

## ANSWER KEY & SOLUTIONS

### CHEMISTRY

Do not open this text booklet until you are asked to do so

**Important instructions:**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.
2. The test is of **3 hours** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from Physics, Chemistry, and Biology (Botany and Zoology). 50 questions in each subject are divided into two Sections (A and B) as per details given below:
  - a. Section A shall consist of **35 (Thirty-five) Questions in each subject (Question Nos - 001 to 035, 051 to 085, 101 to 135, and 151 to 185)**. All questions are compulsory.
  - b. Section B shall consist of 15 (Fifteen) questions in each subject (Question Nos - **036 to 050, 086 to 100, 136 to 150, and 186 to 200**). In Section B, a candidate needs to attempt any 10 (Ten) questions out of 15 (Fifteen) in each subject.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

51. Which one of the following methods can be used to obtain highly pure metal which is liquid at room temperature?

1. Chromatography
2. Distillation
3. Zone refining
4. Electrolysis

Solution: (2)

Metals with low boiling points are distilled for refining.

52. The incorrect statement among the following is :

1. Most of the trivalent Lanthanoid ions are colourless in the solid state.
2. Lanthanoids are good conductors of heat and electricity.
3. Actinoids are highly reactive metals, especially when finely divided
4. Actinoid contraction is greater for element to element than Lanthanoid contraction.

Solution: (1)

Compounds of Lanthanoids are coloured due to the presence of unpaired electrons or f-f transition.

53. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?

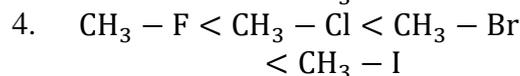
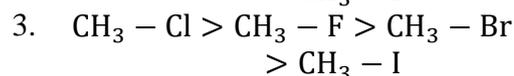
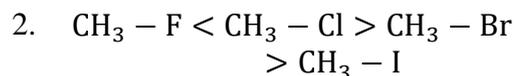
1. Hund's Rule
2. Hofmann Rule
3. Huckel's Rule
4. Saytzeff's Rule

Solution: (4)

Dehydrohalogenation of 2-Bromo pentane follows thermodynamically more stable Product (More substituted alkene will be the major product). This is known as saytzeff's rule.

54. The correct sequence of bond enthalpy of 'C - X bond is :

1.  $\text{CH}_3 - \text{F} > \text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$



Solution: (1)

shorter the bond, stronger will be the bond higher will be the bond enthalpy.

55. Zr(Z = 40) and Hf(Z = 72) have similar atomic and ionic radii because of :

1. diagonal relationship
2. lanthanoid contraction
3. having similar chemical properties
4. belonging to same group

Solution: (2)

Lanthanoid contraction causes similar sizes of 4d and 5d elements.

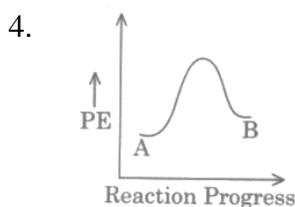
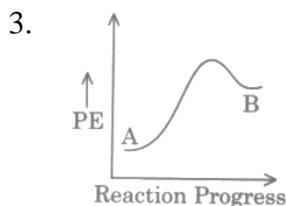
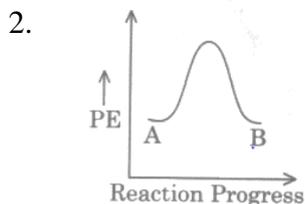
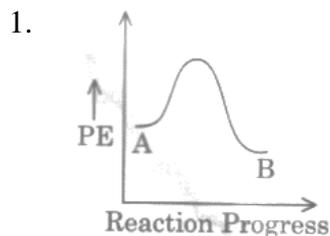
56. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is : [speed of light,  $c = 3.0 \times 10^8 \text{ ms}^{-1}$ ]

1. 219.2 m
2. 2192 m
3. 21.92 cm
4. 219.3 m

Solution: (4)

$$\lambda = \frac{c}{\nu} = \frac{3 \times 10^8 \text{ m/s}}{1368 \times 10^3 \text{ Hz}} = 219.29 = 219.3 \text{ m}$$

57. For a reaction  $\text{A} \rightarrow \text{B}$ , enthalpy of reaction is  $-4.2 \text{ kJ mol}^{-1}$  and enthalpy of activation is  $9.6 \text{ kJ mol}^{-1}$ . The correct potential energy profile for the reaction is shown in option.



Solution: (1)

The reaction is exothermic

58. Which one of the following polymers is prepared by addition polymerisation?

1. Nylon-66
2. Novolac
3. Dacron
4. Teflon

Solution: (4)

Teflon is an addition polymer of tetrafluoro ethylene  $-(F_2C - CF_2)_n$

59. The compound which shows metamerism is

1.  $C_3H_6O$
2.  $C_3H_8O$
3.  $C_4H_{10}O$
4.  $C_5H_{12}$

Solution: (3)

A minimum of 4 carbons are required in order to exhibit metamerism. Because there should be different no. of c-atoms on either side of the functional group.  $CH_3 - CH_2 - O - CH_2 - CH_3$  and  $CH_3 - O - CH_2 - CH_2 - CH_3$  are metamers.

60. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is :

1. Strontium chloride
2. Magnesium chloride
3. Beryllium chloride
4. Calcium chloride

Solution: (3)

Lithium and Beryllium compounds have more covalent characters due to its small Size and high polarizing power

61. Noble gases are named because of their inertness