options :

1. ✖ 2

2. ✖ 6

3. ✖ 4

4. ✔ 8

Question Number : 49 Question Id : 9683559139 Question Type : MCQ Option Shuffling : Yes Is

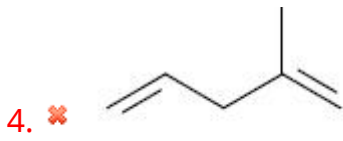
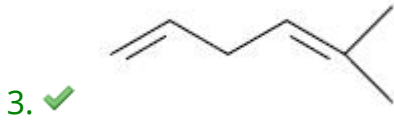
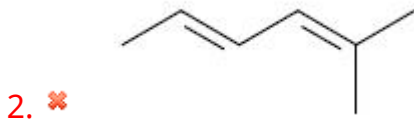
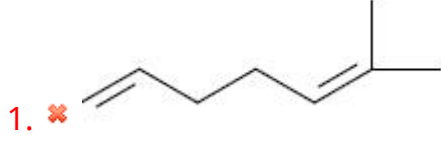
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

A compound in ozonolysis reaction gives formaldehyde, malondialdehyde and acetone. The structure of the compound is

ఒక సమ్మేళనము ఓజోనాలసిస్ చర్యలో ఫార్మల్డిహైడ్, మెలోనాల్డిహైడ్ మరియు ఎసిటోన్లను ఏర్పర్చును. ఆ సమ్మేళన నిర్మాణము

Options :



Question Number : 50 Question Id : 9683559140 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Mixture of water and ethanol can't be separated by fractional distillation due to

నీరు మరియు ఇథనోల్ మిశ్రమాన్ని అంశిక స్వేదనము ద్వారా వేరు చేయలేము కారణము.

Options :

Formation of  $H_3O^+$  and  $EtO^-$

1. ✖  $H_3O^+$  మరియు  $EtO^-$  ఏర్పడును

2. ✖

Both liquids has same boiling point

రెండు ద్రవాల బాష్పీభవన స్థానాలు సమానము

Both liquids has same vapour pressures

రెండు ద్రవాలు ఒకే బాష్పపీడనాన్ని కలిగియుండును

3. ✖

Formation of azeotropic mixture

అజియో ట్రోపిక్ మిశ్రమము ఏర్పడును

4. ✔

Question Number : 51 Question Id : 9683559141 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Hybridization of  $\text{XeO}_2\text{F}_2$  is

$\text{XeO}_2\text{F}_2$  లో Xe యొక్క సంకరీకరణము

Options :

1. ✖  $\text{SP}^3\text{d}^2$

2. ✖  $\text{dSP}^2$

3. ✖  $\text{SP}^3$

4. ✔  $\text{SP}^3\text{d}$

Question Number : 52 Question Id : 9683559142 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Cannizaro reaction, benzaldehyde convert to

కానిజారో చర్యలో బెంజాల్డిహైడ్ నుండి ఏర్పడు ఉత్పన్నము

Options :

Benzoin

1. ✖ బెంజాయిన్

Benzoic acid & Benzoin

2. ✖ బెంజోయిక్ ఆమ్లము మరియు బెంజాయిన్

Benzylalcohol & Benzoin

3. ✖ బెంజైల్ ఆల్కహాల్ మరియు బెంజాయిన్

Benzoic acid and Benzyl alcohol

4. ✔ బెంజోయిక్ ఆమ్లము మరియు బెంజైల్ ఆల్కహాల్

Question Number : 53 Question Id : 9683559143 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following gases can't be liquefied easily.

క్రింది వానిలో ఏ వాయువులు సులభంగా ద్రవీకరణ చెందవు

Options :

1. ✖  $O_2$  &  $N_2$

2. ✖  $NH_3$  &  $CO_2$

3. ✓  $H_2$  & He

4. ✗  $SO_2$  &  $H_2S$

Question Number : 54 Question Id : 9683559144 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The void space in simple cubic lattice in percentage is

సరళ ఘనములో ఉండే ఖాళీ ప్రదేశము శాతములో

Options :

1. ✗ 52.36

2. ✓ 47.6

3. ✗ 68.02

4. ✗ 74.04

Question Number : 55 Question Id : 9683559145 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

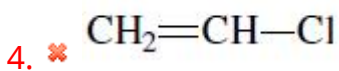
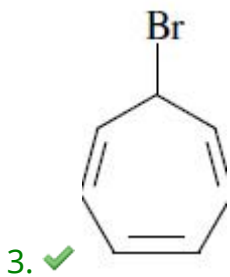
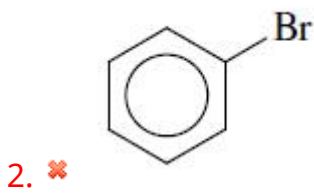
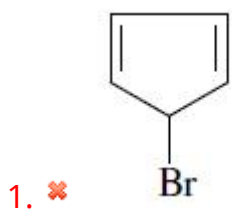
Correct Marks : 1 Wrong Marks : 0

Which of the following has highly reactive in hydrolysis reaction

క్రింది వానిలో జలవిశ్లేషణ చర్యలో అధిక చర్యాశీలతను కల్గియుండు సమ్మేళనము

Options :





Question Number : 56 Question Id : 9683559146 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Point group present in  $\text{NH}_3$  is

$\text{NH}_3$  లో ఉండు బిందు సమూహము (point group)

Options :



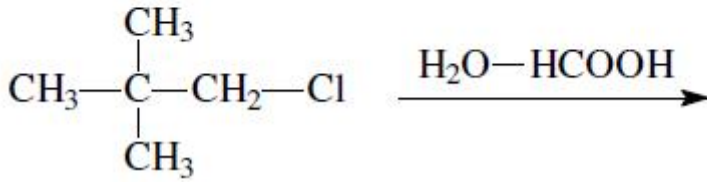
4. ✓  $C_3v$

Question Number : 57 Question Id : 9683559147 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

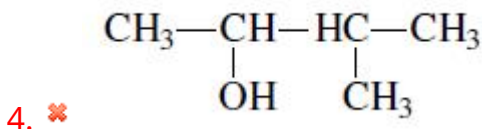
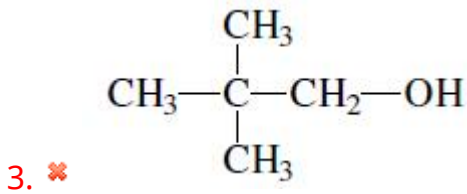
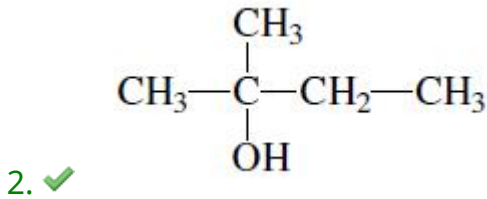
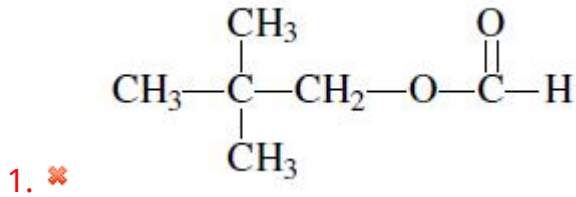
Correct Marks : 1 Wrong Marks : 0

Major product formed in this reaction is

ఈ క్రింది చర్యలో ఏర్పడు ప్రధాన ఉత్పన్నము



Options :



Question Number : 58 Question Id : 9683559148 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Bond order of NO is equal to

NO యొక్క బంధ క్రమము

Options :

1. ✖ 2.0

2. ✖ 3.0

3. ✖ 1.5

4. ✔ 2.5

Question Number : 59 Question Id : 9683559149 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

According to Longmuir adsorption isotherm

లాంగ్ మ్యూర్ సమ ఉష్ణోగ్రత అధిశోషణ వక్రాలను అనుసరించి

Options :

At high pressure the rate of adsorption is linearly proportional to pressure  
1. ✖ అధిక పీడనము వద్ద అధిశోషణ రేటు పీడనానికి అనులోమానుపాతములో ఉండును.

At low pressure the rate of adsorption is linearly proportional to pressure  
2. ✔ అల్పపీడనాల వద్ద అధిశోషణ రేటు పీడనానికి అనులోమాను పాతములో నుండును.

3. ✖

At any pressure the rate of adsorption is linearly proportional to pressure  
ఏ పీడనము వద్ద నైన అధిశోషణ రేటు పీడనానికి అనులోమాను పాతములో నుండును.

At any pressure the rate of adsorption is constant.

4. ✖ ఏ పీడనము వద్ద నైన అధిశోషణ రేటు స్థిరంగా ఉండును

Question Number : 60 Question Id : 9683559150 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No  
Correct Marks : 1 Wrong Marks : 0

In Wittig reaction

విట్టిగ్ చర్యలో

Options :

Two C-C sigma bonds are formed

1. ✖ రెండు C-C సిగ్మా బంధాలు ఏర్పడును

One C-C single bond is formed

2. ✖ ఒక C-C ఏక బంధము ఏర్పడును

C=C is formed

3. ✔ C=C ఏర్పడును

C=O is formed

4. ✖ C=O ఏర్పడును.

Question Number : 61 Question Id : 9683559151 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Surface tension of liquid becomes zero at

ద్రవ తలతన్యత ఎప్పుడు శూన్యంగా ఉండును

Options :

Boiling point

1. ✖ బాష్పీభవన స్థానము వద్ద

Critical point

2. ✔ సందిగ్ధ స్థితి వద్ద

Condensation point

3. ✖ సంఘనన స్థానము వద్ద

Triple point

4. ✖ త్రిక బిందువు వద్ద

Question Number : 62 Question Id : 9683559152 Question Type : MCQ Option Shuffling : Yes Is

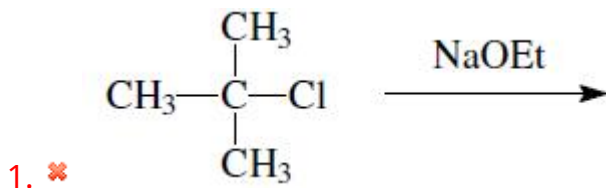
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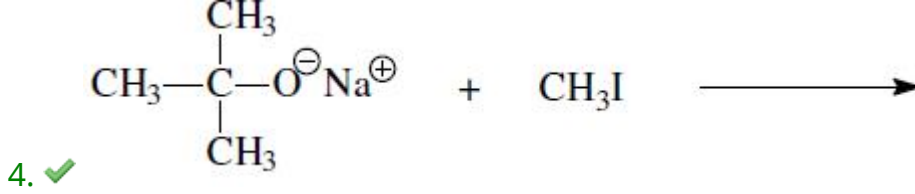
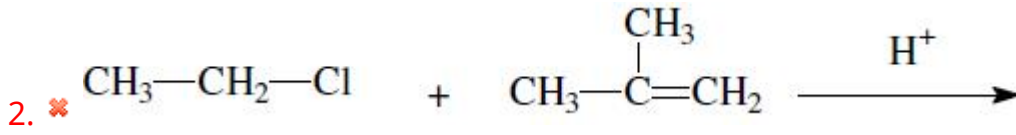
Correct Marks : 1 Wrong Marks : 0

In which of the following reaction ether is formed as major

క్రింది వానిలో ఏ చర్యలో ఈథర్ ప్రధాన ఉత్పన్నముగా ఏర్పడును

Options :





Question Number : 63 Question Id : 9683559153 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Number of phases exist at eutectic point of Ag-Pb system

Ag-Pb వ్యవస్థలో సులభద్రవీకరణ (యుటెక్టిక్) బిందువు వద్ద ఉండే ప్రావస్థల సంఖ్య

Options :

1. ✖ 2

2. ✖ 1

3. ✖ 4

4. ✔ 3

Question Number : 64 Question Id : 9683559154 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0



To estimate potassium ion in gravimetric method, the following reagent is used.

గ్రావిమెట్రిక్ (భారాత్మక) విశ్లేషణ పద్ధతిలో పొటాషియం అయాన్ భారాన్ని లెక్కించుటకు ఉపయోగించే కారకము

Options :

1. ✖  $\text{DMG}^{-1}$

2. ✖  $\text{EDTA}^{-4}$

3. ✔  $\text{Ph}_4\text{B}^{-1}$

4. ✖  $\text{C}_2\text{O}_4^{-2}$

Question Number : 65 Question Id : 9683559155 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Wavelength of first line of Balmer series in Hydrogen spectrum is in  $\text{\AA}$

హైడ్రోజన్ వర్ణపటంలో బామర్ శ్రేణిలో ప్రాథమిక రేఖ యొక్క తరంగ దైర్ఘ్యము విలువ  $\text{\AA}$ లలో

Options :

1. ✖ 4861

2. ✔ 6562

3. ✖ 1217

4. ✖

Question Number : 66 Question Id : 9683559156 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following solution has high osmotic pressure

క్రింది వానిలో దేనికి ద్రవాభిసరణపీడనము అధికంగా ఉండును.

Options :

1 M urea solution

1. ✖ 1 M యూరియా ద్రావణం

0.5 M glucose solution

2. ✖ 0.5 M గ్లూకోజ్ ద్రావణం

0.1 M sugar solution

3. ✖ 0.1 M చక్కర ద్రావణం

0.8 M NaCl solution

4. ✔ 0.8 M NaCl ద్రావణం

Question Number : 67 Question Id : 9683559157 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

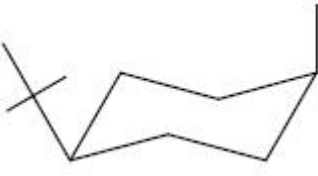
Correct Marks : 1 Wrong Marks : 0

Relatively stable conformer among the following

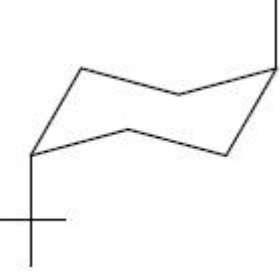
క్రింది వానిలో అధిక స్థిరమైన అనురూపాత్మక సాదృశ్యము

Options :

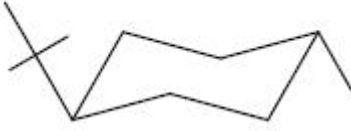
1. ✖



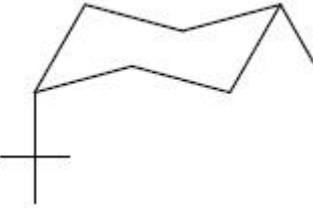
2. ✖



3. ✔



4. ✖



Question Number : 68 Question Id : 9683559158 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The reagent used to separate IIA and IIB group cations is

II A మరియు II B గ్రూపు కేటయానులను భేదపరిచే కారకము

Options :

Nessler's reagent

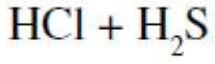
1. ✖

నెస్లర్ కారకము

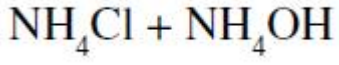
Ammonium polysulphide

2. ✔

అమ్మోనియం పాలిసల్ఫైడ్



3. ✖



4. ✖

Question Number : 69 Question Id : 9683559159 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Milk is an example of

పాలు దేనికి ఉదాహరణ

Options :

Emulsion

1. ✔ ఎమల్షన్

Foam

2. ✖ సురుగు

Gel

3. ✖ జెల్

Solid foam

4. ✖ ఘన సురుగు

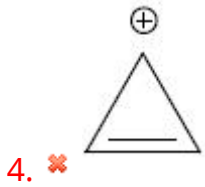
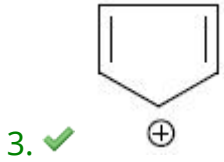
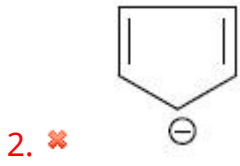
Question Number : 70 Question Id : 9683559160 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is antiaromatic compound

క్రింది వానిలో ఏది అంట్రి అరోమాటిక్ సమ్మేళనము

Options :



Question Number : 71 Question Id : 9683559161 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Redburg constant value is equal to

రిడ్బర్గ్ స్థిరాంకము విలువ దేనికి సమానము

Options :

1. ✖ 
$$\frac{2\pi^2 me^4}{Ch}$$

2. ✖

$$\frac{4\pi^2 me^4}{Ch^2}$$

3. ✖  $\frac{2\pi^2 me^2}{Ch^3}$

4. ✔  $\frac{2\pi^2 me^4}{Ch^3}$

Question Number : 72 Question Id : 9683559162 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

An organic compound having R-configuration, its optical rotation is

ఒక సేంద్రియ సమ్మేళనము 'R' ప్రాదేశిక అమరికను కలియున్నది. అయిన దృవణ భ్రమణము

Options :

dextro

1. ✖ డెక్ట్రో

leavo

2. ✖ లీవో

No optical rotation

3. ✖ దృవణ భ్రమణము ఉండదు

may be dextro (or) leavo

4. ✔ డెక్ట్రో లేదా లీవో ఉండవచ్చును



Question Number : 73 Question Id : 9683559163 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following element can produce imide with ammonia

అమ్మోనియాతో ఇమైడ్ను ఏర్పర్చే మూలకము

Options :

1. ✖ Na

2. ✔ Li

3. ✖ Cs

4. ✖ K

Question Number : 74 Question Id : 9683559164 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

10 ml, 0.02 M  $K_2Cr_2O_7$  solution is required to react with 12 ml of  $FeSO_4$  solution, the conc. of  $FeSO_4$  solution

10 ml, 0.02 M  $K_2Cr_2O_7$  ద్రావణముతో చర్యనొందుటకు 12 ml  $FeSO_4$  ద్రావణము అవసరమైనది. అయిన  $FeSO_4$  ద్రావణ గాఢత

Options :

1. ✖ 0.02 M

2. ✖ 0.016 M

3. ✖ 0.4 M

4. ✓ 0.1 M

Question Number : 75 Question Id : 9683559165 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The reaction which gives  $\beta$ -hydroxy carbonyl compound as the product is

$\beta$ -హైడ్రాక్సి కార్బోనైల్ సమ్మేళనము ఏర్పడు చర్య

Options :

Reimer-Tiemann reaction

1. ✗ రీమర్-టీమన్ చర్య

Aldol reaction

2. ✓ అల్డోల్ చర్య

Cannizaro reaction

3. ✗ కానిజారో చర్య

Dakin reaction

4. ✗ డాకిన్ చర్య

Question Number : 76 Question Id : 9683559166 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following can produce methane on hydrolysis

క్రింది వానిలో జలవిశ్లేషణ చర్యలో మీథేన్ వాయువును ఉత్పత్తి చేయు సమ్మేళనము

Options :

1. ✖  $\text{Be}_2\text{C}$

2. ✖  $\text{Al}_4\text{C}_3$

3. ✔ a & b

4. ✖  $\text{CaC}_2$

Question Number : 77 Question Id : 9683559167 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Example for n-type semiconductor is  
n-type అర్ధవాహకానికి ఉదాహరణ

Options :

Boron doped silicon

1. ✖ సిలికాన్‌ను బోరాన్‌తో మాదీకరణం

Phosphorous doped silicon

2. ✔ సిలికాన్‌ను పాస్ఫరస్‌తో మాదీకరణం

Gallium doped germanium

3. ✖ జేర్మేనియమ్‌ను గాలియమ్‌తో మాదీకరణం

Indium doped germanium

4. ✖ జేర్మేనియమ్‌ను ఇండియమ్‌తో మాదీకరణం

Question Number : 78 Question Id : 9683559168 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Among the following, relatively more acidic compound

క్రింది వానిలో ఏది అధిక ఆమ్లత్వాన్ని కల్గియుండును.

Options :

Phenol

1. ✖ ఫీనాల్

chloroacetic acid

2. ✖ క్లోరోఎసిటికామ్లము

Acetic acid

3. ✖ ఎసిటికామ్లము

Triflouroacetic acid

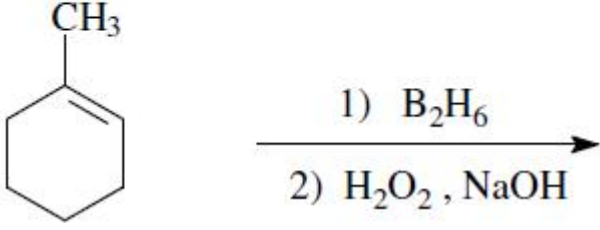
4. ✔ ట్రైఫ్లోరోఎసిటికామ్లము

Question Number : 79 Question Id : 9683559169 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

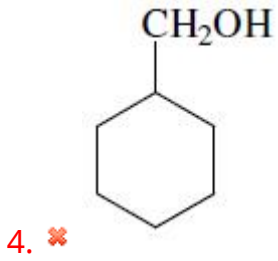
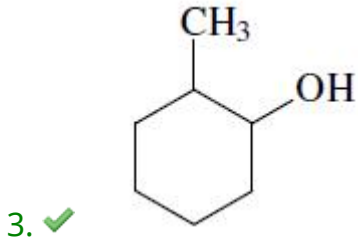
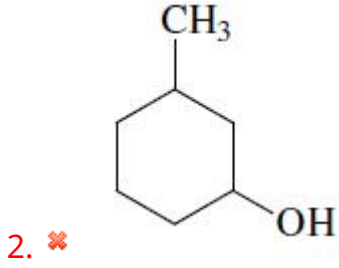
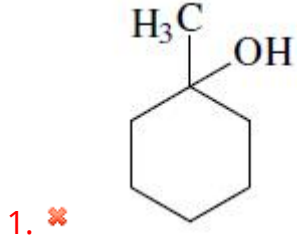
Correct Marks : 1 Wrong Marks : 0

The major product formed in the following reaction

క్రింది చర్యలో అధిక మొత్తములో ఏర్పడు ఉత్పన్నము



Options :



Question Number : 80 Question Id : 9683559170 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In  $P_4O_{10}$

$P_4O_{10}$  లో

Options :

Six P-O-P bridge bonds are present

1. ✓ ఆరు P-O-P వారధి బంధాలుండును.

Six  $d^{\pi}$ - $P^{\pi}$  bonds are present

2. ✗ ఆరు  $d^{\pi}$ - $p^{\pi}$  బంధాలుండును

Six P-O bonds are present

3. ✗ ఆరు P-O బంధాలుండును

Eight  $d^{\pi}$ - $P^{\pi}$  bonds are present

4. ✗ ఎనిమిది  $d^{\pi}$ - $p^{\pi}$  బంధాలుండును

Question Number : 81 Question Id : 9683559171 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which one of the following is related to metallic bonding

లోహబంధాన్ని వివరించునది.

Options :

Paulis exclusion principle

1. ✗ పౌలి వర్జన సూత్రము

Aufban's principle

2. ✗ అఫ్బౌ సూత్రము



Fajan's rules

3. ✖ ఫాజన్ నియమాలు

Pauli's resonance theory

4. ✔ పౌలి రెజోనెన్స్ సిద్ధాంతము

Question Number : 82 Question Id : 9683559172 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Reaction of  $\text{AlF}_3$  with an excess of  $\text{F}^-$  gives

$\text{AlF}_3$  అధిక  $\text{F}^-$  అయానులతో చర్యనొందిన ఏర్పడు సమ్మేళనము.

Options :

1. ✖  $\text{AlF}_4^-$

2. ✔  $\text{AlF}_6^{3-}$

3. ✖  $\text{AlF}_5^{2-}$

4. ✖  $\text{Al}_2\text{F}_6$

Question Number : 83 Question Id : 9683559173 Question Type : MCQ Option Shuffling : Yes Is

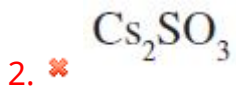
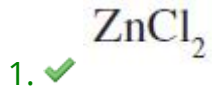
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following solute act as amphoteric in liq.  $\text{SO}_2$

క్రింది వానిలో ఏ సమ్మేళనము ద్రవ  $\text{SO}_2$  లో ద్వంద్వ స్వభావాన్ని ప్రదర్శించును

Options :

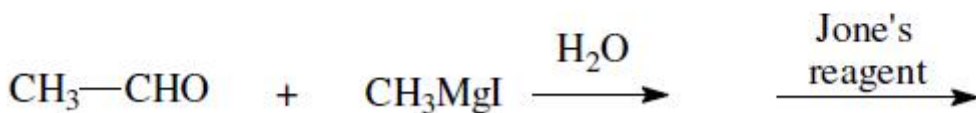


Question Number : 84 Question Id : 9683559174 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

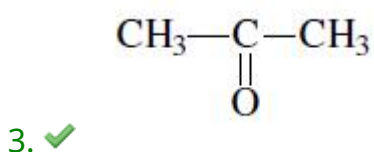
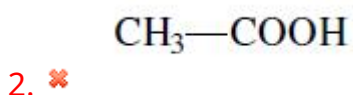
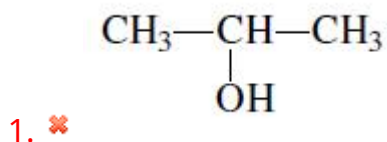
Correct Marks : 1 Wrong Marks : 0

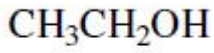
Identify the product formed in following transformations

క్రింది రసాయన చర్యలో ఏర్పడే ఉత్పన్నము గుర్తించుము.



Options :





4. ✖

Question Number : 85 Question Id : 9683559175 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is a peroxide

క్రింది వానిలో ఏది పెరాక్సైడ్

Options :

1. ✖  $\text{MnO}_2$

2. ✖  $\text{KO}_2$

3. ✖  $\text{PtO}_2$

4. ✔  $\text{BaO}_2$

Question Number : 86 Question Id : 9683559176 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

C 60 Fullerene is soluble in

C 60 ఫుల్లరెన్ దేనిలో కరుగును

Options :

1. ✖  $\text{H}_2\text{O}$

2. ✓ Benzene

3. ✗  $\text{NH}_3$

4. ✗  $\text{HCl}$

Question Number : 87 Question Id : 9683559177 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following cycloalkane is relatively more stable

క్రింది వానిలో సాపేక్షంగా అధిక స్థిరత్వాన్ని కలిగియుండు సైక్లో అల్కేన్

Options :

Cyclopropane

1. ✗ సైక్లోప్రోపేన్

Cyclobutane

2. ✗ సైక్లోబ్యూటేన్

Cyclopentane

3. ✗ సైక్లోపెంటేన్

Cyclohexane

4. ✓ సైక్లోహెక్సేన్

Question Number : 88 Question Id : 9683559178 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In permanganometry titrations which one of the following shouldn't be used as medium

పర్మాంగనో మెట్రి అంశమాపన చర్యలో దేనిని యానకంగా ఉపయోగించకూడదు

Options :

1. ✖ NaOH (aq.)

2. ✖ H<sub>2</sub>SO<sub>4</sub> (dil)

3. ✖ H<sub>2</sub>SO<sub>4</sub> (conc)

4. ✔ HCl

Question Number : 89 Question Id : 9683559179 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Ammonium cations form brown colour precipitate with Nessler's reagent due to formation of

అమోనియమ్ కేటయాన్ నెస్లర్ కారకముతో చర్యనొందినపుడు ఏర్పడే బ్రౌన్ (గోధుమ) వర్ణపు అవక్షేపము

Options :

1. ✖ HgO

2. ✔ HgO. Hg(NH<sub>2</sub>) I

3. ✖  $\text{HgO.NH}_4\text{I}$

4. ✖  $\text{Hg NH}_4 \text{I}_2$

Question Number : 90 Question Id : 9683559180 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Among the following, which is formed in Riemer-Tiemann reaction of phenol

క్రింది వానిలో ఫీనాల్ నుండి రీమర్-టీమన్ చర్యలో ఏర్పడు ఉత్పన్నము

Options :

Catecol

1. ✖ కాటకాల్

Aspirin

2. ✖ ఆస్పీన్

Benzene

3. ✖ బెంజీన్

Salicyl aldehyde

4. ✔ సాలిసిలాల్డిహైడ్

Question Number : 91 Question Id : 9683559181 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0



$\text{H}_5\text{IO}_6$  is formed by hydrolysis of  
 $\text{H}_5\text{IO}_6$  దేని జలవిశ్లేషణ చర్యలో ఏర్పడును.

Options :

1. ✖  $\text{I}_2\text{O}_5$

2. ✖  $\text{IF}_5$

3. ✔  $\text{IF}_7$

4. ✖  $\text{ICl}_3$

Question Number : 92 Question Id : 9683559182 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Among the following, the more basic compound is  
ఇవ్వబడిన సమ్మేళనాలలో ఏది అధిక క్షారత్వాన్ని కల్గియుండును.

Options :

N,N-Dimethylaniline

1. ✖ N,N-డైమీథైల్ ఎనిలిన్

Aniline

2. ✖ ఎనిలిన్

Methylamine

3. ✔ మీథైల్ అమైన్

4. ✖

Question Number : 93 Question Id : 9683559183 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The general formula of Lanthanide oxides

లాంథనైడ్ అక్సైడ్ల సాధారణ ఫార్ములా

Options :

1. ✖  $\text{LnO}$

2. ✖  $\text{LnO}_2$

3. ✖  $\text{Ln}_3\text{O}_4$

4. ✔  $\text{Ln}_2\text{O}_3$

Question Number : 94 Question Id : 9683559184 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following reagent is used to calculate the no of C-C double bonds

క్రింది వానిలో దేనిని C-C ద్విబంధాలను లెక్కించుటకు ఉపయోగిస్తారు

Options :

1. ✖  $\text{I}_2\text{O}_5$

2. ✖



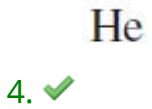
Question Number : 95 Question Id : 9683559185 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following gas is not adsorbed on charcoal

క్రింది ఏ వాయువు ఉత్తేజిత బొగ్గు పైన అధిశోషణ చెందదు

Options :



Question Number : 96 Question Id : 9683559186 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following element does not possess equal magnetic moment in its elementary and +2 states

క్రింది వానిలో ఏ మూలకము, మూలక స్థితి మరియు +2 స్థితిలో సమాన అయస్కాంత భ్రామకాలను కలియుండదు.

Options :

V

1. ✖

Mn

2. ✖

Fe

3. ✖

Cr

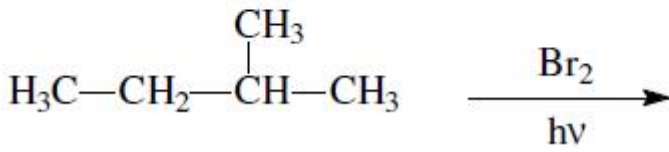
4. ✔

Question Number : 97 Question Id : 9683559187 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

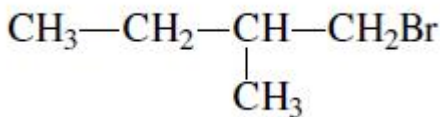
Correct Marks : 1 Wrong Marks : 0

Major product formed in below reaction is

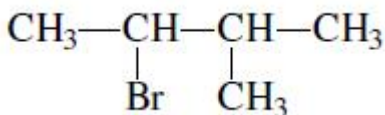
క్రింది చర్యలో ఏ ఉత్పన్నము అధికంగా ఏర్పడును



Options :

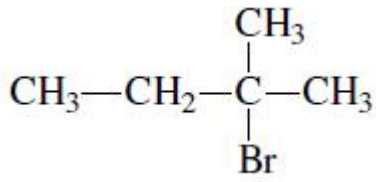


1. ✖

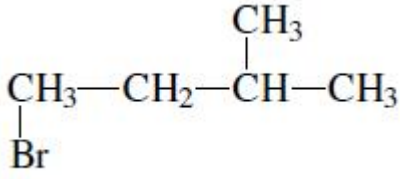


2. ✖

3. ✓



4. ✗



Question Number : 98 Question Id : 9683559188 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following ion exhibit the similar color with  $\text{Dy}^{+3}$

క్రింది ఏ అయాన్  $\text{Dy}^{+3}$  వర్ణమును కలియుండును.

Options :

1. ✓  $\text{Sm}^{+3}$

2. ✗  $\text{Yb}^{+3}$

3. ✗  $\text{Gd}^{+3}$

4. ✗  $\text{Lu}^{+3}$

Question Number : 99 Question Id : 9683559189 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is cementite

సిమెన్ట్ టెట్ ఫార్ములా

Options :

1. ✖  $\text{Fe}_3\text{C}_4$

2. ✔  $\text{Fe}_3\text{C}$

3. ✖  $\text{Al}_4\text{C}_3$

4. ✖  $\text{Fe}_2\text{C}$

Question Number : 100 Question Id : 9683559190 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is optically active

క్రింది వానిలో ఏది దృవణ భ్రమణాన్ని ప్రదర్శించును.

Options :

1. ✔ 1,3-pentadiene  
1,3-పెంటాడైయిన్

2. ✖ Meso tartaric acid  
మీసోటార్టారిక్ ఆమ్లం

3. ✖ Cis-1,2-dichloro cyclopropane  
cis-1,2-డైక్లోరోసైక్లోప్రోపేను



Dichloromethane

ಡೈಕ್ಲೋರೋಮಿಥೇನ್

4. ✖

BOOKLET CODE

A

Invigilator's Signature

## ENTRANCE EXAMINATION – 2020

M. Sc. Chemistry

TIME: 2 HOURS

MAXIMUM MARKS: 100

HALL TICKET NUMBER:

## INSTRUCTIONS

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR ANSWER SHEET** given to you.
2. Make sure that pages numbered from 1 - 21 are present (excluding 3 pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Handover the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. **Cell phones are not allowed.**
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

**Useful Constants:**

Rydberg constant =  $109737 \text{ cm}^{-1}$ ; Faraday constant =  $96500 \text{ C}$ ; Planck constant =  $6.625 \times 10^{-34} \text{ J s}$ ; Speed of light =  $2.998 \times 10^8 \text{ m s}^{-1}$ ; Boltzmann constant =  $1.380 \times 10^{-23} \text{ J K}^{-1}$ ; Gas constant =  $8.314 \text{ J K}^{-1} \text{ mol}^{-1} = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1} = 1.986 \text{ cal K}^{-1} \text{ mol}^{-1}$ ; Mass of electron =  $9.109 \times 10^{-31} \text{ kg}$ ; Mass of proton =  $1.672 \times 10^{-27} \text{ kg}$ ; Charge of electron =  $1.6 \times 10^{-19} \text{ C}$ ;  $1 \text{ D} = 3.336 \times 10^{-30} \text{ C m}$ ;  $1 \text{ bar} = 10^5 \text{ N m}^{-2}$ ;  $RT/F$  (at  $298.15 \text{ K}$ ) =  $0.0257 \text{ V}$ ;  $1 \text{ a.m.u.} = 1.66 \times 10^{-27} \text{ kg}$

**PART – A**

- If a hydrogen atomic orbital has two radial nodes and is non-zero at the origin, its principal (n) and angular momentum (l) quantum numbers, respectively, are  
 [A] 1 and 0 [B] 2 and 1  
 [C] 3 and 0 [D] 4 and 1
- The decomposition of nitrogen pentoxide,  $\text{N}_2\text{O}_5(\text{s}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$ , is an endothermic process, but spontaneous. It is driven by a  
 [A] positive entropy change [B] negative enthalpy change  
 [C] positive free energy change [D] negative entropy change
- At  $25^\circ\text{C}$ , solid  $\text{PbCl}_2$  is least soluble in  
 [A]  $0.1 \text{ M CaCl}_2$  [B]  $0.1 \text{ M NaCl}$   
 [C]  $0.1 \text{ M KNO}_3$  [D]  $0.1 \text{ M HCl}$
- The splitting of nuclear spin energy levels in a magnetic field is known as  
 [A] Stark effect [B] Mössbauer effect  
 [C] Zeeman effect [D] Cotton effect
- The angle between the Miller planes (110) and (100) in a simple cubic lattice is  
 [A]  $45^\circ$  [B]  $60^\circ$   
 [C]  $90^\circ$  [D]  $120^\circ$

6. The order of electromagnetic radiation with increasing wavelength is
- [A] radio wave < microwave < infrared < ultraviolet  
[B] ultraviolet < infrared < radio wave < microwave  
[C] ultraviolet < infrared < microwave < radio wave  
[D] ultraviolet < microwave < infrared < radio wave
7. With increase in ionic strength of the solution, the rate of a chemical reaction between two cationic reactants
- [A] decreases [B] increases  
[C] does not change [D] becomes zero
8. An even function among the following is
- [A]  $\sin(x)$  [B]  $\frac{\sin(x)}{x}$   
[C]  $\exp(x)$  [D]  $\frac{\exp(x)}{x}$
9. The equation,  $xy = 4$ , represents
- [A] a pair of straight lines [B] an ellipse  
[C] a parabola [D] a hyperbola
10. Among the following, the *incorrect* expression for  $\cos 2\theta$  is
- [A]  $2\cos^2\theta - 1$  [B]  $1 - 2\sin^2\theta$   
[C]  $\cos^2\theta - \sin^2\theta$  [D]  $2\cos^2\theta + 1$
11. Taylor series expansion for  $\ln(1+x)$  is
- [A]  $1 + x - 2x^2 + 3x^3 - 3x^4 + \dots$  [B]  $x + x^3 + x^5 + x^7 + \dots$   
[C]  $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$  [D]  $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$
12. The smallest ion among  $K^+$ ,  $Cl^-$ ,  $H^-$ , and  $Ca^{2+}$  is
- [A]  $K^+$  [B]  $H^-$   
[C]  $Cl^-$  [D]  $Ca^{2+}$

13. The expected radius ratios ( $r^+/r^-$ ) for trigonal planar and tetrahedral coordination in ionic compounds, respectively, are in the range
- [A] 0.22–0.41 and 0.41–0.73      [B] 0.15–0.22 and 0.22–0.41  
[C] 0.15–0.22 and 0.41–0.73      [D] 0.22–0.41 and 0.41–0.73
14. The complex that obeys the 18-electron rule among the following is
- [A]  $[\text{Cu}(\text{NH}_3)_6]^{2+}$       [B]  $[\text{PtF}_6]^-$   
[C]  $[\text{TiF}_6]^{2-}$       [D]  $[\text{Ni}(\text{PF}_3)_4]$
15. If 2.0 g of pure nickel metal (atomic weight = 58.69) is dissolved in nitric acid and then diluted to 500 mL with water, the normality of the resulting  $\text{Ni}(\text{NO}_3)_2$  solution is
- [A] 0.136      [B] 0.273  
[C] 0.009      [D] 0.068
16. In the reaction,  $\text{IO}_3^- + a\text{I}^- + b\text{H}^+ \rightarrow c\text{I}_2 + d\text{H}_2\text{O}$ , the values of the stoichiometric coefficients 'a', 'b', 'c', and 'd', respectively, are
- [A] 3, 4, 2, and 3      [B] 5, 6, 3, and 3  
[C] 4, 5, 2, and 3      [D] 3, 4, 2, and 3
17. The species isoelectronic to oxide ( $\text{O}^{2-}$ ) is
- [A] N      [B] F  
[C]  $\text{S}^{2-}$       [D]  $\text{Mg}^{2+}$
18. Based on VSEPR and stereochemically inactive pair of electrons, the possible structure of  $[\text{XeF}_8]^{2-}$  is
- [A] tricapped trigonal prism      [B] pentagonal bipyramidal  
[C] square antiprism      [D] bicapped octahedron
19. The enzyme involved in the fermentation of glucose to alcohol is
- [A] amylase      [B] dehydrogenase  
[C] lipase      [D] zymase

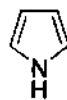
20. Identify the relative reactivities of the following compounds towards aromatic electrophilic reaction



(I)



(II)



(III)



(IV)

[A] (I) < (II) < (III) < (IV)

[B] (I) < (II) < (IV) < (III)

[C] (IV) < (II) < (I) < (III)

[D] (II) < (I) < (III) < (IV)

21. The hybridization of terminal and central carbons of allene, respectively, are

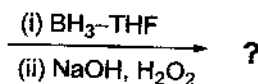
[A]  $sp$  and  $sp^2$

[B]  $sp^2$  and  $sp$

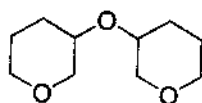
[C]  $sp^3$  and  $sp$

[D]  $sp$  and  $sp^3$

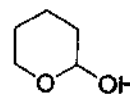
22. The major product formed in the following reaction is



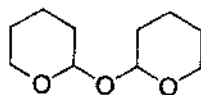
[A]



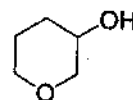
[B]



[C]



[D]



23. The most appropriate reagent required for the conversion of cyclohexene to benzene is

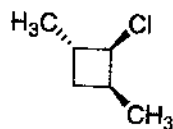
[A]  $KMnO_4$

[B]  $MnO_2$

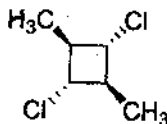
[C] DDQ

[D]  $CrO_3$

24. Identify the optically active compounds among the following



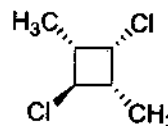
(I)



(II)



(III)



(IV)

[A] (II) and (III)

[B] (I), (II), and (III)

[C] (I), (III), and (IV)

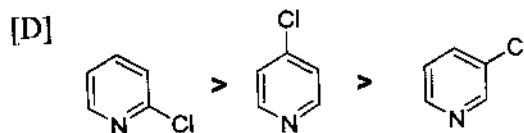
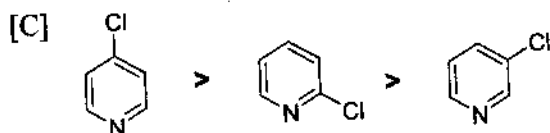
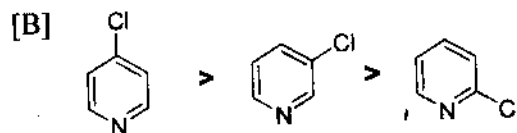
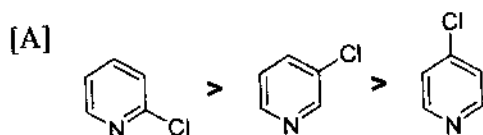
[D] (I) and (III)



W-9

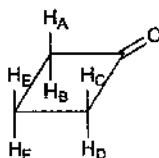
BOOKLET CODE-A

25. Identify the relative reactivities of chloropyridines towards nucleophilic substitution reaction with sodium ethoxide



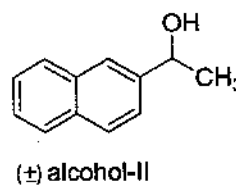
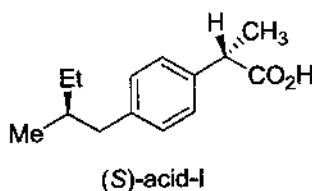
**PART - B**

26. The topic relations among  $H_A$  and  $H_D$ ,  $H_E$  and  $H_F$  of cyclobutanone, respectively, are



- [A] enantiotopic and homotopic                      [B] enantiotopic and enantiotopic  
[C] homotopic and enantiotopic                      [D] homotopic and homotopic

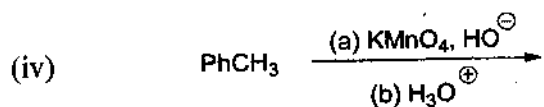
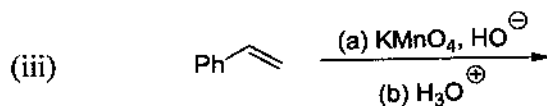
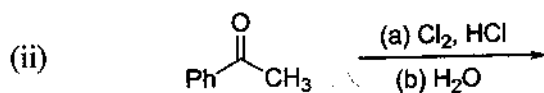
27. Esterification of acid-I with alcohol-II leads to the formation of a



28. Identify the most water soluble bromo-compound from the following



29. The reactions that produce benzoic acid are



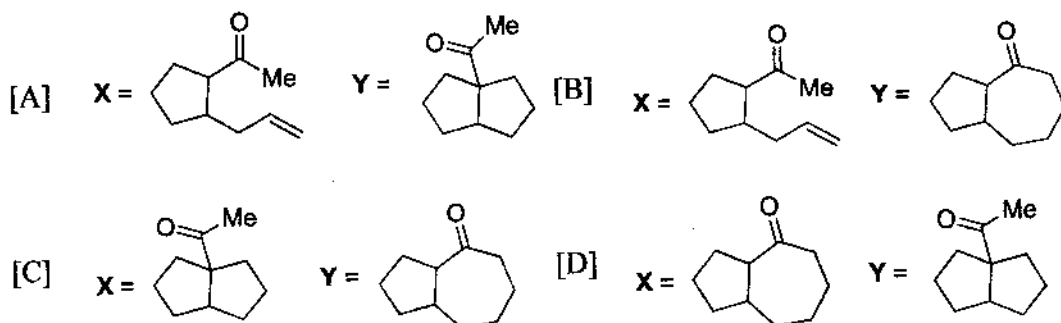
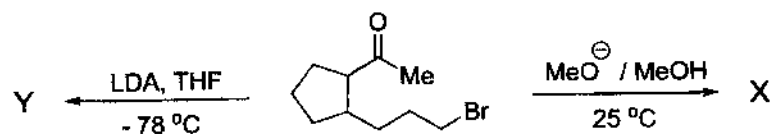
[A] (i), (ii), and (iv)

[B] (ii), (iii), and (iv)

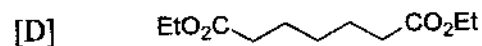
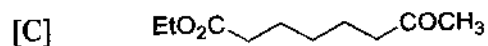
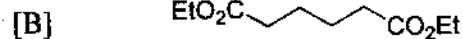
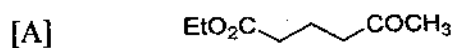
[C] (i), (iii), and (iv)

[D] (i) and (iv)

30. Identify the products X and Y in the following synthetic scheme

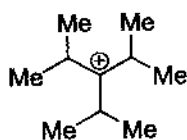


31. The precursor required for obtaining ethyl 2-oxocyclohexanecarboxylate is

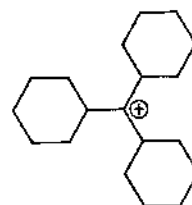


32. The carbocation having the longest half-life is

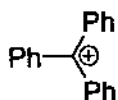
[A]



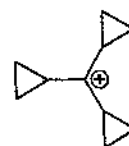
[B]



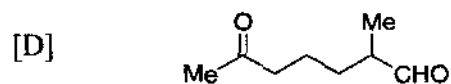
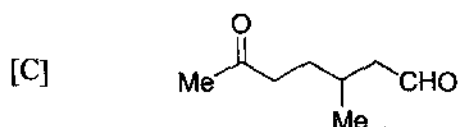
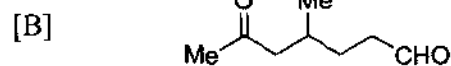
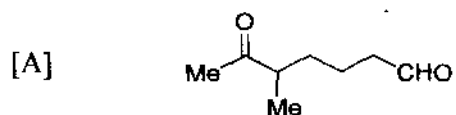
[C]



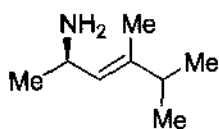
[D]



33. The major product obtained in the ozonolysis of 1,4-dimethylcyclohexene followed by a reductive workup with Zn and ethanoic acid is



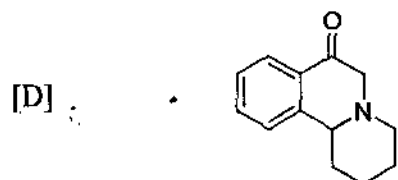
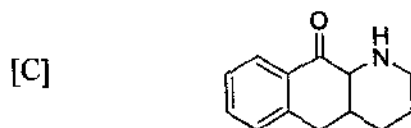
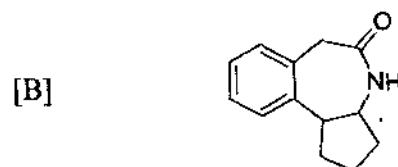
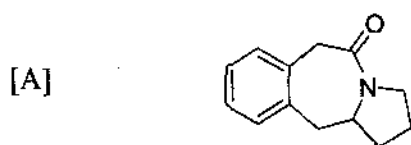
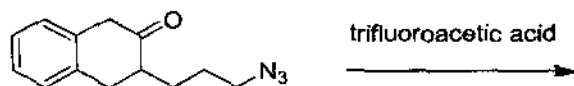
34. The IUPAC name of the following compound is



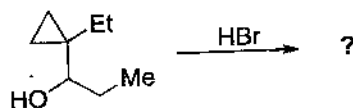
[A] (*R,E*)-4,5-dimethylhex-3-en-2-amine [B] (*S,E*)-4,5-dimethylhex-3-en-2-amine

[C] (*R,E*)-4-methyl,4-isopropyl-3-en-2-amine [D] (*S,E*)-2,3-dimethylhex-3-en-5-amine

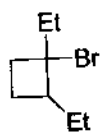
35. The major product formed in the following transformation is



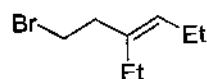
36. Predict the major product in the following transformation



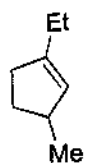
[A]



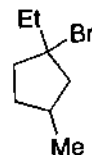
[B]



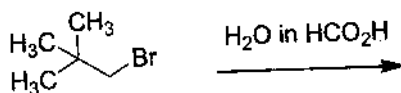
[C]



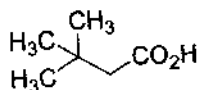
[D]



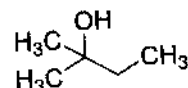
37. Identify the major product in the following reaction



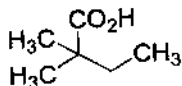
[A]



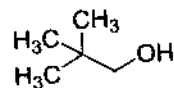
[B]



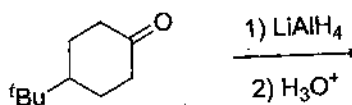
[C]



[D]



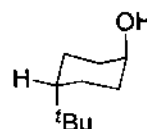
38. The most stable conformation of the major product formed in the following reaction is



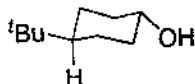
[A]



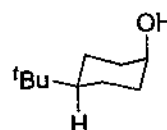
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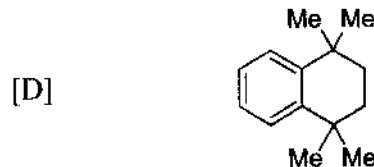
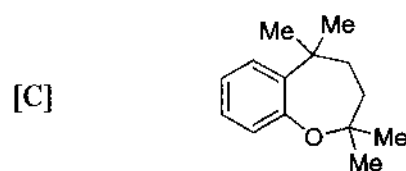
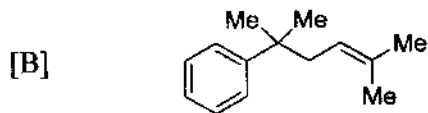
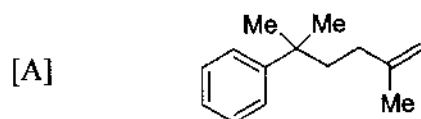
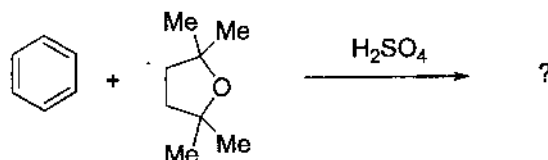
[C]



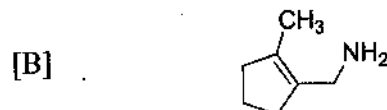
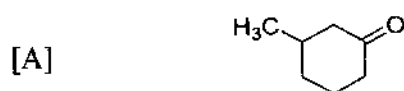
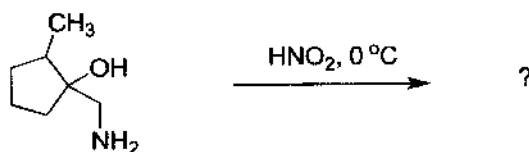
[D]



39. Identify the major product in the following transformation



40. Identify the major product in the following reaction

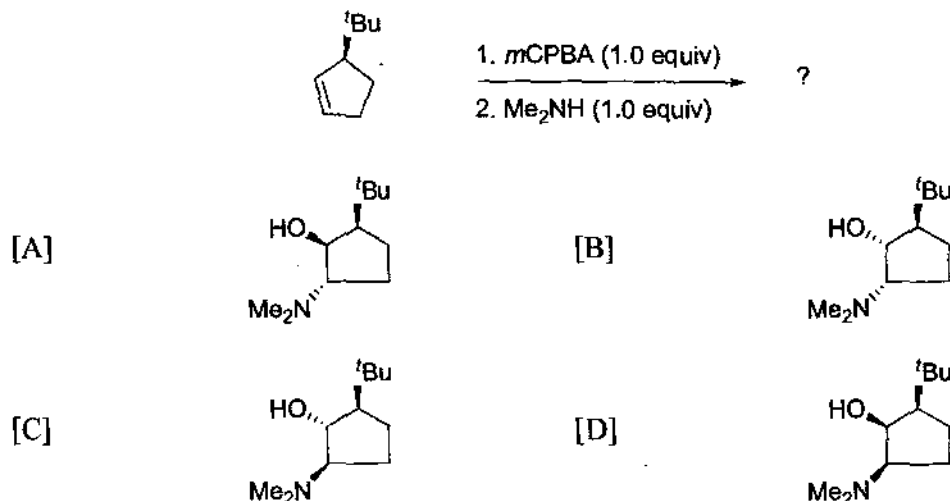


41. The major product formed in the Chichibabin reaction of pyridine is

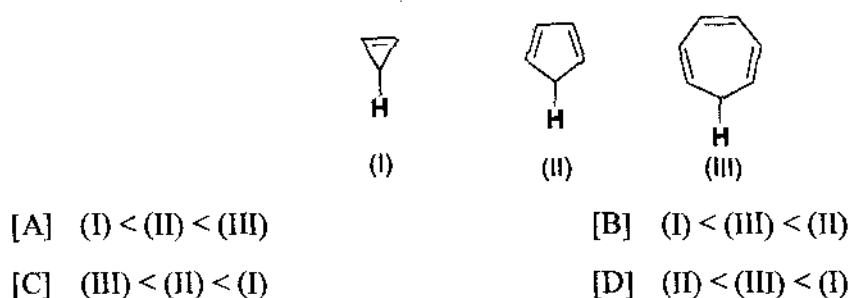




42. The major product formed in the following transformation is



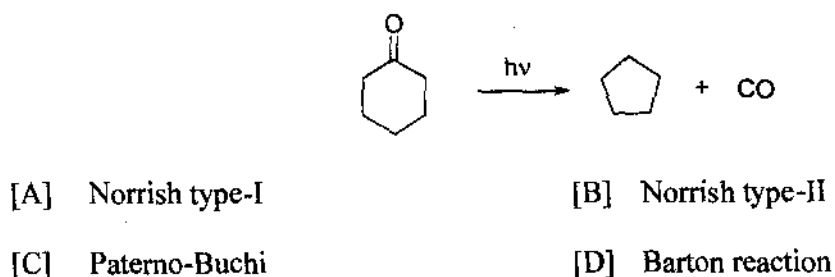
43. Arrange the following compounds in the increasing order of  $pK_a$  value of the highlighted "H"



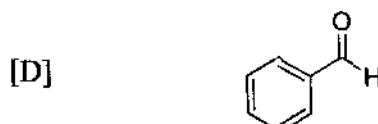
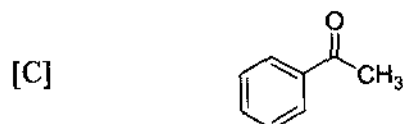
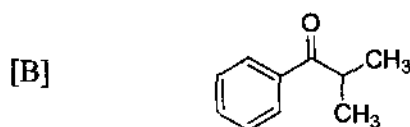
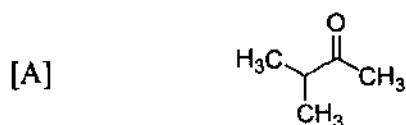
44. The  $[\alpha]_D^{20}$  of a 90% optically pure (*R*)-2-arylpropanoic acid solution is  $+135^\circ$ . On treatment with a base at  $20^\circ\text{C}$  for one hour,  $[\alpha]_D^{20}$  changed to  $+120^\circ$ . The optical purity of the resulting (*R*)-isomer is

- [A] 80%                                      [B] 70%  
 [C] 20%                                      [D] 30%

45. Identify the name of the following reaction



46. Identify the compound that produces a red/orange colored product when treated with 2,4-dinitrophenylhydrazine. The compound does not react with the Schiff's reagent and results negative iodoform test.



47. Which of the following compounds will have its absorption maximum at the longest wavelength?

[A] 1,2,5-hexatriene

[B] 1,5-hexadiyne

[C] 1,3-hexadiyne

[D] 1,3,5-hexatriene

48. The  $^1\text{H}$  NMR spectrum of  $\text{H}_3\text{C}-\text{O}-\text{CHCl}-\text{CH}_2\text{Cl}$  will exhibit

[A] a three-proton doublet, a one-proton singlet, and a two-proton doublet

[B] a three-proton singlet, a one-proton singlet, and a two-proton doublet

[C] a three-proton singlet, a one-proton triplet, and a two-proton doublet

[D] a three-proton triplet, a one-proton triplet, and a two-proton triplet

49. The hormone insulin is a

[A] terpenoid

[B] carbohydrate

[C] steroid

[D] peptide

50. A bacterial cell does not contain

[A] ribosome

[B] DNA

[C] lipid membrane

[D] nucleus

51. Among the following, the electron rich molecular hydride is

[A]  $\text{CsH}$

[B]  $\text{PH}_3$

[C]  $\text{B}_4\text{H}_{10}$

[D]  $\text{SiH}_4$

52. The value of 'n' for the cyclic ion  $[\text{Si}_6\text{O}_{18}]^{n-}$  is

- [A] 6 [B] 10  
[C] 12 [D] 8

53. Among the following, the reagents for separation of Group-IV metal ions are

- [A]  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$  [B]  $\text{HCl}$  and  $\text{H}_2\text{S}$   
[C]  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$ , and  $\text{H}_2\text{S}$  [D]  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$ , and  $(\text{NH}_4)_2\text{CO}_3$

54. Among the following thallium compounds, the most stable one above  $40^\circ\text{C}$  is

- [A]  $\text{TlCl}$  [B]  $\text{TlCl}_3$   
[C]  $\text{TlCl}_2$  [D]  $\text{Tl}_2\text{Cl}_6$

55. Reaction of  $\text{AlF}_3$  with an excess of  $\text{F}^-$  gives

- [A]  $\text{AlF}_4^-$  [B]  $\text{AlF}_5^{2-}$   
[C]  $\text{Al}_2\text{F}_6$  [D]  $\text{AlF}_6^{3-}$

56. The total number of tetrahedral voids in the face-centred cubic unit cell is

- [A] 6 [B] 8  
[C] 4 [D] 12

57. Chlorine in a sample of weight 1.03 g was precipitated as  $\text{AgCl}$  and the weight of the precipitate was 0.500 g. The percentage of chlorine in the sample is (atomic weight of  $\text{Cl} = 35.45$ ,  $\text{Ag} = 107.87$ )

- [A] 32.86 [B] 12  
[C] 48.5 [D] 0.12

58. Match the following

- |                              |                          |
|------------------------------|--------------------------|
| (i) NMR spectroscopy         | p Electronic transition  |
| (ii) EPR spectroscopy        | q Vibration of molecules |
| (iii) IR Spectroscopy        | r Radio frequency waves  |
| (iv) UV-Visible spectroscopy | s Microwave radiation    |

[A] (i) & q; (ii) & r; (iii) & s; (iv) & p [B] (i) & r; (ii) & s; (iii) & p; (iv) & q

[C] (i) & p; (ii) & r; (iii) & q; (iv) & s [D] (i) & r; (ii) & s; (iii) & q; (iv) & p

59. Among the following, the compound with highest melting point is  
[A]  $\text{AlF}_3$  [B]  $\text{SiF}_4$   
[C]  $\text{PF}_5$  [D]  $\text{SF}_6$
60. The product obtained by the reaction of  $\text{Me}_3\text{As}$  and  $\text{XeF}_2$  is  
[A]  $\text{Me}_3\text{AsF}_2$  [B]  $(\text{CH}_2\text{F})_3\text{XeF}_2$   
[C]  $(\text{CF}_3)_3\text{AsXeF}_2$  [D]  $\text{MeAsF}_4$
61. Keeping the mass number unchanged, the nuclear decay process that results in the decrease of atomic number by one unit is  
[A] alpha decay [B] gamma decay  
[C] beta decay [D] positron emission
62. The number of geometrical and optical isomers of the complexes,  $[\text{Co}(\text{ethylenediamine})_2\text{Cl}_2]^+$  (I) and  $[\text{Cr}(\text{gly})_3]$  (II), respectively, are (gly is  $\text{H}_2\text{NCH}_2\text{COO}^-$ )  
[A] I: 2 and 3 [B] I: 2 and 2  
II: 2 and 4 II: 2 and 4  
[C] I: 1 and 2 [D] I: 2 and 4  
II: 2 and 3 II: 2 and 2
63. The metal M that cannot form a stable compound with formula  $[(\eta^5\text{-C}_5\text{H}_5)\text{M}(\text{CO})_4]$  is  
[A] Mo [B] Ta  
[C] V [D] Nb
64. The protein responsible for  $\text{O}_2$  transport in lobsters and crabs is  
[A] hemoglobin [B] myoglobin  
[C] hemoerthyrin [D] hemocyanin
65. The vitamin that contains metal-carbon bond is  
[A] vitamin-A [B] vitamin-B  
[C] vitamin-C [D] vitamin-D

66. The hybridizations of Ni in paramagnetic  $[\text{NiCl}_4]^{2-}$  and diamagnetic  $[\text{Ni}(\text{CN})_4]^{2-}$ , respectively, are

[A]  $\text{sp}^3$  and  $\text{sp}^3$

[B]  $\text{dsp}^2$  and  $\text{dsp}^2$

[C]  $\text{dsp}^2$  and  $\text{sp}^3$

[D]  $\text{sp}^3$  and  $\text{dsp}^2$

67. Among the following, the  $d^n$  configuration not susceptible to Jahn-Teller distortion is

[A]  $d^2$

[B]  $d^4$  (high spin)

[C]  $d^8$

[D]  $d^6$  (high spin)

68. The atomic radii of La, Ce, Eu, and Gd follow the order

[A]  $\text{Gd} < \text{Eu} < \text{Ce} < \text{La}$

[B]  $\text{La} < \text{Ce} < \text{Eu} < \text{Gd}$

[C]  $\text{Gd} < \text{Ce} < \text{Eu} < \text{La}$

[D]  $\text{Gd} < \text{Ce} < \text{La} < \text{Eu}$

69. The inverse of the matrix  $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$  is

[A]  $\begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$

[B]  $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$

[C]  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

[D]  $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

70. Value of the determinant of the matrix  $\begin{pmatrix} 7 & 2 & 3 \\ 0 & 0 & 6 \\ 0 & 4 & 5 \end{pmatrix}$  is

[A] 0

[B] 24

[C] -168

[D] -42

71. The number of real solutions of the two equations,  $x^2 + y^2 = 1$  and  $y - x^2 = 0$ , is

[A] 0

[B] 1

[C] 2

[D] 3

72. The derivative of the function  $(e^{2x} - 1)/(e^{2x} + 1)$  at  $x = 0$  is

[A] -1

[B] 0

[C] 2

[D] 1

73. The general solution to the differential equation,  $x \frac{dy}{dx} = 2y$ , is ( $c$  is the constant of integration)

[A]  $cx$

[B]  $c + x$

[C]  $cx^2/2$

[D]  $c + x^2/2$

74. The equation of the straight line that is perpendicular to  $y = x + 2$ , and passing through the origin is

[A]  $x + y = 0$

[B]  $x + y - 2 = 0$

[C]  $x + y + 2 = 0$

[D]  $x - y = 0$

75. The complex number that results in a pure imaginary quotient when divided by its own complex conjugate is

[A]  $1 + i/2$

[B]  $1 + i$

[C]  $1 + 2i$

[D]  $1 + i\pi$

76. The value of  $\lim_{x \rightarrow \infty} \sqrt{(x + \sin x)/(x - \cos x)}$  is

[A] 1

[B] 0

[C] -1

[D]  $\infty$

77.  $\int e^{x \log a} e^x dx =$

[A]  $\frac{a^x e^x}{\log a}$

[B]  $\frac{e^x}{1 + \log a}$

[C]  $(ae)^x$

[D]  $\frac{(ae)^x}{\log(ae)}$

78. The solution for the set of equations,  $2x - 3y + 4z = 8$ ,  $y - 3z = -7$ , and  $x + 2y + 2z = 11$ , is

[A]  $x = 1, y = 2, z = 3$

[B]  $x = 3, y = 2, z = 1$

[C]  $x = 0, y = 1, z = 2$

[D]  $x = 2, y = 1, z = 0$

79. A triangle has sides of length  $a$ ,  $b$  and  $c$  and the angles opposite to these sides are A, B, and C, respectively. The correct relation among the following is

- [A]  $c^2 = a^2 + b^2 - 2ab \cos C$  [B]  $c^2 = a^2 - b^2 + 2ab \cos C$   
[C]  $c^2 = a^2 + b^2 - 2ab \sin C$  [D]  $c^2 = a^2 + b^2 - 2ab \cos A \cos B$

80. A coin is tossed 6 times. The probability of getting heads exactly 3 times is

- [A]  $3/16$  [B]  $5/16$   
[C]  $1/8$  [D]  $1/2$

81. The root mean square velocity of hydrogen molecule at any given temperature is

- [A] 8 times that of oxygen molecule [B] 4 times that of oxygen molecule  
[C] 16 times that of oxygen molecule [D] none of the above

82. The term symbol for the ground state of phosphorus is

- [A]  $^4S_{3/2}$  [B]  $^1S_0$   
[C]  $^4P_{3/2}$  [D]  $^1P_0$

83. The solid-liquid boundary in the temperature-pressure phase diagram of water has a negative slope. For melting of ice, the change in enthalpy and volume are

- [A] both positive [B] negative and positive, respectively  
[C] both negative [D] positive and negative, respectively

84. The enthalpy change in the reaction,  $N_2 + 3H_2 \rightarrow 2NH_3$ , is  $-150 \text{ kJ}$  at  $300 \text{ K}$ . Assuming that the gases behave ideally, the corresponding change in internal energy in  $\text{kJ}$  is

- [A]  $-145$  [B]  $-147$   
[C]  $145$  [D]  $147$

85. The enthalpy of vaporization of benzene at its normal boiling point,  $80^\circ\text{C}$ , is  $31 \text{ kJ mol}^{-1}$ . The associated entropy (in  $\text{J K}^{-1} \text{ mol}^{-1}$ ) and internal energy (in  $\text{kJ mol}^{-1}$ ) changes, respectively, are

- [A] 88, 28 [B] 388, 28  
[C] 88, 34 [D] 388, 34



86. At 298 K, the maximum work (in kJ) derived from the expansion of 1.0 mol of an ideal gas from 100 atm to 1 atm is

- [A] 286 [B] 11.4  
[C] -286 [D] -143

87. The standard free energy of formation,  $\Delta_f G^\circ$ , of  $\text{N}_2\text{O}_4$  (g) and  $\text{NO}_2$  (g) are  $97.9 \text{ kJ mol}^{-1}$  and  $51.3 \text{ kJ mol}^{-1}$ , respectively. The equilibrium constant for  $\text{N}_2\text{O}_4$  (g)  $\rightleftharpoons$   $2\text{NO}_2$  (g) at 300 K is

- [A] 6.67 [B] 0.8  
[C] 0.15 [D] 0.01

88. The efficiency (in %) of a Carnot engine working between  $0^\circ\text{C}$  and  $100^\circ\text{C}$  is

- [A] 12.3 [B] 26.8  
[C] 33.3 [D] 45.3

89. The pH of a solution made by mixing 30 mL of 0.1 M HCl and 40 mL of 0.1 M aqueous KOH is

- [A] 9.85 [B] 10.15  
[C] 12.15 [D] 13.15

90. A 0.1 M solution of a substance taken in a cell of 1.0 cm path length shows an absorbance of 0.45 at 520 nm. The extinction coefficient in  $\text{cm}^2 \text{mol}^{-1}$  is

- [A] 45000 [B] 5200  
[C] 52000 [D] 4500

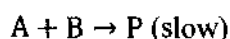
91. The dissociative adsorption of a gas ( $\text{A}_2$ ) on a solid surface follows the Langmuir adsorption isotherm. A plot of  $1/\theta$  vs  $1/\sqrt{P}$  is linear with slope equal to ( $\theta$ : fractional surface coverage,  $P$ : gas pressure at equilibrium,  $K$ : equilibrium constant)

- [A]  $K$  [B]  $1/K$   
[C]  $\sqrt{K}$  [D]  $1/\sqrt{K}$

92. The overall rate constant ( $k$ ) for a three-step chemical reaction is  $k_1\sqrt{k_2/k_3}$ . The activation energies (in  $\text{kJ mol}^{-1}$ ) corresponding to the three elementary reaction steps are 74, 192, and 10, respectively. The overall activation energy for the reaction is approximately equal to (in  $\text{kJ mol}^{-1}$ )

[A] 276 [B] 175  
[C] 165 [D] 128

93. Using the pre-equilibrium approximation, the predicted rate law for the following multistep reaction ( $k_{eff}$ : effective rate constant) is



[A]  $k_{eff}[A_2][B]$  [B]  $k_{eff}[A_2]\sqrt{[B]}$   
[C]  $k_{eff}\sqrt{[A_2]}[B]$  [D]  $k_{eff}[A_2]^2[B]$

94. The slope and X-intercept of the Lineweaver-Burk plot ( $1/V$  vs  $1/[S]$ ) of enzyme kinetics are, respectively ( $V$ : reaction rate,  $[S]$ : concentration of substrate,  $V_{max}$ : maximum rate, and  $K_M$ : Michaelis constant)

[A]  $\frac{K_M}{V_{max}}$  and  $\frac{1}{V_{max}}$  [B]  $\frac{K_M}{V_{max}}$  and  $\frac{-1}{K_M}$   
[C]  $\frac{V_{max}}{K_M}$  and  $\frac{1}{K_M}$  [D]  $\frac{V_{max}}{K_M}$  and  $\frac{-1}{V_{max}}$

95. At 25 °C, the difference in pressure (in Pa), across the surface of a spherical ethanol droplet having radius 220 nm is closest to (the surface tension of ethanol at 25 °C is 22  $\text{mN m}^{-1}$ )

[A]  $2 \times 10^3$  [B]  $4 \times 10^5$   
[C]  $2 \times 10^5$  [D]  $3 \times 10^4$

96. The ionisation energy of the hydrogen atom is 13.6 eV when the electron is in the 1s orbital. The ionisation energy (in eV) for the electron in the 2p orbital is

[A] 3.4 [B] 6.8  
[C] 10.2 [D] 13.6

97. A metal surface is irradiated with light of frequency  $2.0 \times 10^{15}$  Hz. The work-function of the metal is 6 eV. The potential (in V) required to stop the fastest electron ejected from the surface is closest to
- [A] 2.28 [B] 4.28  
[C] 5.28 [D] 6.28
98. The  $^{12}\text{C}^{16}\text{O}$  molecule strongly absorbs at  $6.43 \times 10^{13}$  Hz. The force constant (in  $\text{N m}^{-1}$ ) of the CO bond is
- [A] 1855.6 [B] 1899.6  
[C] 1680.6 [D] 1955.6
99. The resistance of 0.1 M KCl solution in a cell is  $300 \Omega$  and specific conductance is  $1.5 \text{ S m}^{-1}$ . If the resistance of 0.05 M NaCl in the same cell is  $750 \Omega$ , then the molar conductance ( $\text{S m}^2 \text{ mol}^{-1}$ ) of NaCl is
- [A] 0.032 [B] 0.045  
[C] 0.012 [D] 0.055
100. An electrochemical cell involves the cell reaction,  $\text{Cd} + 2\text{AgCl} \rightarrow 2\text{Ag} + \text{CdCl}_2$ . If  $E_{\text{cell}} = 0.675 \text{ V}$  and  $dE_{\text{cell}}/dT = -6.5 \times 10^{-4} \text{ V K}^{-1}$  at  $25^\circ\text{C}$ , then  $\Delta H$  (in  $\text{kJ mol}^{-1}$ ) for the cell reaction is closest to
- [A] -143 [B] -168  
[C] -198 [D] -268

\*\*\*\*\*

BOOKLET CODE

A

Invigilator's Signature

## ENTRANCE EXAMINATION – 2020

M. Sc. Chemistry

TIME: 2 HOURS

MAXIMUM MARKS: 100

HALL TICKET NUMBER:

## INSTRUCTIONS

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR ANSWER SHEET** given to you.
2. Make sure that pages numbered from **1 - 21** are present (excluding 3 pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Handover the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. **Cell phones are not allowed.**
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

**Useful Constants:**

Rydberg constant =  $109737 \text{ cm}^{-1}$ ; Faraday constant =  $96500 \text{ C}$ ; Planck constant =  $6.625 \times 10^{-34} \text{ J s}$ ; Speed of light =  $2.998 \times 10^8 \text{ m s}^{-1}$ ; Boltzmann constant =  $1.380 \times 10^{-23} \text{ J K}^{-1}$ ; Gas constant =  $8.314 \text{ J K}^{-1} \text{ mol}^{-1} = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1} = 1.986 \text{ cal K}^{-1} \text{ mol}^{-1}$ ; Mass of electron =  $9.109 \times 10^{-31} \text{ kg}$ ; Mass of proton =  $1.672 \times 10^{-27} \text{ kg}$ ; Charge of electron =  $1.6 \times 10^{-19} \text{ C}$ ;  $1 \text{ D} = 3.336 \times 10^{-30} \text{ C m}$ ;  $1 \text{ bar} = 10^5 \text{ N m}^{-2}$ ;  $RT/F$  (at  $298.15 \text{ K}$ ) =  $0.0257 \text{ V}$ ;  $1 \text{ a.m.u.} = 1.66 \times 10^{-27} \text{ kg}$

**PART – A**

- If a hydrogen atomic orbital has two radial nodes and is non-zero at the origin, its principal (n) and angular momentum (l) quantum numbers, respectively, are  
 [A] 1 and 0 [B] 2 and 1  
 [C] 3 and 0 [D] 4 and 1
- The decomposition of nitrogen pentoxide,  $\text{N}_2\text{O}_5(\text{s}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g})$ , is an endothermic process, but spontaneous. It is driven by a  
 [A] positive entropy change [B] negative enthalpy change  
 [C] positive free energy change [D] negative entropy change
- At  $25^\circ\text{C}$ , solid  $\text{PbCl}_2$  is least soluble in  
 [A]  $0.1 \text{ M CaCl}_2$  [B]  $0.1 \text{ M NaCl}$   
 [C]  $0.1 \text{ M KNO}_3$  [D]  $0.1 \text{ M HCl}$
- The splitting of nuclear spin energy levels in a magnetic field is known as  
 [A] Stark effect [B] Mössbauer effect  
 [C] Zeeman effect [D] Cotton effect
- The angle between the Miller planes (110) and (100) in a simple cubic lattice is  
 [A]  $45^\circ$  [B]  $60^\circ$   
 [C]  $90^\circ$  [D]  $120^\circ$

6. The order of electromagnetic radiation with increasing wavelength is

- [A] radio wave < microwave < infrared < ultraviolet
- [B] ultraviolet < infrared < radio wave < microwave
- [C] ultraviolet < infrared < microwave < radio wave
- [D] ultraviolet < microwave < infrared < radio wave

7. With increase in ionic strength of the solution, the rate of a chemical reaction between two cationic reactants

- [A] decreases
- [B] increases
- [C] does not change
- [D] becomes zero

8. An even function among the following is

- [A]  $\sin(x)$
- [B]  $\frac{\sin(x)}{x}$
- [C]  $\exp(x)$
- [D]  $\frac{\exp(x)}{x}$

9. The equation,  $xy = 4$ , represents

- [A] a pair of straight lines
- [B] an ellipse
- [C] a parabola
- [D] a hyperbola

10. Among the following, the *incorrect* expression for  $\cos 2\theta$  is

- [A]  $2\cos^2\theta - 1$
- [B]  $1 - 2\sin^2\theta$
- [C]  $\cos^2\theta - \sin^2\theta$
- [D]  $2\cos^2\theta + 1$

11. Taylor series expansion for  $\ln(1+x)$  is

- [A]  $1 + x - 2x^2 + 3x^3 - 3x^4 + \dots$
- [B]  $x + x^3 + x^5 + x^7 + \dots$
- [C]  $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$
- [D]  $x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \dots$

12. The smallest ion among  $K^+$ ,  $Cl^-$ ,  $H^-$ , and  $Ca^{2+}$  is

- [A]  $K^+$
- [B]  $H^-$
- [C]  $Cl^-$
- [D]  $Ca^{2+}$

13. The expected radius ratios ( $r^+/r^-$ ) for trigonal planar and tetrahedral coordination in ionic compounds, respectively, are in the range
- [A] 0.22–0.41 and 0.41–0.73 [B] 0.15–0.22 and 0.22–0.41  
[C] 0.15–0.22 and 0.41–0.73 [D] 0.22–0.41 and 0.41–0.73
14. The complex that obeys the 18-electron rule among the following is
- [A]  $[\text{Cu}(\text{NH}_3)_6]^{2+}$  [B]  $[\text{PtF}_6]^-$   
[C]  $[\text{TiF}_6]^{2-}$  [D]  $[\text{Ni}(\text{PF}_3)_4]$
15. If 2.0 g of pure nickel metal (atomic weight = 58.69) is dissolved in nitric acid and then diluted to 500 mL with water, the normality of the resulting  $\text{Ni}(\text{NO}_3)_2$  solution is
- [A] 0.136 [B] 0.273  
[C] 0.009 [D] 0.068
16. In the reaction,  $\text{IO}_3^- + a\text{I}^- + b\text{H}^+ \rightarrow c\text{I}_2 + d\text{H}_2\text{O}$ , the values of the stoichiometric coefficients 'a', 'b', 'c', and 'd', respectively, are
- [A] 3, 4, 2, and 3 [B] 5, 6, 3, and 3  
[C] 4, 5, 2, and 3 [D] 3, 4, 2, and 3
17. The species isoelectronic to oxide ( $\text{O}^{2-}$ ) is
- [A] N [B] F  
[C]  $\text{S}^{2-}$  [D]  $\text{Mg}^{2+}$
18. Based on VSEPR and stereochemically inactive pair of electrons, the possible structure of  $[\text{XeF}_8]^{2-}$  is
- [A] tricapped trigonal prism [B] pentagonal bipyramidal  
[C] square antiprism [D] bicapped octahedron
19. The enzyme involved in the fermentation of glucose to alcohol is
- [A] amylase [B] dehydrogenase  
[C] lipase [D] zymase



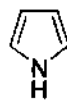
20. Identify the relative reactivities of the following compounds towards aromatic electrophilic reaction



(I)



(II)



(III)



(IV)

[A] (I) < (II) < (III) < (IV)

[B] (I) < (II) < (IV) < (III)

[C] (IV) < (II) < (I) < (III)

[D] (II) < (I) < (III) < (IV)

21. The hybridization of terminal and central carbons of allene, respectively, are

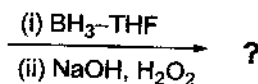
[A]  $sp$  and  $sp^2$

[B]  $sp^2$  and  $sp$

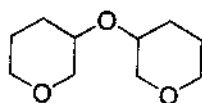
[C]  $sp^3$  and  $sp$

[D]  $sp$  and  $sp^3$

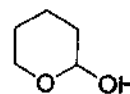
22. The major product formed in the following reaction is



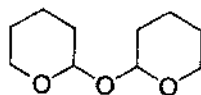
[A]



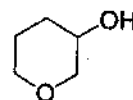
[B]



[C]



[D]



23. The most appropriate reagent required for the conversion of cyclohexene to benzene is

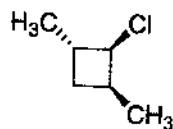
[A]  $KMnO_4$

[B]  $MnO_2$

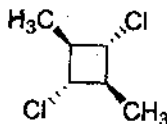
[C] DDQ

[D]  $CrO_3$

24. Identify the optically active compounds among the following



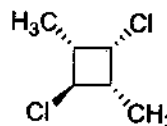
(I)



(II)



(III)



(IV)

[A] (II) and (III)

[B] (I), (II), and (III)

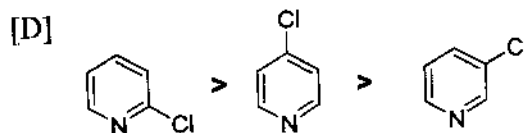
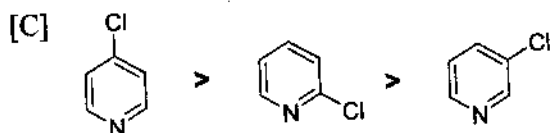
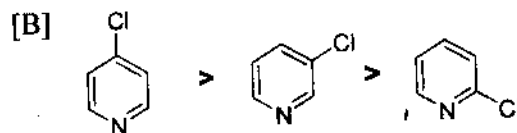
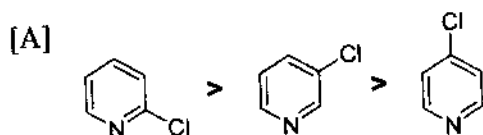
[C] (I), (III), and (IV)

[D] (I) and (III)

W-9

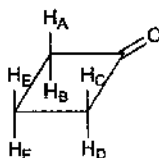
BOOKLET CODE-A

25. Identify the relative reactivities of chloropyridines towards nucleophilic substitution reaction with sodium ethoxide



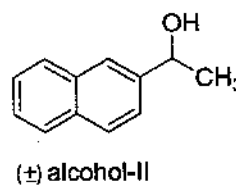
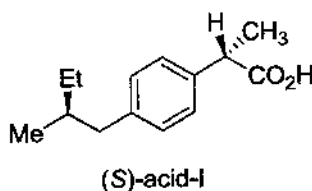
**PART - B**

26. The topic relations among  $H_A$  and  $H_D$ ,  $H_E$  and  $H_F$  of cyclobutanone, respectively, are



- [A] enantiotopic and homotopic                      [B] enantiotopic and enantiotopic  
[C] homotopic and enantiotopic                      [D] homotopic and homotopic

27. Esterification of acid-I with alcohol-II leads to the formation of a

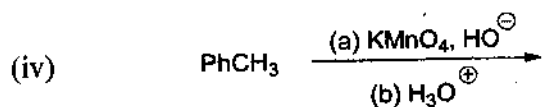
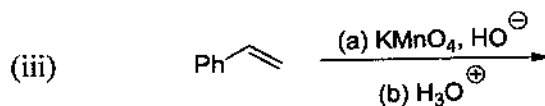
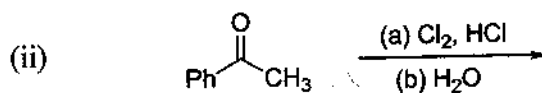
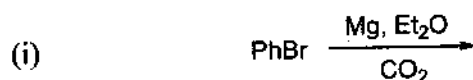


- [A] single enantiomer                      [B] mixture of diastereomers  
[C] single diastereomer                      [D] mixture of enantiomers

28. Identify the most water soluble bromo-compound from the following



29. The reactions that produce benzoic acid are



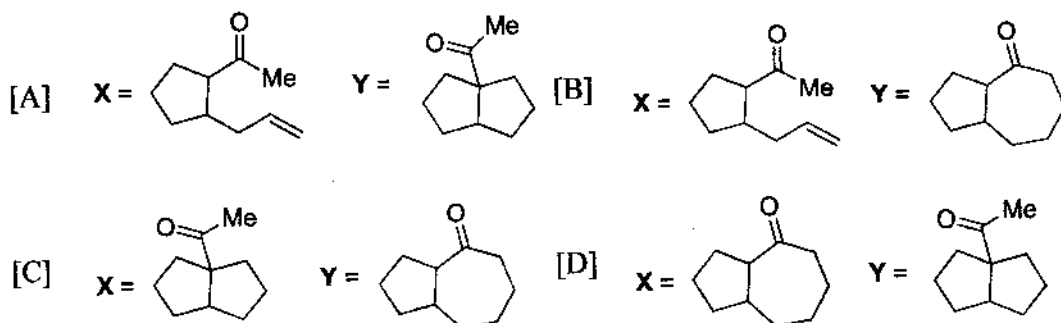
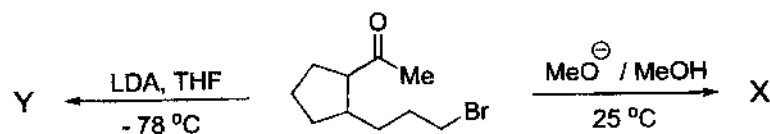
[A] (i), (ii), and (iv)

[B] (ii), (iii), and (iv)

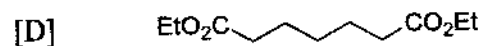
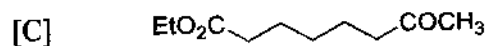
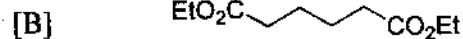
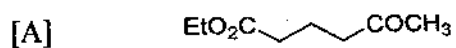
[C] (i), (iii), and (iv)

[D] (i) and (iv)

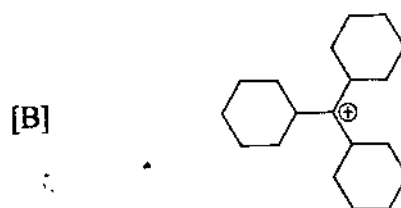
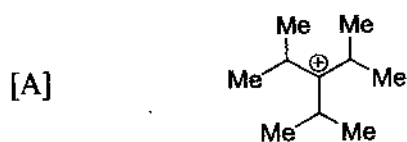
30. Identify the products X and Y in the following synthetic scheme



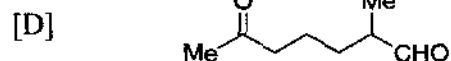
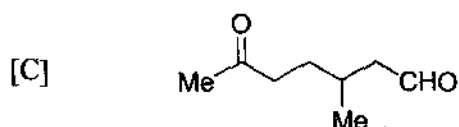
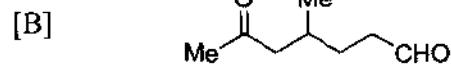
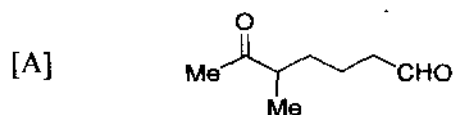
31. The precursor required for obtaining ethyl 2-oxocyclohexanecarboxylate is



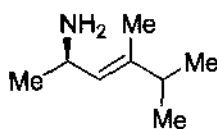
32. The carbocation having the longest half-life is



33. The major product obtained in the ozonolysis of 1,4-dimethylcyclohexene followed by a reductive workup with Zn and ethanoic acid is



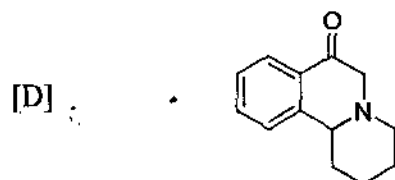
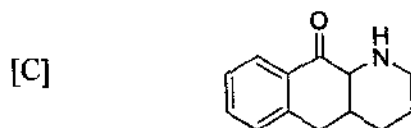
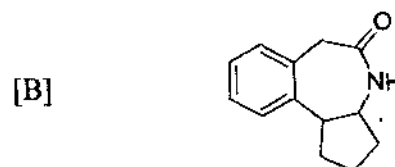
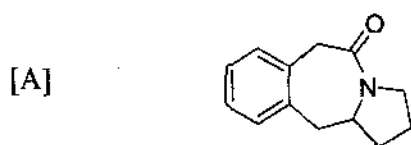
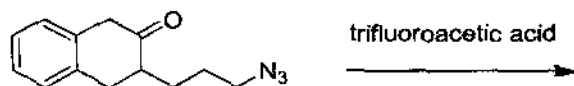
34. The IUPAC name of the following compound is



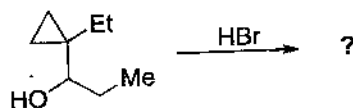
[A] (*R,E*)-4,5-dimethylhex-3-en-2-amine [B] (*S,E*)-4,5-dimethylhex-3-en-2-amine

[C] (*R,E*)-4-methyl,4-isopropyl-3-en-2-amine [D] (*S,E*)-2,3-dimethylhex-3-en-5-amine

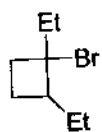
35. The major product formed in the following transformation is



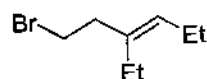
36. Predict the major product in the following transformation



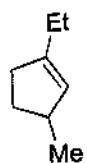
[A]



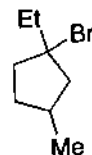
[B]



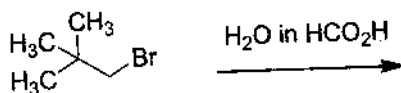
[C]



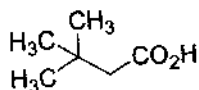
[D]



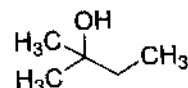
37. Identify the major product in the following reaction



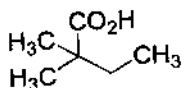
[A]



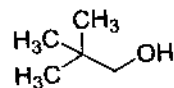
[B]



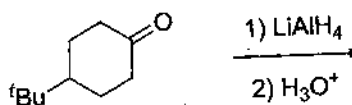
[C]



[D]



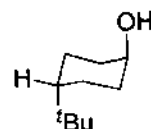
38. The most stable conformation of the major product formed in the following reaction is



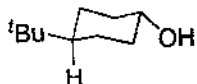
[A]



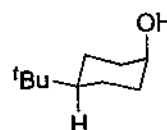
[B]



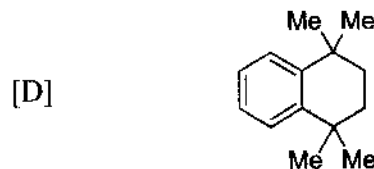
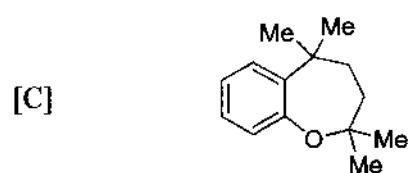
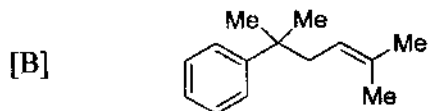
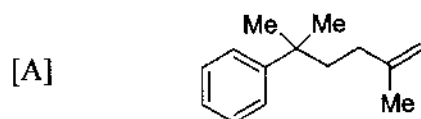
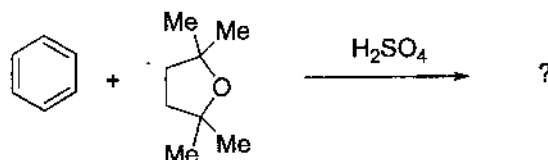
[C]



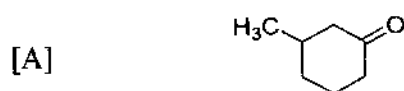
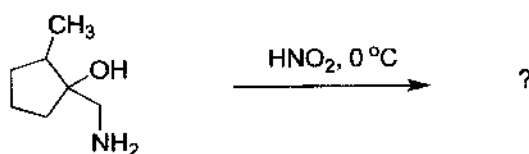
[D]



39. Identify the major product in the following transformation



40. Identify the major product in the following reaction

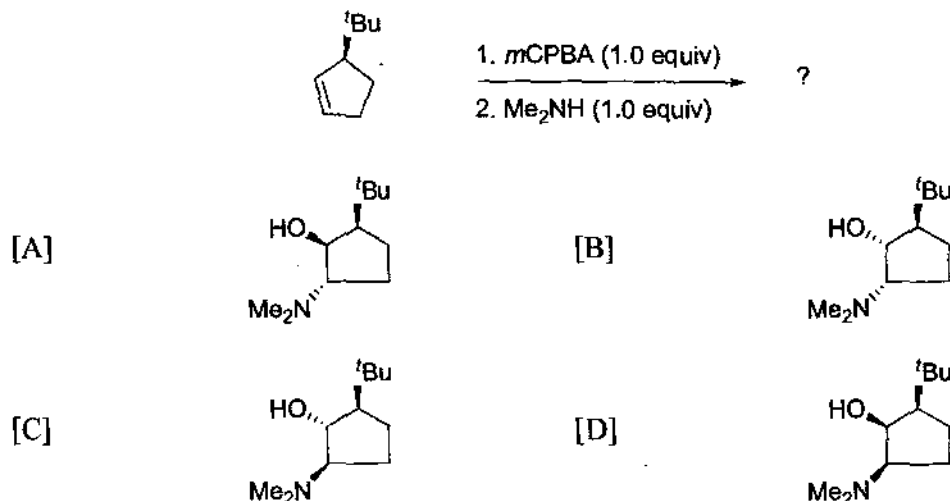


41. The major product formed in the Chichibabin reaction of pyridine is

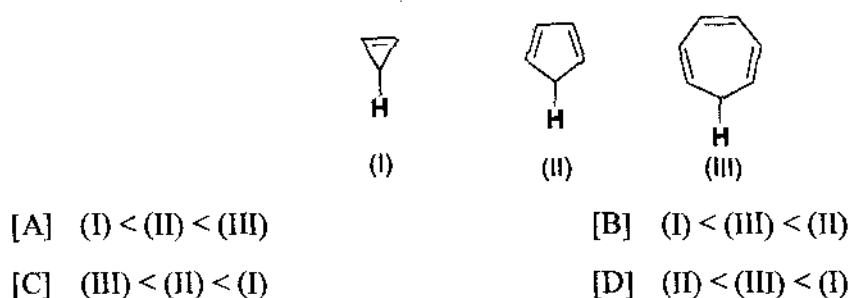




42. The major product formed in the following transformation is



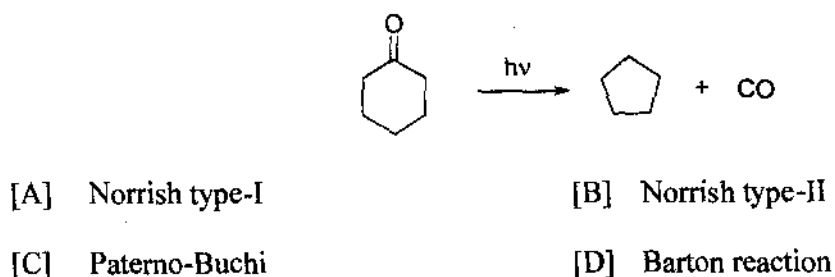
43. Arrange the following compounds in the increasing order of  $pK_a$  value of the highlighted "H"



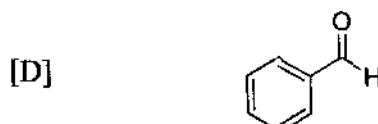
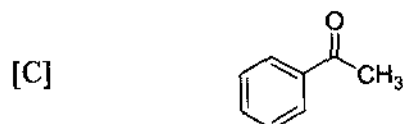
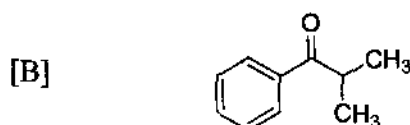
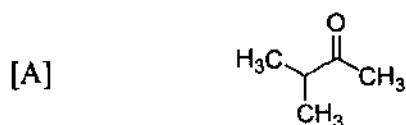
44. The  $[\alpha]_D^{20}$  of a 90% optically pure (*R*)-2-arylpropanoic acid solution is  $+135^\circ$ . On treatment with a base at  $20^\circ\text{C}$  for one hour,  $[\alpha]_D^{20}$  changed to  $+120^\circ$ . The optical purity of the resulting (*R*)-isomer is

- [A] 80%      [B] 70%  
 [C] 20%      [D] 30%

45. Identify the name of the following reaction



46. Identify the compound that produces a red/orange colored product when treated with 2,4-dinitrophenylhydrazine. The compound does not react with the Schiff's reagent and results negative iodoform test.



47. Which of the following compounds will have its absorption maximum at the longest wavelength?

[A] 1,2,5-hexatriene

[B] 1,5-hexadiyne

[C] 1,3-hexadiyne

[D] 1,3,5-hexatriene

48. The  $^1\text{H}$  NMR spectrum of  $\text{H}_3\text{C}-\text{O}-\text{CHCl}-\text{CH}_2\text{Cl}$  will exhibit

[A] a three-proton doublet, a one-proton singlet, and a two-proton doublet

[B] a three-proton singlet, a one-proton singlet, and a two-proton doublet

[C] a three-proton singlet, a one-proton triplet, and a two-proton doublet

[D] a three-proton triplet, a one-proton triplet, and a two-proton triplet

49. The hormone insulin is a

[A] terpenoid

[B] carbohydrate

[C] steroid

[D] peptide

50. A bacterial cell does not contain

[A] ribosome

[B] DNA

[C] lipid membrane

[D] nucleus

51. Among the following, the electron rich molecular hydride is

[A]  $\text{CsH}$

[B]  $\text{PH}_3$

[C]  $\text{B}_4\text{H}_{10}$

[D]  $\text{SiH}_4$

52. The value of 'n' for the cyclic ion  $[\text{Si}_6\text{O}_{18}]^{n-}$  is

- [A] 6 [B] 10  
[C] 12 [D] 8

53. Among the following, the reagents for separation of Group-IV metal ions are

- [A]  $\text{NH}_4\text{OH}$  and  $\text{NH}_4\text{Cl}$  [B]  $\text{HCl}$  and  $\text{H}_2\text{S}$   
[C]  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$ , and  $\text{H}_2\text{S}$  [D]  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$ , and  $(\text{NH}_4)_2\text{CO}_3$

54. Among the following thallium compounds, the most stable one above  $40^\circ\text{C}$  is

- [A]  $\text{TlCl}$  [B]  $\text{TlCl}_3$   
[C]  $\text{TlCl}_2$  [D]  $\text{Tl}_2\text{Cl}_6$

55. Reaction of  $\text{AlF}_3$  with an excess of  $\text{F}^-$  gives

- [A]  $\text{AlF}_4^-$  [B]  $\text{AlF}_5^{2-}$   
[C]  $\text{Al}_2\text{F}_6$  [D]  $\text{AlF}_6^{3-}$

56. The total number of tetrahedral voids in the face-centred cubic unit cell is

- [A] 6 [B] 8  
[C] 4 [D] 12

57. Chlorine in a sample of weight 1.03 g was precipitated as  $\text{AgCl}$  and the weight of the precipitate was 0.500 g. The percentage of chlorine in the sample is (atomic weight of  $\text{Cl} = 35.45$ ,  $\text{Ag} = 107.87$ )

- [A] 32.86 [B] 12  
[C] 48.5 [D] 0.12

58. Match the following

- |                              |                          |
|------------------------------|--------------------------|
| (i) NMR spectroscopy         | p Electronic transition  |
| (ii) EPR spectroscopy        | q Vibration of molecules |
| (iii) IR Spectroscopy        | r Radio frequency waves  |
| (iv) UV-Visible spectroscopy | s Microwave radiation    |

[A] (i) & q; (ii) & r; (iii) & s; (iv) & p [B] (i) & r; (ii) & s; (iii) & p; (iv) & q

[C] (i) & p; (ii) & r; (iii) & q; (iv) & s [D] (i) & r; (ii) & s; (iii) & q; (iv) & p

59. Among the following, the compound with highest melting point is  
[A]  $\text{AlF}_3$  [B]  $\text{SiF}_4$   
[C]  $\text{PF}_5$  [D]  $\text{SF}_6$
60. The product obtained by the reaction of  $\text{Me}_3\text{As}$  and  $\text{XeF}_2$  is  
[A]  $\text{Me}_3\text{AsF}_2$  [B]  $(\text{CH}_2\text{F})_3\text{XeF}_2$   
[C]  $(\text{CF}_3)_3\text{AsXeF}_2$  [D]  $\text{MeAsF}_4$
61. Keeping the mass number unchanged, the nuclear decay process that results in the decrease of atomic number by one unit is  
[A] alpha decay [B] gamma decay  
[C] beta decay [D] positron emission
62. The number of geometrical and optical isomers of the complexes,  $[\text{Co}(\text{ethylenediamine})_2\text{Cl}_2]^+$  (I) and  $[\text{Cr}(\text{gly})_3]$  (II), respectively, are (gly is  $\text{H}_2\text{NCH}_2\text{COO}^-$ )  
[A] I: 2 and 3 [B] I: 2 and 2  
II: 2 and 4 II: 2 and 4  
[C] I: 1 and 2 [D] I: 2 and 4  
II: 2 and 3 II: 2 and 2
63. The metal M that cannot form a stable compound with formula  $[(\eta^5\text{-C}_5\text{H}_5)\text{M}(\text{CO})_4]$  is  
[A] Mo [B] Ta  
[C] V [D] Nb
64. The protein responsible for  $\text{O}_2$  transport in lobsters and crabs is  
[A] hemoglobin [B] myoglobin  
[C] hemoerthyrin [D] hemocyanin
65. The vitamin that contains metal-carbon bond is  
[A] vitamin-A [B] vitamin-B  
[C] vitamin-C [D] vitamin-D

66. The hybridizations of Ni in paramagnetic  $[\text{NiCl}_4]^{2-}$  and diamagnetic  $[\text{Ni}(\text{CN})_4]^{2-}$ , respectively, are

[A]  $\text{sp}^3$  and  $\text{sp}^3$

[B]  $\text{dsp}^2$  and  $\text{dsp}^2$

[C]  $\text{dsp}^2$  and  $\text{sp}^3$

[D]  $\text{sp}^3$  and  $\text{dsp}^2$

67. Among the following, the  $d^n$  configuration not susceptible to Jahn-Teller distortion is

[A]  $d^2$

[B]  $d^4$  (high spin)

[C]  $d^8$

[D]  $d^6$  (high spin)

68. The atomic radii of La, Ce, Eu, and Gd follow the order

[A]  $\text{Gd} < \text{Eu} < \text{Ce} < \text{La}$

[B]  $\text{La} < \text{Ce} < \text{Eu} < \text{Gd}$

[C]  $\text{Gd} < \text{Ce} < \text{Eu} < \text{La}$

[D]  $\text{Gd} < \text{Ce} < \text{La} < \text{Eu}$

69. The inverse of the matrix  $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$  is

[A]  $\begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$

[B]  $\begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}$

[C]  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

[D]  $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

70. Value of the determinant of the matrix  $\begin{pmatrix} 7 & 2 & 3 \\ 0 & 0 & 6 \\ 0 & 4 & 5 \end{pmatrix}$  is

[A] 0

[B] 24

[C] -168

[D] -42

71. The number of real solutions of the two equations,  $x^2 + y^2 = 1$  and  $y - x^2 = 0$ , is

[A] 0

[B] 1

[C] 2

[D] 3

72. The derivative of the function  $(e^{2x} - 1)/(e^{2x} + 1)$  at  $x = 0$  is

[A] -1

[B] 0

[C] 2

[D] 1

73. The general solution to the differential equation,  $x \frac{dy}{dx} = 2y$ , is ( $c$  is the constant of integration)

[A]  $cx$

[B]  $c + x$

[C]  $cx^2/2$

[D]  $c + x^2/2$

74. The equation of the straight line that is perpendicular to  $y = x + 2$ , and passing through the origin is

[A]  $x + y = 0$

[B]  $x + y - 2 = 0$

[C]  $x + y + 2 = 0$

[D]  $x - y = 0$

75. The complex number that results in a pure imaginary quotient when divided by its own complex conjugate is

[A]  $1 + i/2$

[B]  $1 + i$

[C]  $1 + 2i$

[D]  $1 + i\pi$

76. The value of  $\lim_{x \rightarrow \infty} \sqrt{(x + \sin x)/(x - \cos x)}$  is

[A] 1

[B] 0

[C] -1

[D]  $\infty$

77.  $\int e^{x \log a} e^x dx =$

[A]  $\frac{a^x e^x}{\log a}$

[B]  $\frac{e^x}{1 + \log a}$

[C]  $(ae)^x$

[D]  $\frac{(ae)^x}{\log(ae)}$

78. The solution for the set of equations,  $2x - 3y + 4z = 8$ ,  $y - 3z = -7$ , and  $x + 2y + 2z = 11$ , is

[A]  $x = 1, y = 2, z = 3$

[B]  $x = 3, y = 2, z = 1$

[C]  $x = 0, y = 1, z = 2$

[D]  $x = 2, y = 1, z = 0$

79. A triangle has sides of length  $a$ ,  $b$  and  $c$  and the angles opposite to these sides are A, B, and C, respectively. The correct relation among the following is

- [A]  $c^2 = a^2 + b^2 - 2ab \cos C$  [B]  $c^2 = a^2 - b^2 + 2ab \cos C$   
[C]  $c^2 = a^2 + b^2 - 2ab \sin C$  [D]  $c^2 = a^2 + b^2 - 2ab \cos A \cos B$

80. A coin is tossed 6 times. The probability of getting heads exactly 3 times is

- [A]  $3/16$  [B]  $5/16$   
[C]  $1/8$  [D]  $1/2$

81. The root mean square velocity of hydrogen molecule at any given temperature is

- [A] 8 times that of oxygen molecule [B] 4 times that of oxygen molecule  
[C] 16 times that of oxygen molecule [D] none of the above

82. The term symbol for the ground state of phosphorus is

- [A]  $^4S_{3/2}$  [B]  $^1S_0$   
[C]  $^4P_{3/2}$  [D]  $^1P_0$

83. The solid-liquid boundary in the temperature-pressure phase diagram of water has a negative slope. For melting of ice, the change in enthalpy and volume are

- [A] both positive [B] negative and positive, respectively  
[C] both negative [D] positive and negative, respectively

84. The enthalpy change in the reaction,  $N_2 + 3H_2 \rightarrow 2NH_3$ , is  $-150$  kJ at 300 K. Assuming that the gases behave ideally, the corresponding change in internal energy in kJ is

- [A]  $-145$  [B]  $-147$   
[C]  $145$  [D]  $147$

85. The enthalpy of vaporization of benzene at its normal boiling point,  $80^\circ\text{C}$ , is  $31$  kJ  $\text{mol}^{-1}$ . The associated entropy (in  $\text{J K}^{-1} \text{mol}^{-1}$ ) and internal energy (in kJ  $\text{mol}^{-1}$ ) changes, respectively, are

- [A] 88, 28 [B] 388, 28  
[C] 88, 34 [D] 388, 34



86. At 298 K, the maximum work (in kJ) derived from the expansion of 1.0 mol of an ideal gas from 100 atm to 1 atm is

[A] 286

[B] 11.4

[C] -286

[D] -143

87. The standard free energy of formation,  $\Delta_f G^\circ$ , of  $\text{N}_2\text{O}_4$  (g) and  $\text{NO}_2$  (g) are  $97.9 \text{ kJ mol}^{-1}$  and  $51.3 \text{ kJ mol}^{-1}$ , respectively. The equilibrium constant for  $\text{N}_2\text{O}_4$  (g)  $\rightleftharpoons$   $2\text{NO}_2$  (g) at 300 K is

[A] 6.67

[B] 0.8

[C] 0.15

[D] 0.01

88. The efficiency (in %) of a Carnot engine working between  $0^\circ\text{C}$  and  $100^\circ\text{C}$  is

[A] 12.3

[B] 26.8

[C] 33.3

[D] 45.3

89. The pH of a solution made by mixing 30 mL of 0.1 M HCl and 40 mL of 0.1 M aqueous KOH is

[A] 9.85

[B] 10.15

[C] 12.15

[D] 13.15

90. A 0.1 M solution of a substance taken in a cell of 1.0 cm path length shows an absorbance of 0.45 at 520 nm. The extinction coefficient in  $\text{cm}^2 \text{mol}^{-1}$  is

[A] 45000

[B] 5200

[C] 52000

[D] 4500

91. The dissociative adsorption of a gas ( $\text{A}_2$ ) on a solid surface follows the Langmuir adsorption isotherm. A plot of  $1/\theta$  vs  $1/\sqrt{P}$  is linear with slope equal to ( $\theta$ : fractional surface coverage,  $P$ : gas pressure at equilibrium,  $K$ : equilibrium constant)

[A]  $K$

[B]  $1/K$

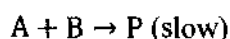
[C]  $\sqrt{K}$

[D]  $1/\sqrt{K}$

92. The overall rate constant ( $k$ ) for a three-step chemical reaction is  $k_1\sqrt{k_2/k_3}$ . The activation energies (in  $\text{kJ mol}^{-1}$ ) corresponding to the three elementary reaction steps are 74, 192, and 10, respectively. The overall activation energy for the reaction is approximately equal to (in  $\text{kJ mol}^{-1}$ )

[A] 276 [B] 175  
[C] 165 [D] 128

93. Using the pre-equilibrium approximation, the predicted rate law for the following multistep reaction ( $k_{eff}$ : effective rate constant) is



[A]  $k_{eff}[A_2][B]$  [B]  $k_{eff}[A_2]\sqrt{[B]}$   
[C]  $k_{eff}\sqrt{[A_2]}[B]$  [D]  $k_{eff}[A_2]^2[B]$

94. The slope and X-intercept of the Lineweaver-Burk plot ( $1/V$  vs  $1/[S]$ ) of enzyme kinetics are, respectively ( $V$ : reaction rate,  $[S]$ : concentration of substrate,  $V_{max}$ : maximum rate, and  $K_M$ : Michaelis constant)

[A]  $\frac{K_M}{V_{max}}$  and  $\frac{1}{V_{max}}$  [B]  $\frac{K_M}{V_{max}}$  and  $\frac{-1}{K_M}$   
[C]  $\frac{V_{max}}{K_M}$  and  $\frac{1}{K_M}$  [D]  $\frac{V_{max}}{K_M}$  and  $\frac{-1}{V_{max}}$

95. At 25 °C, the difference in pressure (in Pa), across the surface of a spherical ethanol droplet having radius 220 nm is closest to (the surface tension of ethanol at 25 °C is 22  $\text{mN m}^{-1}$ )

[A]  $2 \times 10^3$  [B]  $4 \times 10^5$   
[C]  $2 \times 10^5$  [D]  $3 \times 10^4$

96. The ionisation energy of the hydrogen atom is 13.6 eV when the electron is in the 1s orbital. The ionisation energy (in eV) for the electron in the 2p orbital is

[A] 3.4 [B] 6.8  
[C] 10.2 [D] 13.6

97. A metal surface is irradiated with light of frequency  $2.0 \times 10^{15}$  Hz. The work-function of the metal is 6 eV. The potential (in V) required to stop the fastest electron ejected from the surface is closest to
- [A] 2.28 [B] 4.28  
[C] 5.28 [D] 6.28
98. The  $^{12}\text{C}^{16}\text{O}$  molecule strongly absorbs at  $6.43 \times 10^{13}$  Hz. The force constant (in  $\text{N m}^{-1}$ ) of the CO bond is
- [A] 1855.6 [B] 1899.6  
[C] 1680.6 [D] 1955.6
99. The resistance of 0.1 M KCl solution in a cell is  $300 \Omega$  and specific conductance is  $1.5 \text{ S m}^{-1}$ . If the resistance of 0.05 M NaCl in the same cell is  $750 \Omega$ , then the molar conductance ( $\text{S m}^2 \text{ mol}^{-1}$ ) of NaCl is
- [A] 0.032 [B] 0.045  
[C] 0.012 [D] 0.055
100. An electrochemical cell involves the cell reaction,  $\text{Cd} + 2\text{AgCl} \rightarrow 2\text{Ag} + \text{CdCl}_2$ . If  $E_{\text{cell}} = 0.675 \text{ V}$  and  $dE_{\text{cell}}/dT = -6.5 \times 10^{-4} \text{ V K}^{-1}$  at  $25^\circ\text{C}$ , then  $\Delta H$  (in  $\text{kJ mol}^{-1}$ ) for the cell reaction is closest to
- [A] -143 [B] -168  
[C] -198 [D] -268

\*\*\*\*\*

BOOKLET CODE

A

## ENTRANCE EXAMINATION – 2019

## M. Sc. Chemistry

TIME: 2 HOURS

MAXIMUM MARKS: 100

HALL TICKET NUMBER:

## INSTRUCTIONS

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR ANSWER SHEET** given to you.
2. Make sure that pages numbered from 1 - 17 are present (excluding 3 pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Hand over the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. **Cell phones are not allowed.**
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

## Useful Constants:

Rydberg constant =  $109\,737\text{ cm}^{-1}$ ; Faraday constant =  $96\,500\text{ C}$ ; Planck constant =  $6.625 \times 10^{-34}\text{ J s}$ ; Speed of light =  $2.998 \times 10^8\text{ m s}^{-1}$ ; Boltzmann constant =  $1.380 \times 10^{-23}\text{ J K}^{-1}$ ; Gas constant =  $8.314\text{ J K}^{-1}\text{ mol}^{-1} = 0.082\text{ L atm K}^{-1}\text{ mol}^{-1} = 1.986\text{ cal K}^{-1}\text{ mol}^{-1}$ ; Mass of electron =  $9.109 \times 10^{-31}\text{ kg}$ ; Mass of proton =  $1.672 \times 10^{-27}\text{ kg}$ ; Charge of electron =  $1.6 \times 10^{-19}\text{ C}$ ;  $1\text{ D} = 3.336 \times 10^{-30}\text{ C m}$ ;  $1\text{ bar} = 10^5\text{ N m}^{-2}$ ;  $RT/F$  (at  $298.15\text{ K}$ ) =  $0.0257\text{ V}$ .

## PART – A

1. The expected general order of strength of hydrogen bond is:

[A]  $\text{C-H}\cdots\text{O} > \text{N-H}\cdots\text{O} > \text{O-H}\cdots\text{O}$  [B]  $\text{O-H}\cdots\text{O} > \text{N-H}\cdots\text{O} > \text{C-H}\cdots\text{O}$   
 [C]  $\text{N-H}\cdots\text{O} > \text{O-H}\cdots\text{O} > \text{C-H}\cdots\text{O}$  [D]  $\text{O-H}\cdots\text{O} > \text{C-H}\cdots\text{O} > \text{N-H}\cdots\text{O}$

2. An organic compound containing carbon, hydrogen and oxygen requires 2.5 L of oxygen to burn completely at STP and gives two liters each of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapor. The empirical formula of the compound is likely to be

[A]  $\text{C}_2\text{H}_4\text{O}$  [B]  $\text{CH}_2\text{O}$   
 [C]  $\text{C}_2\text{H}_2\text{O}$  [D]  $\text{C}_4\text{H}_2\text{O}$

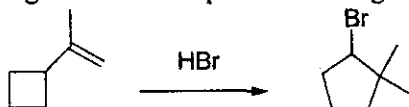
3. Among the following, the diamagnetic complex is

[A]  $[\text{Mn}(\text{CN})_6]^{3-}$  [B]  $[\text{Fe}(\text{CN})_6]^{3-}$   
 [C]  $[\text{Co}(\text{NH}_3)_6]^{3+}$  [D]  $[\text{Ni}(\text{NH}_3)_6]^{3+}$

4. The internal energy of a system ( $V$  = volume,  $T$  = Temperature,  $P$  = pressure,  $S$  = entropy) is a function of

[A]  $V$  and  $T$  [B]  $V$  and  $S$   
 [C]  $P$  and  $T$  [D]  $P$  and  $S$

5. The following reaction will proceed through



- I. addition of HBr across the double bond  
 II. formation of a primary carbocation  
 III. formation of a tertiary carbocation  
 IV. formation of a secondary carbocation

[A] (I) and (IV) [B] (III)  
 [C] (I) [D] (III) and (IV)

6. The number of *real* solutions to the following system of equations is

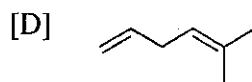
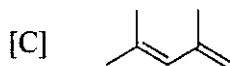
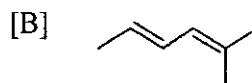
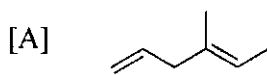
$$\begin{aligned}x^2 + 4y^2 &= 5 \\ 4x^2 + y^2 &= 5\end{aligned}$$

- [A] 1 [B] 2  
[C] 3 [D] 4

7. The elements present in all naturally occurring amino acids among the following are  
(I) hydrogen (II) carbon (III) nitrogen (IV) oxygen (V) phosphorus

- [A] (I), (II), (III) and (IV) [B] (I), (II), (III) and (V)  
[C] (I), (II), (IV) and (V) [D] (I), (II), (III), (IV) and (V)

8. A compound upon oxidation using excess  $\text{KMnO}_4$  gives a molecule each of formic acid, malonic acid and acetone. The structure of the compound is



9. Calcium estimation from milk is generally performed by

- [A] gravimetric analysis [B] precipitation titration  
[C] complexometric titration [D] redox titration

10. The equation  $x^2 - y^2 = 0$  represents a

- [A] pair of straight lines [B] circle  
[C] ellipse [D] parabola

11. Chromosomes are made up of

- [A] RNA and proteins [B] DNA and RNA  
[C] DNA and proteins [D] Lipids and proteins

12. Atoms having radius  $1.50 \text{ \AA}$  are arranged in a simple (primitive) cubic lattice. Radius of the largest atom (in  $\text{\AA}$ ) that can be placed at the body center of the cubic cell, without affecting the unit cell size is

- [A] 0.75 [B] 1.10  
[C] 1.35 [D] 1.50

13. The name reaction which is used for the conversion of salicylaldehyde to catechol is

- [A] Vilsmeier-Haack reaction [B] Shapiro reaction  
[C] Reimer-Tiemann reaction [D] Dakin reaction

14. The local maximum of the function,  $y = x^2 e^{-x}$ , is at  $x =$

- [A] 2 [B] 1  
[C] 0 [D] -2

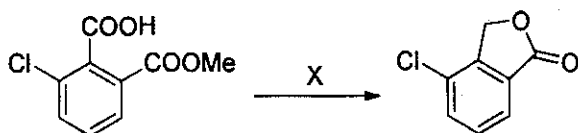
15. The photo-excitation and water oxidation processes in photosynthesis are associated respectively, with the metals

- [A] Ca and Mg [B] Mn and Ca  
[C] Mg and Co [D] Mg and Mn

16. Enthalpy change for the transition of solid Sn, from the grey form (density =  $5.75 \text{ g cm}^{-3}$ ) to the white form (density =  $7.31 \text{ g cm}^{-3}$ ) at 10.0 bar and 298 K is  $+2.1 \text{ kJ mol}^{-1}$ . The internal energy change for this transition in  $\text{kJ mol}^{-1}$  is (1.0 bar =  $10^5 \text{ Pa}$ ; atomic weight of Sn = 118.7)

- [A] -4.4 [B] -2.1  
[C] +2.1 [D] +4.4

17. Identify the most appropriate reagent, X, in the following reaction



- [A]  $\text{LiAlH}_4$  [B]  $\text{LiBH}_4$   
[C]  $\text{NaBH}_4$  [D]  $\text{BH}_3 \cdot \text{THF}$

18. Which of the following is not an extensive property?

- [A] Mass [B] Volume  
[C] Heat capacity [D] Specific heat

19. Air contains 78% N<sub>2</sub>, 21% O<sub>2</sub>, 0.9% Ar and 0.1% CO<sub>2</sub> by volume. The molecular weight of air is close to (Atomic weight of N, O, Ar, C are 14, 16, 40, 12 respectively)

- [A] 29 [B] 31  
[C] 28 [D] 30

20. The terpene that contains carbonyl group among the following is

- [A] Limonene [B] Camphor  
[C] 3-Carene [D]  $\alpha$ -Pinene

21. The F–N–F bond angle in NF<sub>3</sub> is 102°30', whereas H–N–H bond angle in NH<sub>3</sub> is 107°48'. This difference in bond angle can be explained based on

- [A] VSEPR theory that the repulsion between bond pairs is less in NF<sub>3</sub> than in NH<sub>3</sub> [B] VSEPR theory that the repulsion between bond pairs is more in NF<sub>3</sub> than in NH<sub>3</sub>  
[C] molecular orbital theory that predicts low bond order for NF<sub>3</sub> molecule [D] the fact that the first ionization energy of fluorine is higher than that of hydrogen

22. Among the following, the drug which contains a  $\beta$ -lactam unit is

- [A] Ibuprofen [B] Naproxen  
[C] Penicillin [D] Sertraline

23. The reaction between dioxygen and PtF<sub>6</sub> provides

- [A] [O]<sup>+</sup>[PtF<sub>6</sub>]<sup>–</sup> [B] [OF][PtF<sub>5</sub>]<sup>–</sup>  
[C] [O]<sup>–</sup>[PtF<sub>6</sub>]<sup>+</sup> [D] [O<sub>2</sub>]<sup>+</sup>[PtF<sub>6</sub>]<sup>–</sup>

24. The determinant  $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$  is

- [A] –2 [B] –1  
[C] 0 [D] 3

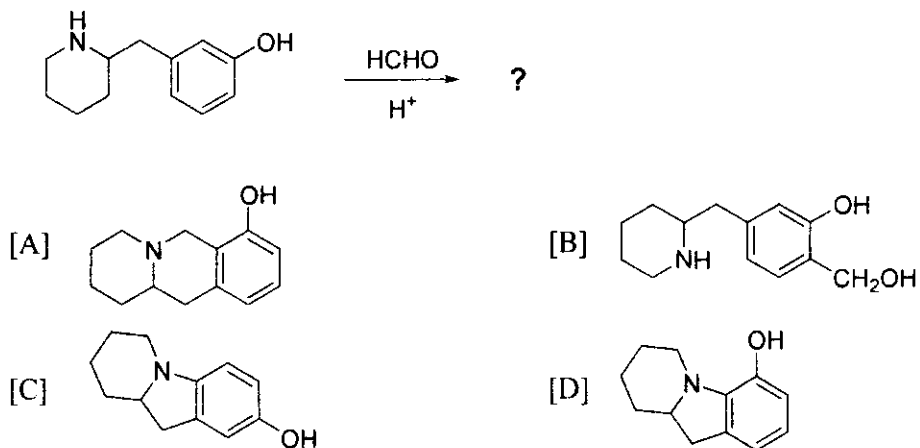
25.  $\lim_{x \rightarrow 0} \frac{\sin x}{e^x - e^{-x}}$  is

- [A]  $\frac{1}{2}$  [B]  $\frac{\pi}{2}$   
[C]  $-\frac{\pi}{2}$  [D]  $\infty$

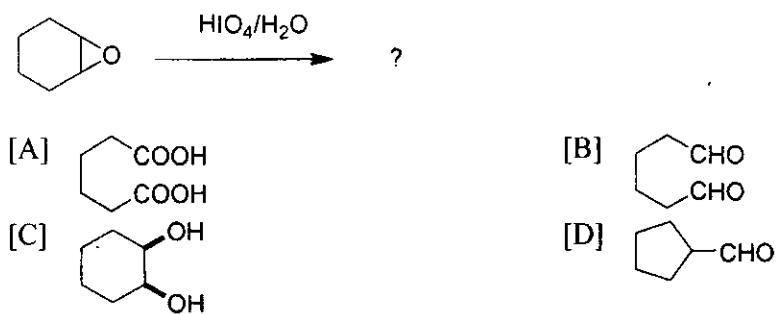


## PART – B

26. The major product formed in the following reaction is



27. The product of the following reaction is



28.  $\int e^x \cos x \, dx =$

- [A]  $e^x \sin x + \text{constant}$ 
 [B]  $e^x (\sin x - \cos x) + \text{constant}$
- [C]  $\frac{e^x}{2} (\sin x + \cos x) + \text{constant}$ 
 [D]  $\sin x + \text{constant}$

29. The argument of the complex number  $(-1 - i)$  is

- [A]  $\frac{\pi}{4}$ 
 [B]  $-\frac{\pi}{4}$
- [C]  $\frac{3\pi}{4}$ 
 [D]  $-\frac{3\pi}{4}$

30.  $\frac{\sin^3 \theta}{\tan \theta - \sin \theta} =$

- [A]  $\cos \theta + \cos^2 \theta$ 
 [B]  $\cos \theta - \cos^2 \theta$
- [C]  $\sin \theta + \sin^2 \theta$ 
 [D]  $\sin \theta - \sin^2 \theta$

31.  $\frac{(1-x^4)}{(1-x)} =$

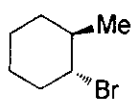
[A]  $1 + x^3$

[B]  $1 + x + x^2 + x^3$

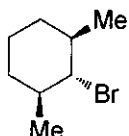
[C]  $1 - x^3$

[D]  $1 - x + x^2 - x^3$

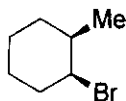
32. Rates of E<sub>2</sub> reaction of the following bromides increases as



(I)



(II)



(III)

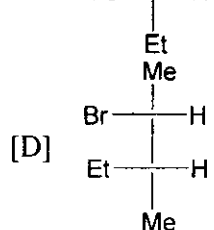
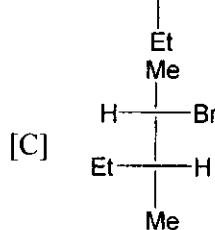
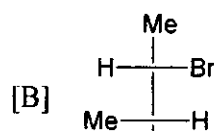
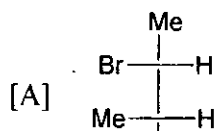
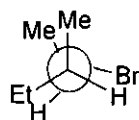
[A] (I) < (II) < (III)

[B] (I) < (III) < (II)

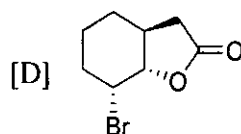
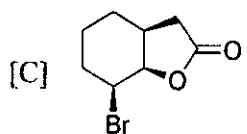
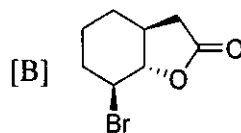
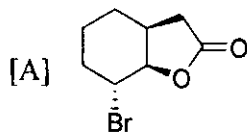
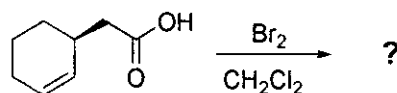
[C] (III) < (II) < (I)

[D] (II) < (I) < (III)

33. The Fischer projection that is identical to the following Newmann projection is



34. The major product formed in the following reaction is



35. Heating resorcinol with 'X' and conc.  $\text{H}_2\text{SO}_4$  followed by pouring the reaction mixture in aqueous NaOH solution gives greenish yellow color. The reagent 'X' is

- [A] benzoic acid [B] phthalic anhydride  
[C] urea [D] glucose

36. The major product obtained by the reaction of cyclohexanone oxime with conc.  $\text{H}_2\text{SO}_4$  is

- [A] Cyclopentane carboxaldehyde [B]  $N,N'$ -Dicyclohexylcarbodiimide  
[C] Caprolactam [D] Bakelite

37. The reactivity of the following compounds in electrophilic substitution decreases as

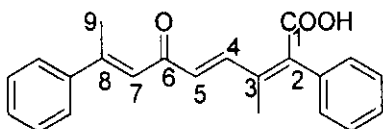
I: toluene ; II: nitrobenzene ; III: benzene ; IV: phenol

- [A]  $\text{I} > \text{II} > \text{III} > \text{IV}$  [B]  $\text{IV} > \text{III} > \text{II} > \text{I}$   
[C]  $\text{I} > \text{III} > \text{IV} > \text{II}$  [D]  $\text{IV} > \text{I} > \text{III} > \text{II}$

38. The reagent which is the source of nitrogen in the Gabriel synthesis of amines is

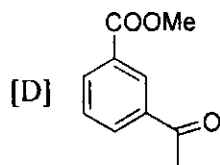
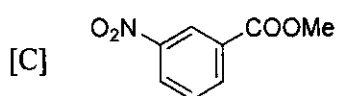
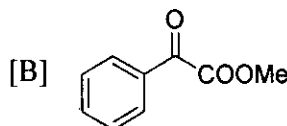
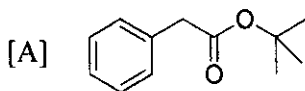
- [A] sodium azide [B] potassium phthalimide  
[C] potassium cyanide [D] sodium nitrite

39. Stereochemistry of the double bonds in the following compound can be designated as

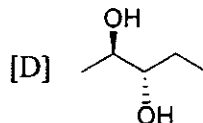
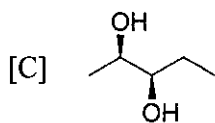
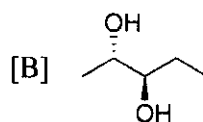
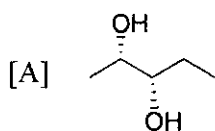


- [A] (2E, 4E, 7E) [B] (2Z, 4E, 7Z)  
[C] (2E, 4Z, 7E) [D] (2Z, 4E, 7E)

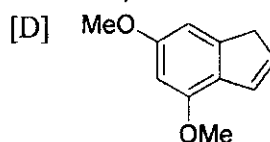
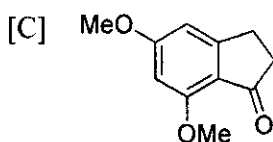
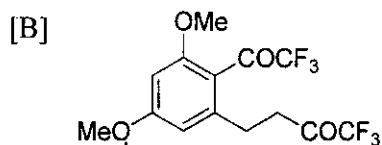
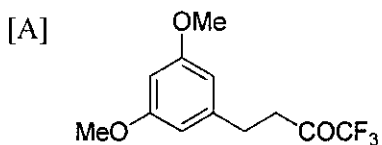
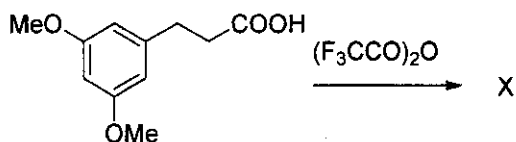
40. Among the following, the compound which undergoes the fastest decarboxylation under acid catalysis is



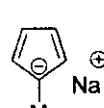
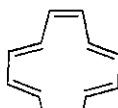
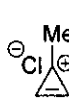
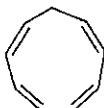
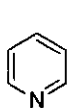
41. Structure of (2*R*, 3*R*)-2,3-pentanediol is



42. The product 'X' in the following reaction is



43. Among the following, the aromatic compounds are



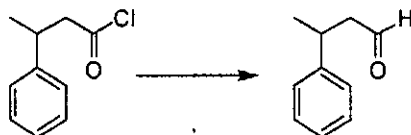
[A] I, II and III

[B] I, III and V

[C] I, IV and V

[D] II, IV and V

44. The reagent that can perform the following transformation is



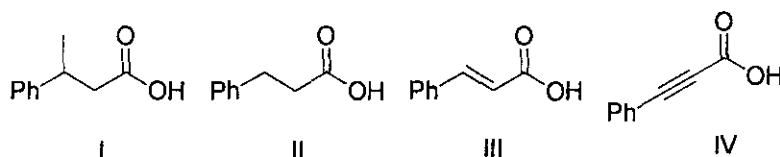
[A]  $\text{NaBH}_4$

[B]  $\text{NaH}$

[C]  $\text{LiAlH}(\text{O}^t\text{Bu})_3$

[D]  $\text{LiAlH}_4$

45. The decreasing order of the acidity of compounds I-IV is



- [A]  $\text{I} > \text{II} > \text{III} > \text{IV}$                                   [B]  $\text{II} > \text{I} > \text{IV} > \text{III}$   
 [C]  $\text{III} > \text{IV} > \text{I} > \text{II}$                                   [D]  $\text{IV} > \text{III} > \text{II} > \text{I}$

46. The reaction which gives  $\beta$ -hydroxy carbonyl compound as the product is

- [A] Cannizzaro reaction                                  [B] Claisen condensation  
 [C] Benzoin reaction                                  [D] Aldol reaction

47. The equation that is **not true** for mixing of two ideal gases at constant temperature and pressure is

- [A]  $\Delta U_{\text{mix}} = 0$                                   [B]  $\Delta S_{\text{mix}} = 0$   
 [C]  $\Delta H_{\text{mix}} = 0$                                   [D]  $q_{\text{mix}} = 0$

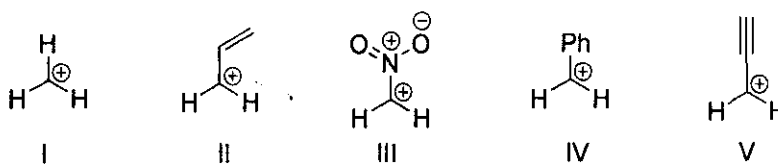
48. The number of ways in which two electrons can be placed in the three p-orbitals (each electron having two possible spins) such that the two electrons satisfy Pauli's exclusion principle, is

- [A] 9    [B] 18  
 [C] 30    [D] 36

49. The number of possible stereo-isomers of glucose is

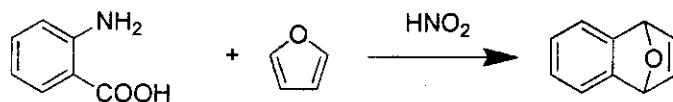
- [A] 16    [B] 8  
 [C] 24    [D] 32

50. The order of increasing stability for the following carbocation intermediates is



- [A]  $\text{III} < \text{I} < \text{V} < \text{IV} < \text{II}$                                   [B]  $\text{III} < \text{I} < \text{IV} < \text{II} < \text{V}$   
 [C]  $\text{III} < \text{II} < \text{V} < \text{I} < \text{IV}$                                   [D]  $\text{III} < \text{I} < \text{V} < \text{II} < \text{IV}$

51. The intermediate involved in the following transformation is



- [A] Carbocation [B] Carbanion  
[C] Benzyne [D] Carbene

52. The biuret test is used to confirm the presence of proteins because the reagent reacts with the

- [A] basic side chains in protein [B] protein main chain CO group  
[C] protein main chain NH group [D] protein hydrophobic core

53. Edman degradation is generally used for

- [A] the determination of the amino acid sequence in a protein [B] the synthesis of nucleic acids from nucleosides  
[C] the preparation of one carbon less aldose from parent aldose [D] sequencing a nucleic acid

54. The  $pK_a$  values of  $\text{HOCl}$ ,  $\text{HClO}_2$  and  $\text{HClO}_3$  follow the order

- [A]  $\text{HClO}_2 > \text{HOCl} > \text{HClO}_3$  [B]  $\text{HOCl} > \text{HClO}_2 > \text{HClO}_3$   
[C]  $\text{HOCl} > \text{HClO}_3 > \text{HClO}_2$  [D]  $\text{HClO}_3 > \text{HClO}_2 > \text{HOCl}$

55. The reagents used in the brown ring test for nitrate are

- [A] conc.  $\text{H}_2\text{SO}_4$  and ferrous sulfate [B] conc.  $\text{H}_2\text{SO}_4$  and ferric sulfate  
[C] conc.  $\text{HCl}$  and ferric sulfate [D] conc.  $\text{HCl}$  and ferrous sulfate

56. Among the following, the statement(s) that are correct for solid  $\text{BeCl}_2$  are

- (I) It forms infinite chains with tetrahedral beryllium.  
(II) It forms infinite chains with planar beryllium.  
(III) The  $\text{Be}-\text{Cl}$  distance is longer than that found in linear  $\text{BeCl}_2$  vapor.

- [A] (II) and (III) [B] (I) and (III)  
[C] (I) only [D] (III) only

57. Among 18 groups in the periodic table, the only group that contains examples of elements that are gas, liquid and solid at room temperature ( $25^\circ\text{C}$ ) is

- [A] 1 [B] 17  
[C] 12 [D] 6

58. Elemental fluorine is produced by the electrolysis of

- |                                 |  |
|---------------------------------|--|
| [A] aqueous hydrogen fluoride   | [B] aqueous potassium hydrogen difluoride (potassium bifluoride) |
| [C] anhydrous hydrogen fluoride | [D] a mixture of potassium fluoride and hydrogen fluoride        |

59. The CFSE for tetrahedral  $[\text{CoCl}_4]^{2-}$  is  $8,000 \text{ cm}^{-1}$ . The CFSE (in  $\text{cm}^{-1}$ ) for octahedral  $[\text{CoCl}_6]^{4-}$  will be

- |            |            |
|------------|------------|
| [A] 12,000 | [B] 16,000 |
| [C] 18,000 | [D] 20,000 |

60. The number of unpaired electrons in an octahedral complex  $[\text{CoF}_6]^{3-}$  is

- |       |       |
|-------|-------|
| [A] 3 | [B] 4 |
| [C] 0 | [D] 5 |

61. The active site of *Nitrogenase* contains

- |               |               |
|---------------|---------------|
| [A] Mg and Fe | [B] Cu and Co |
| [C] Mo and Fe | [D] Ni and Zn |

62. The unpaired electron in the square planar cobalt(II) complexes is located in

- |                       |                           |
|-----------------------|---------------------------|
| [A] $d_{z^2}$ orbital | [B] $d_{x^2-y^2}$ orbital |
| [C] $d_{xy}$ orbital  | [D] $d_{yz}$ orbital      |

63. In zinc blende structure of  $\text{ZnS}$ , each

- |  |  |
|--|--|
| [A] $\text{S}^{2-}$ ion is octahedrally surrounded by six $\text{Zn}^{2+}$ ions  | [B] $\text{Zn}^{2+}$ ion is octahedrally surrounded by six $\text{S}^{2-}$ ions  |
| [C] $\text{Zn}^{2+}$ ion is tetrahedrally surrounded by four $\text{S}^{2-}$ ions and each $\text{S}^{2-}$ ion is octahedrally surrounded by six $\text{Zn}^{2+}$ ions | [D] $\text{Zn}^{2+}$ ion is tetrahedrally surrounded by four $\text{S}^{2-}$ ions and each $\text{S}^{2-}$ ion is tetrahedrally surrounded by four $\text{Zn}^{2+}$ ions |

64. Among the following, the correct statement(s) regarding  $\text{N}(\text{SiMe}_3)_3$  is/are

- (I) It has a pyramidal geometry around nitrogen.  
 (II)  $p\pi-d\pi$  bonding is present in this compound.  
 (III) It is a strong Lewis base.  
 (IV) It has a trigonal planar geometry around nitrogen.

- |                   |           |
|-------------------|-----------|
| [A] (I) and (IV)  | [B] (II)  |
| [C] (II) and (IV) | [D] (III) |

65.  $\text{Al}(\text{OH})_3$  reacts as a base with acids to form salts that contain  $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$  ions. However, in dilute aqueous  $\text{NaOH}$  solution, it

- [A] splits water and releases hydrogen gas [B] get reduced to form metallic Al  
[C] remains unaffected [D] forms sodium aluminate

66. The solubility of  $\text{BaSO}_4$  (molecular weight = 233) at  $25^\circ\text{C}$  is  $0.0023 \text{ mg/mL}$ . The solubility product,  $K_{\text{SP}}$  (in  $\text{mol}^2 \text{L}^{-2}$ ) of  $\text{BaSO}_4$  is close to

- [A]  $1.0 \times 10^{-5}$  [B]  $1.0 \times 10^{-10}$   
[C] 0.0023 [D]  $2.3 \times 10^{-3}$

67. The spectroscopic technique used to study electronic transitions involved in molecules is

- [A] IR [B] UV-Vis  
[C] EPR [D] NMR

68. Among the following, the correct statement is

- [A]  $\text{Ce}^{4+}$  is diamagnetic but  $\text{La}^{3+}$  is paramagnetic. [B]  $\text{Ce}^{3+}$  is diamagnetic but  $\text{La}^{3+}$  is paramagnetic.  
[C]  $\text{Ce}^{4+}$  and  $\text{La}^{3+}$  are diamagnetic. [D]  $\text{Ce}^{3+}$  and  $\text{La}^{3+}$  are diamagnetic.

69. The hybridization of boron in diborane is

- [A]  $sp^3d$  [B]  $sp^3$   
[C]  $sp^2$  [D]  $sp$

70. The oxidation states of phosphorus in orthophosphoric acid and orthophosphorous acid are, respectively

- [A] (V) and (IV) [B] (III) and (IV)  
[C] (V) and (III) [D] (III) and (I)

71. The correct formula for the red solid of nickel(II)-dimethylglyoximate complex is

- [A]  $[\text{Ni}(\text{C}_8\text{H}_{12}\text{N}_4\text{O}_4)_2]^{2-}$  [B]  $[\text{Ni}(\text{C}_8\text{H}_{14}\text{N}_4\text{O}_4)_2]$   
[C]  $[\text{Ni}(\text{C}_8\text{H}_{16}\text{N}_4\text{O}_4)_2]^{2+}$  [D]  $[\text{Ni}(\text{C}_8\text{H}_{14}\text{N}_4\text{O}_4)_2(\text{H}_2\text{O})_2]$

72. A wire frame in the form of an equilateral triangle is changed to a circle; length of the wire remains the same. Ratio of the areas  $\left(\frac{A_{\text{circle}}}{A_{\text{triangle}}}\right)$  is

- [A] 2 [B] 0.5  
[C]  $\frac{\sqrt{3}\pi}{9}$  [D]  $\frac{3\sqrt{3}}{\pi}$



73. When a current of 2.0 A was passed for 80 min through a solution of a divalent cation, 2.8 g of the metal was deposited on the cathode. Atomic weight of the metal would be closest to
- [A] 28 [B] 56  
[C] 84 [D] 112
74. Among the following, the function that has a single maximum over its entire domain, and goes to zero as  $x$  goes to  $\pm\infty$  is
- [A]  $\sin x$  [B]  $\exp x$   
[C]  $\operatorname{sech} x$  [D]  $\log x$
75. A coordination complex of the formula  $[\operatorname{Co}(\operatorname{NH}_3)_5\operatorname{NO}_2]\operatorname{Cl}_2$  can exhibit
- [A] coordination isomerism [B] optical isomerism  
[C] ionization isomerism [D] linkage isomerism
76. Two parabolas given by the equations,  $y = \frac{x^2}{2}$  and  $x = \frac{y^2}{2}$  intersect at the points with coordinates (0, 0) and
- [A] (0.5, 0.5) [B] (2, 2)  
[C] (1, 2) [D] (2, 0)
77. A die has numbers 1 to 6 marked on the six faces. If  $n$  dies are thrown simultaneously, the probability of all showing 1 on top is
- [A]  $\frac{1}{n^6}$  [B]  $\frac{1}{6^n}$   
[C]  $\sqrt[n]{6}$  [D]  $\frac{n}{6}$  (for  $n < 6$ )
78. Given the vectors,  $\vec{A} = \hat{x} + \hat{y} + \hat{z}$  and  $\vec{B} = \hat{x} - \hat{y} + \hat{z}$  (where,  $\hat{x}, \hat{y}, \hat{z}$  are unit vectors along the Cartesian axes),  $(\vec{A} \times \vec{B}) \cdot (\vec{A} \times \vec{B}) =$
- [A] 0 [B] 1  
[C] 4 [D] 8
79. Given the standard reduction potential,  $E^\circ = +1.23$  V for  $\operatorname{O}_2 + 4\operatorname{H}^+ + 4\operatorname{e}^- \rightarrow 2\operatorname{H}_2\operatorname{O}$ , the equilibrium constant for the reaction  $2\operatorname{H}_2(\operatorname{g}) + \operatorname{O}_2(\operatorname{g}) \rightarrow 2\operatorname{H}_2\operatorname{O}(\operatorname{l})$  at 25 °C is
- [A]  $1.6 \times 10^{83}$  [B]  $4.5 \times 10^{67}$   
[C]  $6.3 \times 10^{20}$  [D]  $1.9 \times 10^2$

80. In the X-ray diffractogram of NaCl, diffraction from the (1 1 1) plane is observed at  $2\theta = 27.4^\circ$ . The Miller plane corresponding to the peak at  $2\theta = 56.5^\circ$  is
- [A] (1 0 0) [B] (2 1 1)  
[C] (1 1 1) [D] (2 2 2)
81. A photon with wavelength of 300 nm is absorbed by a gas and then emitted as two photons one with wavelength of 760 nm. The wavelength (in nm) of the second photon is close to
- [A] 496 [B] 300  
[C] 760 [D] 530
82. When a metal is irradiated with light of frequency  $2 \times 10^{15}$  Hz, the maximum kinetic energy of the ejected electron is found to be  $6.63 \times 10^{-19}$  J. The threshold frequency (in Hz) of the metal is close to
- [A]  $2.0 \times 10^{15}$  [B]  $1.0 \times 10^{15}$   
[C]  $3.0 \times 10^{15}$  [D]  $4.0 \times 10^{15}$
83. The longest wavelength (in Å) in the Lyman series of  $H^+$  atom spectrum is
- [A] 1125.7 [B] 1512.7  
[C] 1215.7 [D] 1152.7
84. The root mean square speed of  $N_2$  gas is equal to that of propane gas at STP at temperature close to
- [A] 174 [B] 273  
[C] 274 [D] 373
85.  $\frac{\sin \varphi}{1 - \cot \varphi} + \frac{\cos \varphi}{1 - \tan \varphi} =$
- [A]  $\cot \varphi$  [B]  $\tan \varphi$   
[C]  $\cos \varphi + \sin \varphi$  [D]  $\cos \varphi - \sin \varphi$
86. Three circles each of radius 1.0 cm touch one another externally and they lie between two parallel lines. The minimum possible distance (in cm) between these parallel lines is
- [A]  $2 + \sqrt{3}$  [B]  $3 + \sqrt{3}$   
[C]  $4 + \sqrt{3}$  [D]  $5 + \sqrt{3}$

87. The van der Waals  $b$  constant of gases, A, B and C gases are 0.025, 0.045 and 0.035 L mol<sup>-1</sup>, respectively. The correct descending order of the molecular volume of these gases is

[A]  $C > B > A$

[B]  $A > B > C$

[C]  $B > C > A$

[D]  $A > C > B$

88. Fraction of the unit cell occupied by atoms packed in an FCC lattice is

[A]  $\frac{\sqrt{3}\pi}{8}$

[B]  $\frac{\pi}{6}$

[C]  $\frac{\sqrt{2}\pi}{3}$

[D]  $\frac{\sqrt{2}\pi}{6}$

89. If the optical density of a solution is 1, then the % of light transmitted through the solution is

[A] 20

[B] 10

[C] 80

[D] 90

90. A reaction that is spontaneous at room temperature (27 °C) can have enthalpy,  $\Delta H$  (kJ mol<sup>-1</sup>) and entropy,  $\Delta S$  (J K<sup>-1</sup>) values respectively,

[A] 0, -300

[B] -70, -300

[C] +70, +300

[D] +70, -300

91. The activity of K<sub>3</sub>PO<sub>4</sub> solution of molarity (C) and mean activity coefficient ( $\gamma_{\pm}$ ) is

[A]  $27 C^3 \gamma_{\pm}^3$

[B]  $9 C^4 \gamma_{\pm}^4$

[C]  $9 C^3 \gamma_{\pm}^3$

[D]  $27 C^4 \gamma_{\pm}^4$

92. A complex reaction consists of three steps with rate constants  $k_1$ ,  $k_2$  and  $k_3$ , and the corresponding activation energies are  $E_1$ ,  $E_2$  and  $E_3$ . If the overall rate constant of the reaction,  $k = \frac{k_1 k_3}{k_2}$  then the overall activation energy of the reaction ( $E$ ) is

[A]  $E_1 - E_2 + E_3$

[B]  $E_1 + E_2 + E_3$

[C]  $E_1 + E_2 - E_3$

[D]  $E_1 - E_2 - E_3$

93. Order of the reaction for which the half-life doubles when the initial concentration of the reactant is doubled is

[A] 0

[B] 1

[C] 2

[D] 3

94. 2.0 mol of He, 3.0 mol of Ne and 1.0 mol of Ar are mixed at 300 K. Assuming that these gases behave ideally, the Gibbs free energy change of mixing (in kJ) is nearly equal to
- [A] -13.82 [B] -15.12  
[C] -1.73 [D] -3.46
95. The infrared spectrum of diatomic molecule, with reduced mass  $2.52 \times 10^{-26}$  kg, shows an intense line at  $380 \text{ cm}^{-1}$ . The force constant of the molecule (in  $\text{N m}^{-1}$ ) is
- [A] 0.129 [B] 12.9  
[C] 129 [D] 1.29
96. The de Broglie wavelength (in m) for a cricket ball of weight 0.14 kg travelling at  $40 \text{ m s}^{-1}$  is close to
- [A]  $1.20 \times 10^{-34}$  [B]  $1.00 \times 10^{-34}$   
[C]  $2.40 \times 10^{-34}$  [D]  $1.80 \times 10^{-34}$
97. The isobaric thermal expansion coefficient of an ideal gas ( $T$  = temperature,  $V$  = volume) is
- [A]  $1/T$  [B]  $1/T^2$   
[C]  $1/V$  [D]  $1/V^2$
98. The function,  $y = 2x^3 + 3x^2 + cx + 8$  intersects the x-axis at  $-4$ . The value of  $c$  is
- [A] 20 [B] -18  
[C] 2 [D] 10
99. The graphs of two linear equations  $ax + by = c$  and  $bx - ay = c$  where  $a$ ,  $b$  and  $c$  are not equal to zero
- [A] intersect at one point [B] are parallel  
[C] intersect at two points [D] are perpendicular
100. The Miller planes that are mutually perpendicular are
- [A] (1 0 0), (0 2 0) [B] (2 1 1), (4 2 2)  
[C] (2 0 0), (1 1 0) [D] (1 1 1), (1 0 0)

**University of Hyderabad**  
**Entrance Examinations - 2019**

School/Department/Centre : CHEMISTRY

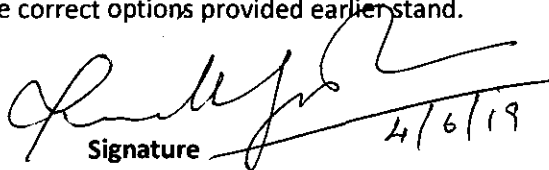
Course/Subject : M. SC. (CODE: T-9)

**ANSWER KEY – BOOKLET A**

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	B	26	A	51	C	76	B
2	A	27	B	52	C	77	B
3	C	28	C	53	A	78	D
4	B	29	D	54	B	79	A
5	D	30	A	55	A	80	D
6	D	31	B	56	B	81	A
7	A	32	D	57	B	82	B
8	D	33	A	58	D	83	C
9	C	34	A	59	A	84	A
10	A	35	B	60	B	85	C
11	C	36	C	61	C	86	A
12	B	37	D	62	C	87	C
13	D	38	B	63	D	88	D
14	A	39	D	64	C	89	B
15	D	40	A	65	D	90	C
16	C	41	C	66	B	91	D
17	D	42	C	67	B	92	A
18	D	43	B	68	C	93	A
19	A	44	C	69	B	94	B
20	B	45	D	70	C	95	C
21	A	46	D	71	-	96	A
22	C	47	B	72	D	97	A
23	D	48	C	73	B	98	B
24	C	49	A	74	C	99	D
25	A	50	D	75	D	100	A

**Note/Remarks :**

1. Due to some typing error, all options were wrong for question no. 71. So the benefit may be given to all students for this question.
2. All other challenges are found to be incorrect; the correct options provided earlier stand.

  
Signature

School/Department/Centre

Dean  
School of Chemistry  
University of Hyderabad  
P.O. Central University  
Gachibowli, Hyderabad-500 046.

BOOKLET CODE

C

Invigilator's Signature

## ENTRANCE EXAMINATION – 2018

M. Sc. Chemistry

TIME: 2 HOURS

MAXIMUM MARKS: 100

HALL TICKET NUMBER:

## INSTRUCTIONS

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR ANSWER SHEET** given to you.
2. Make sure that pages numbered from 1 - 24 are present (excluding 4 pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Hand over the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. **Cell phones are not allowed.**
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

**Useful Constants:**

Rydberg constant =  $109737 \text{ cm}^{-1}$ ; Faraday constant =  $96500 \text{ C}$ ; Planck constant =  $6.625 \times 10^{-34} \text{ J s}$ ; Speed of light =  $2.998 \times 10^8 \text{ m s}^{-1}$ ; Boltzmann constant =  $1.380 \times 10^{-23} \text{ J K}^{-1}$ ; Gas constant =  $8.314 \text{ J K}^{-1} \text{ mol}^{-1} = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1} = 1.986 \text{ cal K}^{-1} \text{ mol}^{-1}$ ; Mass of electron =  $9.109 \times 10^{-31} \text{ kg}$ ; Mass of proton =  $1.672 \times 10^{-27} \text{ kg}$ ; Charge of electron =  $1.6 \times 10^{-19} \text{ C}$ ;  $1 \text{ D} = 3.336 \times 10^{-30} \text{ C m}$ ;  $1 \text{ bar} = 10^5 \text{ N m}^{-2}$ ;  $RT/F$  (at  $298.15 \text{ K}$ ) =  $0.0257 \text{ V}$ .

**PART – A**

1. Identify the order of acid strength of  $\text{CH}_3\text{CO}_2\text{H}$ ,  $\text{CF}_3\text{CO}_2\text{H}$ ,  $\text{NO}_2\text{CH}_2\text{CO}_2\text{H}$ , and  $\text{CCl}_3\text{CO}_2\text{H}$ .

- [A]  $\text{CH}_3\text{CO}_2\text{H} < \text{NO}_2\text{CH}_2\text{CO}_2\text{H} < \text{CCl}_3\text{CO}_2\text{H} < \text{CF}_3\text{CO}_2\text{H}$   
 [B]  $\text{CH}_3\text{CO}_2\text{H} < \text{CCl}_3\text{CO}_2\text{H} < \text{NO}_2\text{CH}_2\text{CO}_2\text{H} < \text{CF}_3\text{CO}_2\text{H}$   
 [C]  $\text{CH}_3\text{CO}_2\text{H} < \text{NO}_2\text{CH}_2\text{CO}_2\text{H} < \text{CF}_3\text{CO}_2\text{H} < \text{CCl}_3\text{CO}_2\text{H}$   
 [D]  $\text{CH}_3\text{CO}_2\text{H} > \text{NO}_2\text{CH}_2\text{CO}_2\text{H} > \text{CCl}_3\text{CO}_2\text{H} > \text{CF}_3\text{CO}_2\text{H}$

2. Among the following, the molecule having the longest bond length is:

- [A] NO [B]  $\text{NO}^+$   
 [C]  $\text{NO}^{2+}$  [D]  $\text{NO}^-$

3. The number of real roots to the pair of equations  $x^2 + y^2 = 1$  and  $9x^2 + 4y^2 = 36$  is:

- [A] 0 [B] 1  
 [C] 2 [D] 3

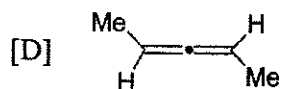
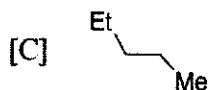
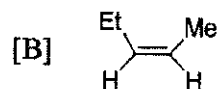
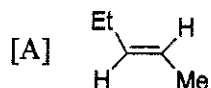
4. One of the molecules present in turmeric is:

- [A] nicotine [B] curcumin  
 [C] quinine [D] piperine

5. The integral  $\int_{\pi/4}^{3\pi/4} \frac{dx}{(1+\cos(x))} =$

- [A] -2 [B] -1  
 [C] 4 [D] 2

6. 2-Pentyne on reduction with Na/liq.NH<sub>3</sub> provides:



7. In an election there are 10 candidates for 4 seats. The voter may cast vote for 1, 2, 3 or 4 seats. The total number of ways in which the voter can cast the vote is:

[A] 853

[B] 583

[C] 385

[D] 305

8. A circle is expanding in time; if the rate of increase of its radius is  $r'$ , the rate of increase of its area is given by:

[A]  $r' \times \text{area}$

[B]  $(r')^2$

[C]  $r' \times \text{radius}$

[D]  $r' \times \text{circumference}$

9. A solid cylinder with diameter 3 cm and height 10 cm is flattened into a circular disc with diameter 30 cm. Thickness of the resulting disc is:

[A] 100 cm

[B] 1 cm

[C] 1 mm

[D] 1 nm

10. Let  $T_n$  be the number of all possible triangles formed by joining  $n$  non-collinear points. Then,  $T_6 - T_5 =$

[A] 10

[B] 8

[C] 5

[D] 7



11. The value of the following determinant is:

$$\begin{vmatrix} 2 & 3 & 4 & 5 \\ 3 & 5 & 6 & 9 \\ 7 & -1 & 0 & 2 \\ 3 & 5 & 6 & 9 \end{vmatrix}$$

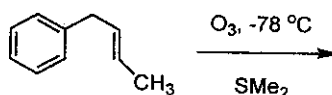
[A] -27

[B] 0

[C] 1

[D] 27

12. Identify the products obtained from the following reaction:



[A] 3-phenylpropane-1,2-diol and methanol

[B] 2-phenylethanal and ethanol

[C] acetic acid and 2-phenylacetic acid

[D] 2-phenylethanal and ethanal

13. Which one of the following is an unusual base pairing in nucleic acids?

[A] A-T

[B] G-T

[C] G-C

[D] A-U

14. The amino acid that directly participates in the biosynthesis of heme is:

[A] glycine

[B] methionine

[C] aspartate

[D] tryptophan

15. A triangle with vertices (4, 0), (-1, -1) and (3, 5) is:

[A] isosceles and not right angled

[B] right angled but not isosceles

[C] isosceles and right angled

[D] neither right angled nor isosceles

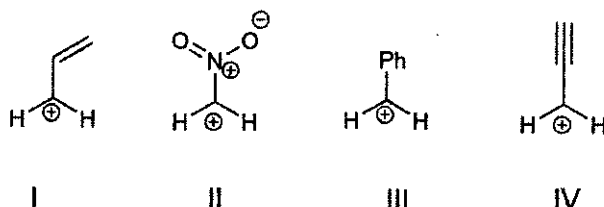
16. The graph of equation of  $2x^2 + 2y^2 - 4x + y + 1 = 0$  is a:

- [A] circle with center  $(1, -\frac{1}{4})$  and radius  $\frac{3}{4}$   
 [B] circle with center  $(-\frac{1}{4}, 1)$  and radius  $\frac{9}{16}$   
 [C] parabola with vertex at  $(1, -\frac{1}{4})$   
 [D] parabola with vertex at  $(-\frac{1}{4}, 1)$

17. If the point of intersection of the lines,  $4ax + 2ay + c = 0$  and  $5bx + 2by + d = 0$  lies in the fourth quadrant and is equidistant from the two axes ( $a, b, c$  and  $d$  are non-zero numbers), then:

- [A]  $3bc - 2ad = 0$  [B]  $2bc - 3ad = 0$   
 [C]  $2bc + 3ad = 0$  [D]  $3bc + 2ad = 0$

18. Arrange the following intermediates in the decreasing order of their stability:



- [A]  $II > IV > I > III$  [B]  $I > III > IV > II$   
 [C]  $III > I > IV > II$  [D]  $III > II > I > IV$

19. Excess acidity caused by acid rain to the soil can be neutralized by:

- [A] addition of more fertilizer [B] removal of acidified soil  
 [C] addition of  $\text{Cs}_2\text{CO}_3$  [D] addition of lime

20. Half-life of  $^{14}\text{C}$  is 5730 years. The fraction of  $^{14}\text{C}$  that remains in a 50,000 years old sample is:

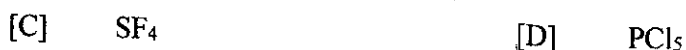
- [A]  $2.36 \times 10^{-3}$  [B]  $0.36 \times 10^{-3}$   
 [C]  $1.36 \times 10^{-3}$  [D]  $3.36 \times 10^{-3}$

21. The integral,  $\int x \ln(x) dx =$

[A]  $\frac{x^2}{2} + x \left( \ln(x) - \frac{1}{2} \right) + \text{const.}$  [B]  $\frac{x \ln(x)}{2} + \text{const.}$

[C]  $\frac{x^2}{2} \left( \ln(x) + \frac{1}{2} \right) + \text{const.}$  [D]  $\frac{x^2}{2} \left( \ln(x) - \frac{1}{2} \right) + \text{const.}$

22. The molecule possessing non-zero dipole moment is:



23. The hybridization of sulfur (as per VSEPR theory) in  $\text{SF}_4$  molecule is:



24. Zinc uranyl acetate and Nessler's reagent are used in the confirmatory test of the following cations:



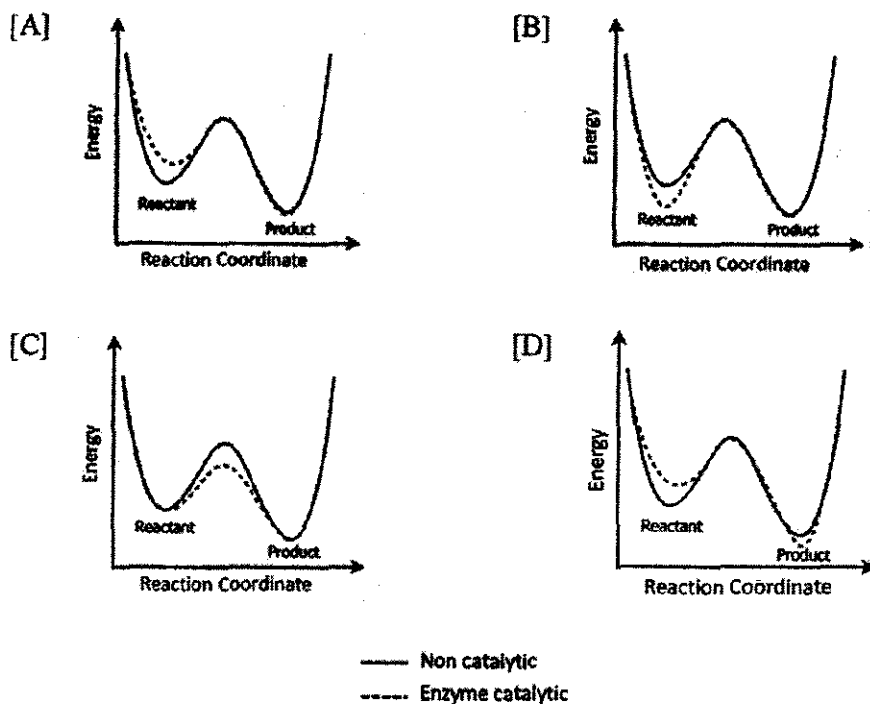
25. The  $\text{pK}_a$  value of hydrofluoric acid is 3.2. The approximate degree of dissociation of 0.35 M solution of hydrofluoric acid is:

[A] 1.2% [B] 2.4%

[C] 4.2% [D] 12%

## PART-B

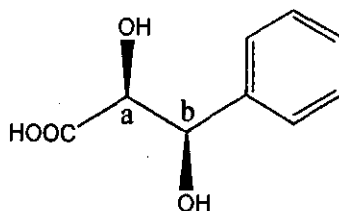
26. The energy diagram that correctly corresponds to an enzyme catalyzed reaction is:



27. Intermediate involved in the Reimer-Tiemann reaction is:

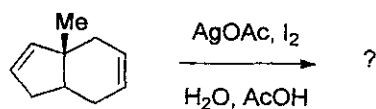
- [A] carbene [B] carbanion  
[C] free radical [D] carbocation

28. Absolute stereochemistry of the following compound is:



- [A] a- (S) b- (R) [B] a- (R), b- (R)  
[C] a- (S) b- (S) [D] a- (R), b- (S)

29. The major product obtained in the following transformation is:



- [A]
- [B]
- [C]
- [D]

30. Which one of the following reactions involves both oxidation and reduction processes?

- [A] Robinson Annulation                      [C] Cannizzaro reaction
- [B] Claisen condensation                      [D] Perkin condensation

31. Contact angle of a liquid with glass wall of a capillary tube of length 10 cm is  $90^\circ$ . When the capillary tube is dipped vertically in the liquid, the liquid level in the capillary tube:

- [A] increases                      [B] decreases
- [C] remains same                      [D] overflows out

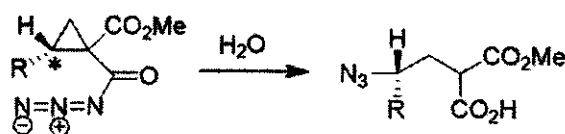
32. According to Hückel rule, which one of the following is not an aromatic compound?

- [A]
- [B]
- [C]
- [D]

33. The rate of effusion of  $\text{O}_2$  is  $1.0 \text{ mL s}^{-1}$  at 300 K and 1.0 atm pressure. Under the same conditions, the rate of effusion (in  $\text{mL s}^{-1}$ ) of  $\text{H}_2$  is close to:

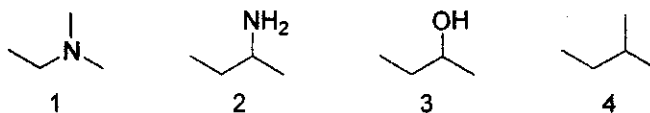
- |         |          |
|---------|----------|
| [A] 1.0 | [B] 4.0  |
| [C] 8.0 | [D] 16.0 |

34. The stereochemical change at the reaction centre ( $\text{C}^*$ ) in the following ring-opening reaction is ( $\text{R}=\text{Methyl}$ ):



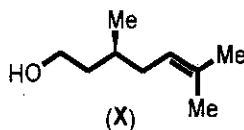
- |                  |                      |
|------------------|----------------------|
| [A] inversion    | [B] retention        |
| [C] racemisation | [D] double inversion |

35. The decreasing order of boiling points of the following compounds is:



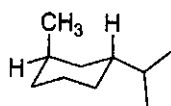
- |                     |                     |
|---------------------|---------------------|
| [A] $1 > 2 > 3 > 4$ | [B] $2 > 3 > 1 > 4$ |
| [C] $3 > 2 > 1 > 4$ | [D] $1 > 3 > 2 > 4$ |

36. Ozonolysis of a given molecule (X) provides the product Y and acetone. The IUPAC name of Y is:

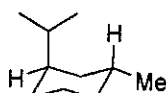


- |                                    |                                    |
|------------------------------------|------------------------------------|
| [A] (S)-5-hydroxy-3-methylpentanal | [B] (R)-5-hydroxy-3-methylpentanol |
| [C] (R)-5-hydroxy-3-methylpentanal | [D] (S)-3,6-dimethylhept-5-en-1-ol |

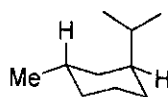
37. The most stable conformation of (1*R*,3*R*)-1-isopropyl-3-methylcyclohexane is:



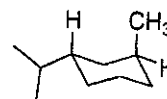
[A]



[B]



[C]



[D]

38. In the non-aqueous solvent  $\text{BrF}_3$ , the nature of  $\text{SbF}_5$  is:

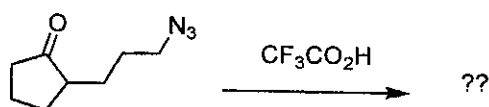
[A] basic

[B] acidic

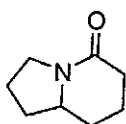
[C] neutral

[D] mildly basic

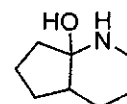
39. The product obtained in the following reaction is:



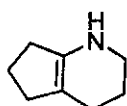
[A]



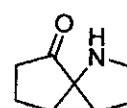
[B]



[C]



[D]



40.  $\text{ClF}_3$  molecule is:

[A] T-shaped

[B] trigonal planar

[C] trigonal bipyramidal

[D] square planar

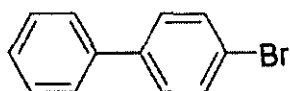
41. The paramagnetic species among the following is:

[A]  $\text{N}_2\text{O}$ [B]  $\text{NO}_2$ [C]  $\text{NO}_3^-$ [D]  $\text{N}_2\text{O}_4$

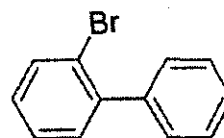
42. The major product formed in the following reaction is:



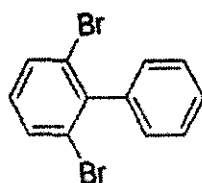
[A]



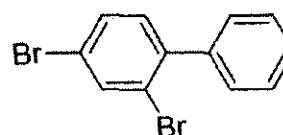
[B]



[C]



[D]



43. Two gases have the same value of van der Waals gas constant ' $a$ ' but different ' $b$ ' values. The more compressible of the two gases is:

- [A] the gas with lower ' $b$ ' value.
- [B] the gas with higher ' $b$ ' value.
- [C] both are equally compressible.
- [D] cannot be predicted.

44. Among the complexes (i)  $[\text{Ni}(\text{CN})_4]^{2-}$ , (ii)  $[\text{Fe}(\text{CO})_5]$ , (iii)  $[\text{CuCl}_5]^{3-}$  and (iv)  $[\text{PtCl}_6]^{2-}$  the ones that obey the 18-electron rule are:

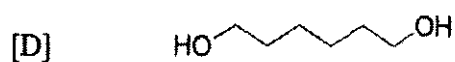
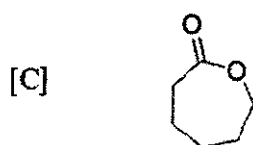
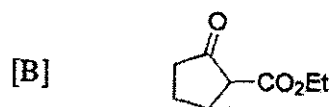
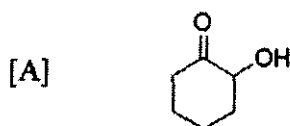
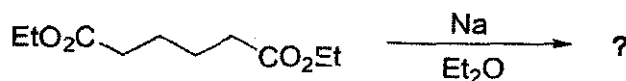
- [A] (i) and (ii)
- [B] (i) and (iii)
- [C] (iii) and (iv)
- [D] (ii) and (iv)

45. Penicillin contains:

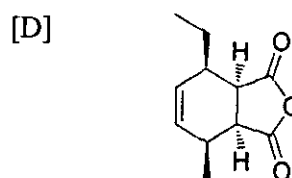
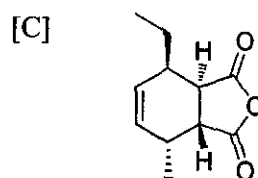
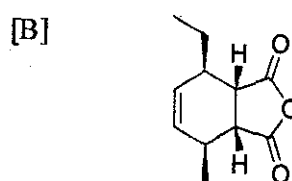
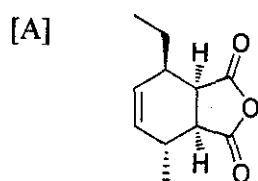
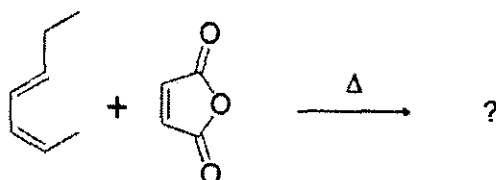
- [A]  $\beta$ -lactone unit
- [B]  $\beta$ -lactam unit
- [C]  $\gamma$ -lactone unit
- [D]  $\gamma$ -lactam unit



46. The major product formed in the following reaction is:



47. The major product obtained in the following transformation is:



48. Reaction of dichromate anion with iodide in acid medium gives:

[A]  $\text{Cr}^{3+}$ , iodine and water

[B]  $\text{Cr}^{3+}$ , iodate and water

[C]  $\text{Cr}^{3+}$ , iodate and oxygen

[D]  $\text{Cr}^{2+}$ , iodide and water

49. Carbon-based free radical intermediates are stabilized by

- [A] electron donating groups
- [B] both electron donating and withdrawing groups
- [C] electron withdrawing groups
- [D] neutral substituents

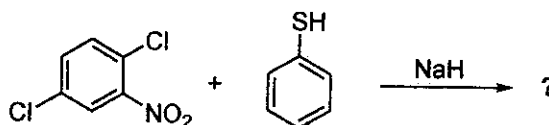
50. The reaction that involves the formation of both C-C and C-O bonds is:

- [A] Diels-Alder reaction
- [B] Darzen's glycidic ester condensation
- [C] Aldol reaction
- [D] Beckmann rearrangement

51. A complex of formula  $[MA_2B_2]X_2$  is found to have no geometrical isomers. Both A and B are monodentate ligands and X is a halogen. The structure of the complex is:

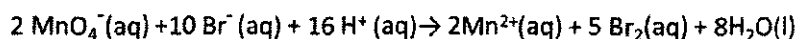
- [A] tetrahedral
- [B] square-planar
- [C] square-pyramidal
- [D] octahedral

52. The product formed in the following reaction is:



- [A]
- [B]
- [C]
- [D]

53. The number of electrons involved in the following balanced redox reaction is:



[A] 2

[B] 4

[C] 5

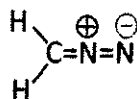
[D] 10

54. Names of  $\text{O}_2^-$ ,  $\text{O}_2^{2-}$ ,  $\text{O}_2^+$  are respectively:

[A] superoxide, peroxide and dioxygenyl [B] peroxide, superoxide and dioxygenyl

[C] superoxide, dioxygenyl and peroxide [D] dioxygenyl, peroxide, and superoxide

55. The hybridization of carbon, central nitrogen, and terminal nitrogen in the following resonance structure of diazomethane are respectively :

[A]  $sp^2$ ,  $sp$ ,  $sp$ [B]  $sp^3$ ,  $sp^2$ ,  $sp$ [C]  $sp^2$ ,  $sp^2$ ,  $sp$ [D]  $sp^3$ ,  $sp$ ,  $sp$ 

56. The number of OH and P=O groups present in triphosphoric acid are respectively:

[A] 3 and 5

[B] 5 and 3

[C] 2 and 5

[D] 3 and 3

57. Among  $\text{BrO}_4^-$ ,  $\text{SiF}_4$ ,  $\text{TeF}_4$ ,  $\text{ICl}_4^-$ , the species isostructural to xenon tetrafluoride are (is):

[A]  $\text{BrO}_4^-$  and  $\text{ICl}_4^-$ [B]  $\text{TeF}_4$  and  $\text{ICl}_4^-$ [C] Only  $\text{ICl}_4^-$ [D]  $\text{SiF}_4$  and  $\text{TeF}_4$

58. Assuming an octahedral geometry the number of geometrical isomers that are possible in  $[\text{PF}_3\text{Cl}_3]^-$  and  $[\text{PF}_2\text{Cl}_4]^-$  are:

[A] 2, 2

[B] 2, 3

[C] 3, 2

[D] 4, 2

59. Among the following pair of diatomic molecules, choose the one where the bonding  $\sigma(2p)$  orbital is lower in energy than the  $\pi(2p)$  orbitals.

[A]  $\text{O}_2$  and  $\text{F}_2$

[B]  $\text{O}_2$  and  $\text{B}_2$

[C]  $\text{C}_2$  and  $\text{O}_2$

[D]  $\text{F}_2$  and  $\text{B}_2$

60. Among the following complexes, the pair which shows ionization isomerism is:

i.  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Br}_2$  and  $[\text{Co}(\text{NH}_3)_4\text{Br}_2]\text{Cl}\cdot\text{H}_2\text{O}$

ii.  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$  and  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}\cdot\text{H}_2\text{O}$

iii.  $[(\text{ON})\text{Ru}(\text{NO})_4(\text{OH})]^{2-}$  and  $[(\text{NO})\text{Ru}(\text{NO})_4(\text{OH})]^{2-}$

iv.  $[\text{Co}(\text{en})_3][\text{Cr}(\text{CN})_6]$  and  $[\text{Cr}(\text{en})_3][\text{Co}(\text{CN})_6]$

[A] i

[B] ii

[C] iii

[D] iv

61. The most abundant transition metal in earth crust is:

[A] aluminium

[B] copper

[C] iron

[D] calcium

62. If the vectors  $\mathbf{a} = i - j + 2k$ ,  $\mathbf{b} = 2i + 4j + k$  and  $\mathbf{c} = pi + j + qk$  are mutually orthogonal, then  $(p, q)$  is:

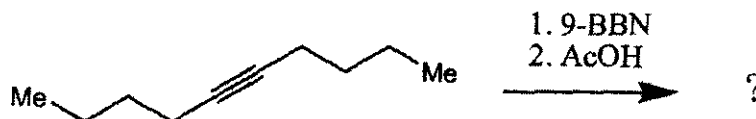
[A] (2, -3)

[B] (-2, 3)

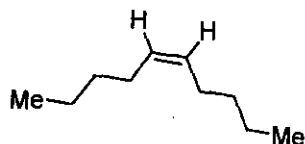
[C] (-3, 2)

[D] (3, -2)

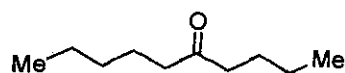
63. The most appropriate product obtained in the following reaction is:



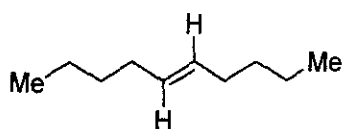
[A]



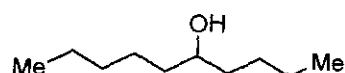
[B]



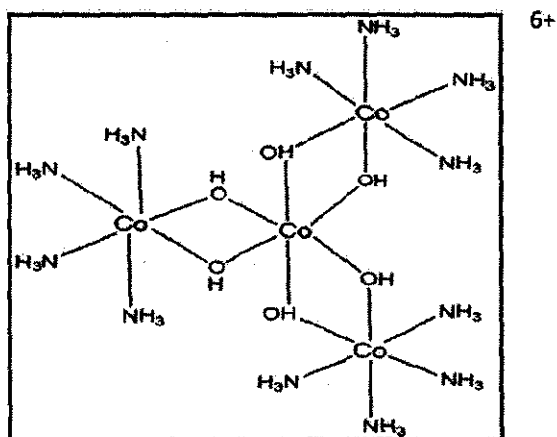
[C]



[D]



64. The correct IUPAC name of the following complex cation is:



- [A] tris[tetraammine- $\mu$ -dihydroxocobalt(III)]cobalt(III) ion  
 [B] tris( $\mu$ -dihydroxotetraamminecobalt)cobalt(6+) ion  
 [C] tris(tetraamminecobalt-hexahydroxo)cobalt(6+) ion  
 [D] tetra(tetraamminehexahydroxo)cobalt(6+) ion

65. Metal ' $M_1$ ' reacts with cyanide ion in the presence of air to form the complex anion  $M_1(CN)_2^-$ , which gives back ' $M_1$ ' upon treatment with ' $M_2$ '.  $M_1$  and  $M_2$  are respectively:

- |                       |                     |
|-----------------------|---------------------|
| [A] silver and copper | [B] copper and zinc |
| [C] gold and zinc     | [D] gold and silver |

66. If  $x^m y^n = (x + y)^{(m+n)}$ , then  $dy/dx =$

- |                  |           |
|------------------|-----------|
| [A] $x/y$        | [B] $xy$  |
| [C] $(m + n)y/x$ | [D] $y/x$ |

67. The fractional surface coverage ( $\theta$ ) in dissociative adsorption of a gas is ( $K$  = equilibrium constant for adsorption-desorption,  $P$  = pressure of gas):

- |  |  |
|--|--|
| [A] $\theta = \frac{KP}{1 + KP}$                 | [B] $\theta = \frac{KP^2}{1 + KP^2}$     |
| [C] $\theta = \frac{(KP)^{1/2}}{1 + (KP)^{1/2}}$ | [D] $\theta = \frac{(KP)^2}{1 + (KP)^2}$ |

68. A mixture contains equal number of polymer molecules with molecular weights 20,000 and 40,000. The number average molar mass of the mixture (in amu) is:

- |            |            |
|------------|------------|
| [A] 30,000 | [B] 25,000 |
| [C] 35,000 | [D] 42,000 |

69. A vessel contains a mixture of helium (He) and methane ( $CH_4$ ). The ratio of the root mean square speed of the He atoms to that of the  $CH_4$  molecules is:

- |       |        |
|-------|--------|
| [A] 1 | [B] 2  |
| [C] 4 | [D] 16 |

70. The fragment which is *isobal* to  $\text{Fe}(\text{CO})_4$  is:

[A]  $\text{CH}_2$

[B]  $\text{CH}_3$

[C]  $\text{CH}_4$

[D]  $\text{CH}$

71. The spin only magnetic moment (in Bohr Magneton) of high-spin  $\text{Mn}^{3+}$  ion is

[A] 1.73

[B] 3.88

[C] 2.83

[D] 4.90

72. The  $n^{\text{th}}$  derivative of  $\ln(x)$ , where  $n > 1$ , is:

[A]  $\frac{(-1)^{n-1}(n-1)!}{x^n}$

[B]  $\frac{(-1)^n(n-1)!}{x^n}$

[C]  $\frac{(n-1)!}{x^n}$

[D]  $\frac{(-1)^{n-1}n!}{x^n}$

73. The metal ions present in Chlorophyll and vitamin  $\text{B}_{12}$  are respectively:

[A] Fe and Co

[B] Fe and Mg

[C] Co and Mg

[D] Mg and Co

74. Match the following:

[1]  $\text{HgS}$

(a) Pyrolusite

[2]  $\text{MnO}_2$

(b) Chalcopyrite

[3]  $\text{CuFeS}_2$

(c) Ilmenite

[4]  $\text{FeTiO}_3$

(d) Cassiterite

[5]  $\text{SnO}_2$

(e) Cinnabar

[A] (1)-(e), (2)-(a), (3)-(b), (4)-(c), (5)-(d)

[B] (1)-(e), (2)-(c), (3)-(a), (4)-(d), (5)-(b)

[C] (1)-(b), (2)-(a), (3)-(e), (4)-(c), (5)-(d)

[D] (1)-(c), (2)-(d), (3)-(b), (4)-(a), (5)-(e)

75. The square of the matrix  $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$  is:

[A]  $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

[B]  $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

[C]  $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

[D]  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

76. The crystal field stabilization of tetrahedral  $[\text{CoBr}_4]^{2-}$  is:

[A]  $4/9\Delta_t$

[B]  $6/9\Delta_t$

[C]  $4/5\Delta_t$

[D]  $6/5\Delta_t$

77. If the parabola,  $y = 4x^2 + 3$  is rotated by  $-90^\circ$  (anticlockwise  $90^\circ$ ) about the origin, the resulting function is:

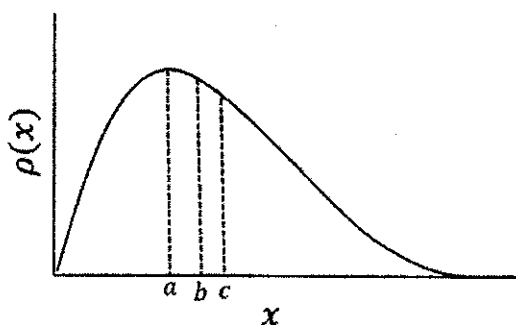
[A]  $y = 4x^2 - 3$

[B]  $x = -4y^2 - 3$

[C]  $y = -4x^2 - 3$

[D]  $x = 4y^2 - 3$

78. In the probability density distribution given below,  $a$ ,  $b$  and  $c$  respectively represent:



[A] mode, mean and median

[B] median, mode and mean

[C] mode, median and mean

[D] mean, mode, median

79. If,  $\cos \varphi - \sin \varphi = \sqrt{2} \sin \varphi$ , then  $\cos \varphi + \sin \varphi =$

[A]  $-\sqrt{2} \sin \varphi$

[B]  $\sqrt{2} \operatorname{cosec} \varphi$

[C]  $\sqrt{2} \cos \varphi$

[D]  $\sqrt{2} \tan \varphi$



80. When two dice are thrown simultaneously, the probability of obtaining 4 as the total is:

[A]  $1/36$

[B]  $3/36$

[C]  $5/36$

[D]  $7/36$

81. The plane that is perpendicular to the (110) plane in a simple cubic lattice is:

[A] (010)

[B] (001)

[C] (101)

[D] (011)

82. The limiting molar conductivity of NaOH, NaF and  $\text{NH}_4\text{F}$  are 24.8, 10.5 and 12.5  $\text{mS m}^2 \text{mol}^{-1}$ , respectively. The limiting molar conductivity (in  $\text{mS m}^2 \text{mol}^{-1}$ ) of  $\text{NH}_4\text{OH}$  is:

[A] 27.1

[B] 22.5

[C] 17.8

[D] 16.4

83. The exact differential among the following for a perfect gas (where  $P$ ,  $T$  and  $R$  are pressure, temperature and gas constant, respectively) is:

[A]  $\frac{P}{RT} dT + R dP$

[B]  $RP dT + RT dP$

[C]  $\frac{RP}{T} dT + \frac{RT}{P} dP$

[D]  $RdT + \frac{RT}{P} dP$

84. A real gas behaves more like an ideal gas at:

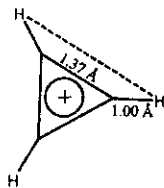
[A] low pressure and high temperature

[B] high pressure and high temperature

[C] low pressure and low temperature

[D] high pressure and low temperature

85. In the cyclopropenium ion, the C-C and C-H bond lengths are respectively 1.37 Å and 1.00 Å. The non-bonded H---H distance (in Å) is:



- [A] 2.24 [B] 2.74
- [C] 3.10 [D] 3.37
86. The three quantum numbers ( $n$ ,  $l$ , and  $m$ ) of the unpaired electron of copper atom in its ground state are:
- [A] (4, 0, 0) [B] (4, 1, 0)
- [C] (3, 2, 0) [D] (3, 2, -2)
87. The ratio of the osmotic pressures of two solutions A and B ( $P_A/P_B$ ) is 1.2. If the depression of freezing point of solution A is 0.3 K, the depression in the freezing point of B at the same temperature (in Kelvin) is close to:

- [A] 0.36 [B] 0.43
- [C] 0.50 [D] 0.29
88. At 298 K the standard free energy change ( $\Delta G^\circ$ , in  $\text{kJ mol}^{-1}$ ) for the cell reaction  $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$  is:
- [ $E_{\text{Cu}^{2+}/\text{Cu}}^\circ = 0.339 \text{ V}$  and  $E_{\text{Zn}^{2+}/\text{Zn}}^\circ = -0.762 \text{ V}$ ]
- [A] +106 [B] +212
- [C] -106 [D] -212

89. The saturated vapour pressures of two liquids A and B are respectively 50 kPa and 20 kPa at 30°C; they are completely miscible and form ideal mixture. The vapour pressure (in kPa) of a mixture of 2 moles of A and 3 moles of B at 30°C is:

[A]	25	[B]	32
[C]	35	[D]	70

90. When Cu  $K_\alpha$  X-ray with wavelength  $\lambda = 1.54 \text{ \AA}$  is used, the diffraction from the (3 2 0) plane of a crystal occurs at,  $2\theta = 45.6^\circ$ . If Mo  $K_\alpha$  X-ray with  $\lambda = 0.71 \text{ \AA}$  is used, diffraction from the (3 2 0) plane will be found at  $2\theta =$

[A]	$20.6^\circ$	[B]	$21.6^\circ$
[C]	$22.8^\circ$	[D]	$57.2^\circ$

91. The equilibrium constant for  $A_2 \rightleftharpoons 2A$  is 2.0 at 30°C. The mole fraction of A at equilibrium at the same temperature is:

[A]	0.25	[B]	0.50
[C]	0.67	[D]	0.80

92. The entropy change (in cal  $K^{-1}$ ) in the isothermal reversible expansion of one mole of a perfect gas from 7.6 to 2.9 atm at 300 K is:

[A]	0.826	[B]	1.328
[C]	1.907	[D]	3.061

93. For the gas phase reaction,  $H_2O + CH_4 = CO + 3H_2$ , if  $K_c = 3.8 \times 10^{-3} M^2$  at 1000 K, the  $K_p$  (atm<sup>2</sup>) is:

[A]	16	[B]	26
[C]	12	[D]	14

94. The decomposition reaction  $2\text{H}_2\text{O}_2 (\text{aq}) \rightarrow 2\text{H}_2\text{O} (\text{l}) + \text{O}_2 (\text{g})$  is first order in  $\text{H}_2\text{O}_2$  with a rate constant  $1.8 \times 10^{-5} \text{ s}^{-1}$  at 300 K. If the initial concentration of  $\text{H}_2\text{O}_2$  is 0.3 M, the concentration (in M) after 4 h is:

[A] 0.12 [B] 0.06  
[C] 0.23 [D] 0.18

95. In a gas phase reaction,  $A \rightarrow \text{products}$ , depending on the initial pressure,  $p_0$ , the rate,  $r$  is found to change as shown in the table. Order of the reaction is:

$p_0 / \text{atm}$	1	2	4
$r / \text{atm s}^{-1}$	6	17	48

[A] 0 [B] 1  
[C] 1.5 [D] 2

96. The change in the internal energy of a gas is equal to the heat supplied. The correct statement among the following is:

[A] the gas is expanded isothermally  
[B] the process is carried out at constant volume  
[C] the gas is expanded under constant pressure  
[D] the process is carried out irreversibly

97. When a capillary tube with a cross sectional area  $a$  is dipped into a liquid, the liquid rises to a height of 15 cm. If another tube with cross sectional area  $2a$  is dipped, the rise of the liquid in this tube will be:

[A] 10.6 cm [B] 15 cm  
[C] 7.5 cm [D] 21.3 cm

98. The number of possible lines in the emission spectrum of hydrogen atom from the principal quantum level  $n = 7$  to  $n = 3$  is:

[A] 10

[B] 9

[C] 8

[D] 7

99. The wavelength of a certain line in Balmer series is observed to be  $4341 \text{ \AA}$ , it corresponds to an emission from the state with principal quantum number:

[A] 20

[B] 15

[C] 10

[D] 5

100. The speed of an electron in the first Bohr orbit of hydrogen is  $x$ , then the speed of the electron in  $\text{He}^+$  in the second orbit is:

[A]  $x/2$

[B]  $x$

[C]  $2x$

[D]  $4x$

**BOOKLET CODE** **A**

**Invigilator's Signature**

**ENTRANCE EXAMINATION – 2017**  
**M. Sc. Chemistry**

**TIME: 2 HOURS**

**MAXIMUM MARKS: 100**

**HALL TICKET NUMBER:**

**INSTRUCTIONS**

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR ANSWER SHEET** given to you.
2. Make sure that pages numbered from **1 - 18** are present (excluding pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Hand over the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. Cell phones are not allowed.
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

**Useful Constants:**

Rydberg constant =  $109737 \text{ cm}^{-1}$ ; Faraday constant =  $96500 \text{ C}$ ; Planck constant =  $6.625 \times 10^{-34} \text{ J s}$ ;  
 Speed of light =  $2.998 \times 10^8 \text{ m s}^{-1}$ ; Boltzmann constant =  $1.380 \times 10^{-23} \text{ J K}^{-1}$ ; Gas constant =  $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$  =  $0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$  =  $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$ ; Mass of electron =  $9.109 \times 10^{-31} \text{ kg}$ ; Mass of proton =  $1.672 \times 10^{-27} \text{ kg}$ ; Charge of electron =  $1.6 \times 10^{-19} \text{ C}$ ;  $1 \text{ D} = 3.336 \times 10^{-30} \text{ C m}$ ;  $1 \text{ bar} = 10^5 \text{ N m}^{-2}$ ;  $RT/F$  (at  $298.15 \text{ K}$ ) =  $0.0257 \text{ V}$ .

**PART – A**

- $\text{Mg}_2\text{SiO}_4$  belongs to the class of
 

[A] pyrosilicates.	[B] chain silicates.
[C] sheet silicates.	[D] orthosilicates.
- The electronegativity of carbon is highest in
 

[A] $sp$ hybridized carbon.	[B] $sp^2$ hybridized carbon.
[C] $sp^3$ hybridized carbon.	[D] the ground state of carbon.
- The maximum number of cyclic structures possible for the molecular formula  $\text{C}_3\text{H}_6\text{O}$  is:
 

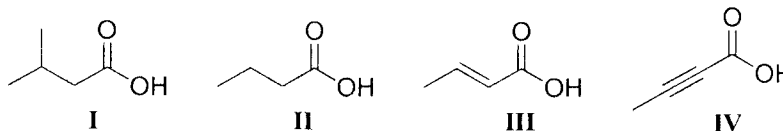
[A] 1	[B] 2
[C] 3	[D] 4
- The correct order of basicity of the group 15 (group 5A) trihydrides is:
 

[A] $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3$	[B] $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3$
[C] $\text{NH}_3 = \text{PH}_3 > \text{AsH}_3$	[D] $\text{NH}_3 > \text{PH}_3 = \text{AsH}_3$
- The first noble gas compound reported is:
 

[A] $\text{XeO}_3$	[B] $\text{KrF}_2$
[C] $\text{XeF}_6$	[D] $\text{Xe}^+(\text{PtF})_6^-$
- $\left(\frac{\partial U}{\partial V}\right)_T$  for an ideal gas is:
 

[A] positive	[B] negative
[C] zero	[D] infinite

7. The decreasing order of acidity of the following compounds is:



[A] I > II > III > IV

[B] II > I > IV > III

[C] IV > III > I > II

[D] IV > III > II > I

8. A 20.0 mL sample of 0.30 M HCl is titrated with 0.15 M NaOH. What is the pH of the solution after 40.3 mL of NaOH is added to the acid?

[A] 2.95

[B] 3.13

[C] 11.05

[D] 10.87

9. The most appropriate reagent for the conversion of hexanoic acid to hexan-1-ol is:

[A]  $\text{NaBH}_4$

[B]  $\text{LiBH}_4$

[C]  $\text{CaH}_2$

[D]  $\text{BH}_3 \cdot \text{THF}$

10. The shape of  $\text{NO}_3^-$  is

[A] trigonal planar.

[B] tetrahedral.

[C] T-shaped.

[D] trigonal pyramidal.

11. The most appropriate reagent to carry out the following transformation is:



[A]  $\text{KMnO}_4$

[B]  $\text{CrO}_3$

[C]  $\text{OsO}_4$

[D] Pyridinium chlorochromate

12. The species having the shortest bond length among the following is:

[A] NO

[B]  $\text{NO}^+$

[C]  $\text{NO}^{2+}$

[D]  $\text{NO}^-$

13. The degree of dissociation of an aqueous solution of a weak acid ( $\text{pK}_a=4.74$ ) at  $\text{pH}=4.74$  is:

[A] 0.34

[B] 0.25

[C] 0.50

[D] 0.90



14. Which of the following elements are present in DNA?

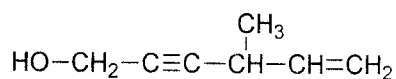
- (i) Carbon      (ii) Nitrogen      (iii) Oxygen      (iv) Phosphorus

- [A] i, ii, and iii      [B] i, ii, and iv  
[C] ii, iii, and iv      [D] i, ii, iii, and iv

15. Unit of van der Waals gas constant  $a$  is:

- [A] atm L      [B] atm L<sup>2</sup>mol<sup>-2</sup>  
[C] L mol<sup>-1</sup>      [D] L<sup>2</sup>mol<sup>-2</sup>

16. The IUPAC name of the following compound is:



- [A] 4-Methylhex-5-en-2-yn-1-ol      [B] 3-Methylhex-4-yn-6-ol  
[C] 1-Hydroxy-4-methylhex-5-en-2-yne      [D] 6-Hydroxy-3-methylhex-4-yn-1-ene

17. The osmotic pressure of a 3.42% (W/V) solution of sucrose (Molecular weight = 342) and a solution of 1.73 g of a molecule, A, in 100 mL of water are same at the same temperature. The molecular weight of A is:

- [A] 123      [B] 273  
[C] 676      [D] 173

18. The quantum numbers  $n$ ,  $l$ , and  $m$  of the highest occupied atomic orbital of Be are:

- [A] (1, 0, 0)      [B] (2, 0, 0)  
[C] (2, 1, 0)      [D] (2, 1, 1)

19. 100 g of C<sub>6</sub>H<sub>6</sub> is mixed with 100 g of C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub> at 20 °C and 1 atm. Assuming ideal behavior, the entropy of mixing (in cal K<sup>-1</sup>) is:

- [A] 3.24      [B] 5.24  
[C] 7.24      [D] 4.24

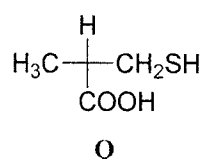
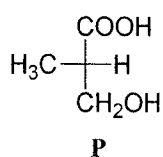
20. The gas which effuses 2.3 times faster than  $\text{N}_2\text{O}_4$  at the same temperature is:

- [A]  $\text{NH}_3$  [B]  $\text{CN}_2$   
 [C]  $\text{O}_3$  [D]  $\text{N}_2\text{O}$

21. The most electrophilic molecule among the following is:

- [A]  $\text{H}_2\text{O}$  [B]  $\text{H}_2\text{C}=\text{CH}_2$   
 [C]  $\text{BF}_3$  [D]  $\text{NH}_3$

22. The absolute configurations of the following compounds are:



- [A] 'R' in P and 'S' in Q [B] 'R' in both P and Q  
 [C] 'S' in P and 'R' in Q [D] 'S' in both P and Q

23. If the ratio of the area of a square to that of a circle is equal to  $\pi$ , the ratio of perimeter of the square to the circumference of the circle is equal to:

- [A] 1 [B] 2  
 [C] 3 [D] 4

24. If the carbon-carbon bond length in benzene ( $\text{C}_6\text{H}_6$ ) is  $1.40 \text{ \AA}$ , the distance between the carbons at 1 and 3 position is:

- [A]  $2.000 \text{ \AA}$  [B]  $2.135 \text{ \AA}$   
 [C]  $2.425 \text{ \AA}$  [D]  $2.800 \text{ \AA}$

25. Tommy has to cross two rivers to meet Janny. The first river has 10 bridges and the second one has 20 bridges. How many possible paths can Tommy follow to meet Janny?

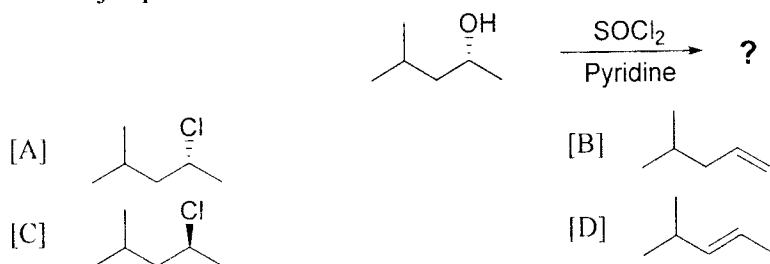
- [A] 200 [B] 2  
 [C] 201 [D] 199

## PART – B

26. Choose the planar species from the following: (i)  $\text{XeF}_4$ , (ii)  $\text{ClO}_4^-$ , (iii)  $\text{PdCl}_4^{2-}$ , (iv)  $\text{MnO}_4^-$

- [A] (i) and (ii) [B] (i) and (iv)  
[C] (iii) only [D] (i) and (iii)

27. The major product formed in the following reaction is



28. One mole of a compound with molecular formula  $\text{C}_9\text{H}_{16}$  upon ozonolysis gives one mole each of acetone, formaldehyde and levulinaldehyde (a ketoaldehyde). The compound is:

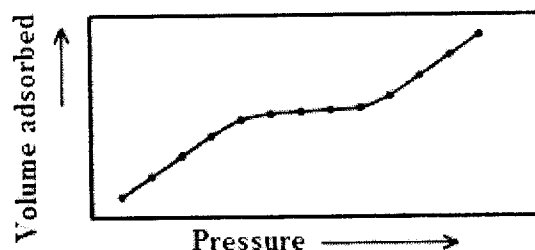
- [A] 2,6-dimethylhepta-2,5-diene  
[B] 2,6-dimethylhepta-1,6-diene  
[C] 2,6-dimethylhepta-1,5-diene  
[D] (E)-2,6-dimethylhepta-2,4-diene

29. Choose the species with the maximum number of unpaired electrons from the following:

(i)  $[\text{MnCl}_4]^{2-}$  (ii)  $[\text{NiCl}_4]^{2-}$  (iii)  $[\text{FeCl}_4]^-$  and (iv)  $[\text{CoCl}_4]^{2-}$

- [A] (iv) only [B] (i) and (iii)  
[C] (i) and (ii) [D] (i) only

30. The adsorption isotherm of  $\text{N}_2$  on Nickel is shown in the figure below;



The behavior is best described by:

- [A] Henry's Isotherm [B] Langmuir Isotherm  
[C] BET Isotherm [D] Gibbs Isotherm

31. Ferrocene is an organometallic compound consisting of
- [A] one  $\text{Fe}^{3+}$  and two  $\eta^5$  cyclopentadienyl anions.  
 [B] one  $\text{Fe}^{2+}$  and two  $\eta^5$  cyclopentadienyl anions.  
 [C] one  $\text{Fe}^{3+}$  and two  $\eta^1$  cyclopentadienyl anions.  
 [D] one  $\text{Fe}^{2+}$  and two  $\eta^1$  cyclopentadienyl anions.
32. The number of moles of orthophosphoric acid generated by the complete reaction of solid phosphorus pentoxide with one mole of water is:
- [A]  $\frac{3}{2}$  [B]  $\frac{1}{3}$   
 [C]  $\frac{1}{6}$  [D]  $\frac{2}{3}$
33. The equilibrium constant of a gas phase reaction is 2.0 at 400 K and 3.0 at 500 K. The standard enthalpy ( $\Delta H^\circ$ ) of this reaction is close to
- [A]  $+0.805 \text{ kcal mol}^{-1}$  [B]  $+1.61 \text{ kcal mol}^{-1}$   
 [C]  $-0.805 \text{ kcal mol}^{-1}$  [D]  $-1.61 \text{ kcal mol}^{-1}$
34. If  $\Delta_o$  and  $\Delta_t$  represent the octahedral and tetrahedral crystal field splittings respectively, the ratio  $\frac{\Delta_o}{\Delta_t}$  is close to:
- [A] 1.00 [B] 0.50  
 [C] 2.2 [D] 0.44
35. The VSEPR geometry will be identical with the molecular geometry for:
- [A]  $\text{AlCl}_3$  [B]  $\text{SF}_4$   
 [C]  $\text{ICl}_3$  [D]  $\text{XeF}_4$
36. Which of the following metal ions can give both high and low spin octahedral complexes?
- [A]  $\text{Cr}^{3+}$  [B]  $\text{Fe}^{2+}$   
 [C]  $\text{Cu}^{2+}$  [D]  $\text{Ti}^{3+}$
37. Which of the following compounds possesses inversion symmetry?
- [A]  $\text{SiF}_4$  [B]  $\text{PF}_5$   
 [C]  $[\text{CoF}_6]^{3-}$  [D]  $\text{BCl}_3$

38. The spin-only magnetic moment (in B.M.) of a high-spin complex of  $\text{Fe}^{3+}$  is:

[A] 1.73

[B] 5.92

[C] 2.83

[D] 4.90

39.  $\int e^x(1+x) dx =$

[A]  $e^x$

[B]  $e^x(1+x)$

[C]  $(1+x)$

[D]  $xe^x$

40. If  $i$ ,  $j$  and  $k$  are unit vectors along the Cartesian axes  $x$ ,  $y$  and  $z$  directions respectively, length of the projection of the vector  $3i - 4j + 2k$  on the  $xy$  plane is:

[A] 1

[B] 3

[C] 5

[D] 7

41. The amount of  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$  (Molecular weight =  $244.3 \text{ g mol}^{-1}$ ) required to prepare 500 mL of 0.0740 M chloride ion ( $\text{Cl}^-$ ) solution in water is:

[A] 4.52 g

[B] 9.04 g

[C] 7.71 g

[D] 8.35 g

42. The total number of valence electrons in each metal atom in the dichloro bridged complex  $(\text{CO})_2\text{Rh}(\mu\text{-Cl}_2)\text{Rh}(\text{CO})_2$  is:

[A] 14

[B] 16

[C] 17

[D] 18

43. A constant current of 0.800 A is used to deposit copper at the cathode. The number of grams of copper deposited in 15.2 min, considering the half-reaction;  $\text{Cu}^{2+} + 2e^- \rightarrow \text{Cu (s)}$ , is (Atomic weight of  $\text{Cu} = 63.5 \text{ g mol}^{-1}$ ):

[A] 0.772 g

[B] 0.240 g

[C] 0.480 g

[D] 12.16 g

44. Which of the following is a correct description of the gas phase structure of  $\text{XeF}_6$ ?

[A] Perfect octahedral

[B] Distorted octahedral

[C] Trigonal prismatic

[D] Polymeric with Xe octahedral

45. How many geometric isomers are possible for the complex  $[\text{Co}(\text{dien})\text{ABC}]$ , where  $\text{dien} = \text{NH}_2\text{CH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2\text{NH}_2$ , a tridentate ligand and A, B and C are monodentate ligands?
- [A] 6 [B] 4  
[C] 5 [D] 2
46. When dilute HCl is added to a white salt, effervescence is observed along with a colorless and odourless gas. Then a white precipitate is also formed which dissolves on heating. The salt is:
- [A]  $\text{Na}_2\text{SO}_4$  [B]  $\text{ZnCO}_3$   
[C]  $\text{PbCO}_3$  [D]  $\text{HgNO}_3$
47. The borane  $[\text{B}_8\text{H}_8]^{8-}$  can be classified as:
- [A] Arachno borane [B] Closo borane  
[C] Hypo borane [D] Nido borane
48. Addition of concentrated  $\text{H}_2\text{SO}_4$  to a solution of  $\text{KMnO}_4$  leads to the formation of an explosive oil with formula:
- [A]  $\text{Mn}_2\text{O}_7$  [B]  $\text{Mn}_3\text{O}_4$   
[C]  $\text{MnO}_2$  [D]  $\text{K}_2\text{MnO}_4$
49. The activation energy of a certain reaction is  $87 \text{ kJ mol}^{-1}$ . The ratio of the rate constants of this reaction at  $37^\circ\text{C}$  to the reaction at  $15^\circ\text{C}$  is:
- [A]  $\frac{5}{1}$  [B]  $\frac{8.3}{1}$   
[C]  $\frac{13}{1}$  [D]  $\frac{24}{1}$
50. Both  $[\text{Ni}(\text{CN})_4]^{2-}$  and  $[\text{Zn}(\text{CN})_4]^{2-}$  are diamagnetic. The hybridization of valence orbitals of  $\text{Ni}^{2+}$  and  $\text{Zn}^{2+}$  in these complexes will be
- [A]  $\text{sp}^3$  for both. [B]  $\text{sp}^3$  and  $\text{dsp}^2$ , respectively.  
[C]  $\text{dsp}^2$  for both. [D]  $\text{dsp}^2$  and  $\text{sp}^3$ , respectively.
51. Which of the following processes results in the formation of neutrino?
- [A]  $\alpha$ -ray emission [B]  $\beta$ -ray emission  
[C]  $\gamma$ -ray emission [D] X-ray emission

52. The standard potential of the cell,  $\text{Zn}|\text{Zn}^{2+}||\text{Fe}^{3+}|\text{Fe}^{2+}$  ( $E_{\text{Zn}^{2+}/\text{Zn}}^0 = -0.76 \text{ V}$  and  $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^0 = +0.77 \text{ V}$ ) is:

- [A] +0.77 V [B] -1.53 V  
[C] +2.30 V [D] +1.53 V

53. Argon gas (assumed to be ideal) is expanded reversibly and adiabatically from a volume of 50 L to 200 L. If the initial temperature is 300 K then the final temperature would be:

- [A] 75 K [B] 37.5 K  
[C] 119 K [D] 200 K

54. If the average speed of hydrogen molecule at a given temperature is  $c$ , then the average speed of oxygen molecule at the same temperature will be

- [A]  $2c$  [B]  $4c$   
[C]  $\frac{c}{2}$  [D]  $\frac{c}{4}$

55. The molar conductance of a saturated AgCl solution is  $130 \text{ S cm}^2 \text{ mol}^{-1}$  and the solubility product of AgCl is  $1.6 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$ . Resistance of this solution placed in a conductivity cell with cell constant  $0.75 \text{ cm}^{-1}$  is:

- [A]  $4.6 \times 10^{10} \Omega$  [B]  $4.6 \times 10^5 \Omega$   
[C]  $9.2 \times 10^5 \Omega$  [D]  $9.2 \times 10^{10} \Omega$

56.  $\tan\left(\frac{\theta}{2}\right) =$

- [A]  $\frac{\sin\theta}{(1 + \cos\theta)}$  [B]  $\frac{(1 + \cos\theta)}{\sin\theta}$   
[C]  $\frac{\cos\theta}{(1 + \sin\theta)}$  [D]  $\frac{(1 + \sin\theta)}{\cos\theta}$

57. A reaction follows the general rate law,  $\text{rate} = k[\text{A}][\text{B}]^2[\text{C}]$ . If the concentration of B is decreased by a factor of 3, and the concentration of C is decreased by a factor of 2, the rate of the reaction will decrease by a factor of

- [A] 6 [B] 12  
[C] 18 [D]  $\frac{1}{6}$

58. The mobilities of  $A^+$  and  $B^-$  are  $6.6 \times 10^{-4}$  and  $5.7 \times 10^{-4} \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$  respectively at  $25^\circ\text{C}$ . The ratio of their transport number is:
- [A] 1.16 [B] 2.15  
[C] 3.15 [D] 4.15
59. When an X-ray beam collides with an electron, a part of the photon energy is transferred to the electron and the light is scattered. This effect is known as:
- [A] Raman effect [B] Zeeman effect  
[C] Compton effect [D] Stark effect
60. The total number of rotational and vibrational degrees of freedom for  $\text{H}_2\text{C}=\text{CH}-\text{CH}_3$  are respectively:
- [A] 0 and 21 [B] 1 and 21  
[C] 3 and 21 [D] 2 and 22
61. The equation connecting molar heat capacity at constant pressure to molar heat capacity at constant volume for an ideal gas is:
- [A]  $C_p = \frac{C_v}{R}$  [B]  $C_p = \frac{R}{C_v}$   
[C]  $C_p = R \times C_v$  [D]  $C_p = R + C_v$
62. The atomic weight of antimony is 121.757 amu. It has only two naturally occurring isotopes. Abundance of the isotope with mass 120.904 amu is 57.3%. The mass of the other isotope is:
- [A] 122.610 [B] 122.902  
[C] 122.393 [D] 122.757
63. The (100) X-ray diffraction peak of a cubic crystal occurs at  $\theta = 19.50^\circ$ . The (111) diffraction peak will be observed at:
- [A]  $9.75^\circ$  [B]  $19.50^\circ$   
[C]  $33.77^\circ$  [D]  $35.32^\circ$
64. The maximum number of hydrogen bonds a water molecule can have is:
- [A] 1 [B] 2  
[C] 3 [D] 4



65. For a certain phase transition, there is no change in the volume, but the specific heat has a discontinuity. From this it may be concluded that the phase transition is a

- [A] First-order transition [B] Second-order transition  
[C]  $\lambda$ -transition [D] Quantum phase transition

66. On which organelle does the protein synthesis takes place?

- [A] ribosome [B] mitochondria  
[C] Golgi body [D] lysosome

67.  $\lim_{x \rightarrow 0} \frac{\partial^2}{\partial x^2} (\sqrt{4 - x^2}) =$

- [A] 0.50 [B] 0.25  
[C] 0.00 [D] 2.00

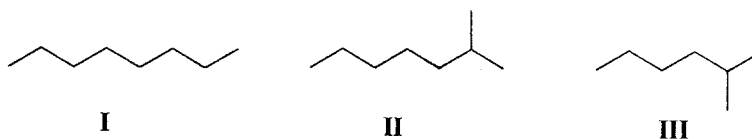
68.  $\int_0^l \sin\left(\frac{\pi x}{l}\right) \cos\left(\frac{\pi x}{l}\right) dx =$

- [A] 0.00 [B]  $l$   
[C] 1.00 [D]  $\infty$

69. Nickel (Atomic weight =  $58.71 \text{ g mol}^{-1}$ ) crystallizes in FCC lattice with a unit cell length of  $3.52 \text{ \AA}$ . The density (in  $\text{g cm}^{-3}$ ) of nickel is:

- [A] 3.24 [B] 5.64  
[C] 8.94 [D] 18.2

70. The increasing order of heat of combustion of the following compounds is:



- [A] I < II < III [B] II < III < I  
[C] II < I < III [D] III < II < I

71. The complex number  $(-2 - i 2\sqrt{3})$  in polar form is given by:

- [A]  $4e^{i\pi/3}$  [B]  $4e^{i2\pi/3}$   
[C]  $4e^{i4\pi/3}$  [D]  $4e^{i5\pi/3}$

72.  $\frac{d}{dx} [\ln(x^2 + 2x + 1)]$  at  $x = 0$  is:

- [A] 0 [B] 1  
[C] 2 [D] 3

73. Given the series 1, 1, 2, 3, 5, 8, 13, 21, X, ..., the value of X is:

- [A] 34 [B] 29  
[C] 27 [D] 25

74. If  $\alpha$  and  $\beta$  are the remaining two angles of a right angle triangle,  $\sin(2\beta)$  is equal to:

- [A]  $\cos(2\alpha)$  [B]  $\sin(2\alpha)$   
[C]  $1 + \tan^2 \alpha$  [D]  $\sec^2 \alpha$

75. The two curves  $X^2 + Y^2 = 4$  and  $X^2 - Y^2 = 2$  intersect each other at

- [A] no point. [B] one point.  
[C] two points. [D] four points.

76. Sum of the infinite series,  $1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \frac{x^8}{8!} + \dots$  is

- [A]  $\sin(x)$  [B]  $\cos(x)$   
[C]  $\cosh(x)$  [D]  $\sinh(x)$

77.  $\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{e^x - 1} =$

- [A]  $e$  [B]  $-e$   
[C]  $\frac{1}{e}$  [D]  $-\frac{1}{e}$

78. The following conversion is best achieved with:



- [A]  $n\text{-Bu}_2\text{CuLi}$  (2 equivalents) [B]  $n\text{-Bu}_2\text{CuLi}$  (1 equivalent)  
[C]  $n\text{-BuLi}$  (2 equivalents) [D]  $n\text{-BuLi}$  (1 equivalent)

79. If the vectors  $Xi + j - 2k$ ,  $2i + k$  and  $3i - 2j + k$  are coplanar ( $i$ ,  $j$  and  $k$  are the unit vectors), then  $X =$

[A]  $-9$  [B]  $9$

[C]  $-\frac{9}{2}$  [D]  $\frac{9}{2}$

80. The compound that does NOT give a tertiary alcohol upon reaction with an excess of ethyl magnesium bromide is:

[A] 3,3-dimethylhexan-2-one

[B] hexan-2-one

[C] ethyl benzoate

[D] ethyl formate

81. The value of  $A = \begin{vmatrix} 1 & 0 & 0 \\ 2 & \cos x & \sin x \\ 3 & \sin x & \cos x \end{vmatrix}$  is:

[A]  $1$  [B]  $0$

[C]  $\cos 2x$  [D]  $\sin 2x$

82. A ball which is thrown vertically upwards, satisfies the height (m) vs time (s) equation,  $h = 3 + 14t - 5t^2$ . The maximum height it would reach is:

[A]  $12.8$  m in  $1.4$  s [B]  $11.8$  m in  $1.4$  s

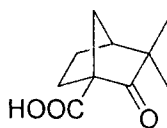
[C]  $12.8$  m in  $1.5$  s [D]  $11.8$  m in  $1.5$  s

83. The key reagent in Woodward cis dihydroxylation is:

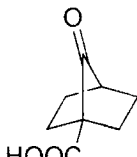
[A]  $\text{OsO}_4$  [B]  $\text{KMnO}_4$

[C]  $\text{CH}_3\text{COOAg}/\text{I}_2/\text{H}_2\text{O}$  [D]  $\text{C}_6\text{H}_5\text{COOAg}/\text{I}_2/\text{benzene}$

84. Identify the compound(s) that can easily undergo decarboxylation from the following:



I



II

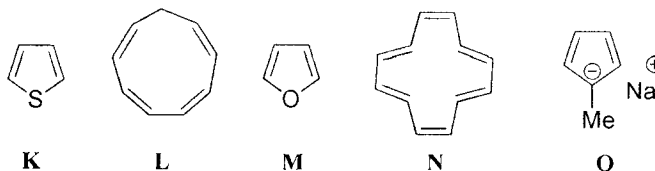


III

[A] II [B] I and II

[C] I, II and III [D] III

85. The aromatic compounds among the following are:



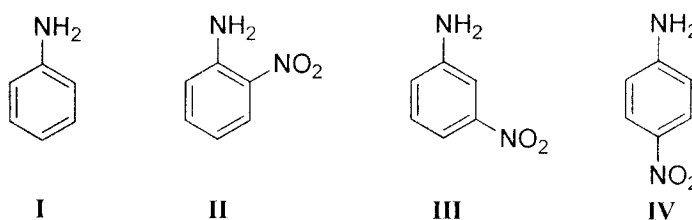
[A] **K, L and M**

[B] **K, M and O**

[C] **K, M and N**

[D] **K, M, N and O**

86. The decreasing order of basicity of the following compounds is:



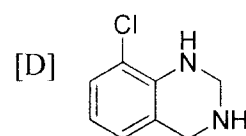
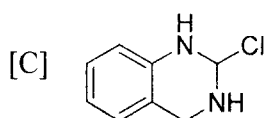
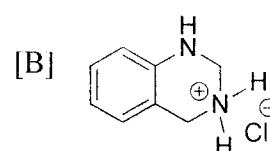
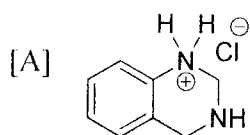
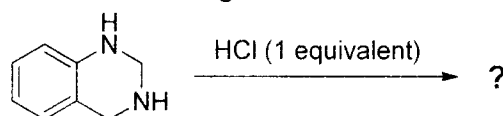
[A] **I > IV > III > II**

[B] **I > III > IV > II**

[C] **II > IV > III > I**

[D] **I > II > III > IV**

87. The major product formed in the following reaction is:



88. If  $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$  then  $A + A^{-1} =$

[A]  $\begin{bmatrix} 2 & 0 \\ 0 & 0 \end{bmatrix}$

[B]  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

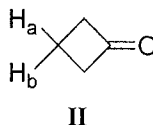
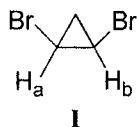
[C]  $\begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix}$

[D]  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

89. On which of the following compounds, is the blood group typing in humans based?

- [A] carbohydrates [B] DNA  
[C] proteins [D] lipids

90. Identify the topicity of the hydrogens marked  $H_a$  and  $H_b$  in the following compounds



- [A] **I** – diastereotopic  
      **II** – enantiotopic  
[B] **I** – homotopic  
      **II** – enantiotopic  
[C] **I** – enantiotopic  
      **II** – homotopic  
[D] **I** – homotopic  
      **II** – homotopic

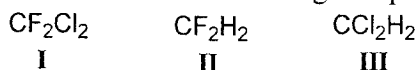
91. The Hell-Volhard-Zelinsky reaction is:

- [A] conversion of a  $\alpha$ -haloester in to a  $\alpha$ -hydroxyester  
[B]  $\alpha$ -halogenation of a carboxylic acid  
[C] decarboxylation of a  $\beta$ -keto acid  
[D] generation of a carbon-carbon double bond

92. The compound that does NOT form iodoform is:

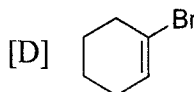
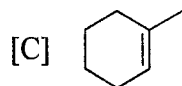
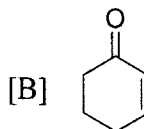
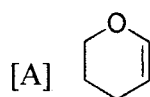
- [A] acetaldehyde [B] 3-pentanone  
[C] 2-butanone [D] isopropyl alcohol

93. The decreasing order of dipole moment of the following compounds is:



- [A] **II** > **I** > **III** [B] **II** > **III** > **I**  
[C] **I** > **II** > **III** [D] **I** > **III** > **II**

94. The electron rich olefin among the following is:



95. Which of the following hormones contains iodine?

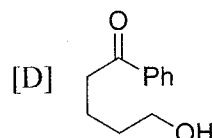
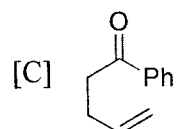
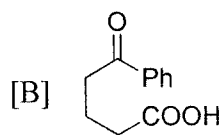
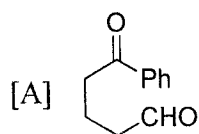
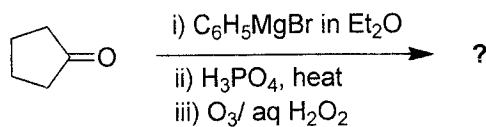
[A] thyroxine

[B] adrenalin

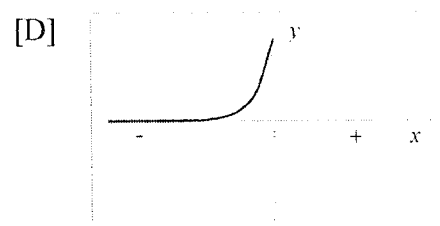
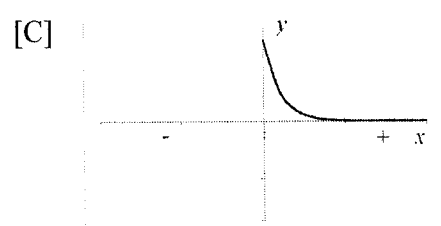
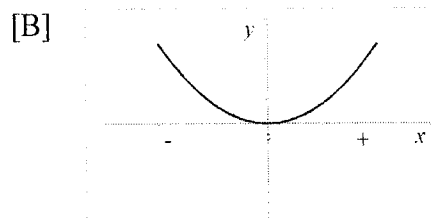
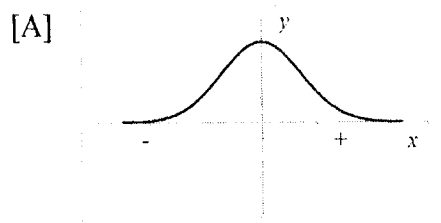
[C] testosterone

[D] insulin

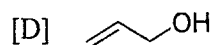
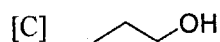
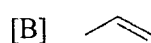
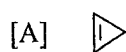
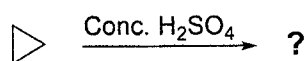
96. The product formed in the following reaction is:



97. The graph of  $y = e^{-x^2}$  is



98. The major product formed in the following reaction is:



99. Identify the reaction involving olefination of ketones from the following:

- [A] Friedel-Crafts reaction
- [B] Wittig reaction
- [C] Cannizzaro reaction
- [D] Schmidt reaction

100. The organelle in the cell, other than the nucleus, that contains DNA is:

- |                     |                 |
|---------------------|-----------------|
| [A] Golgi apparatus | [B] lysosomes   |
| [C] mitochondria    | [D] peroxisomes |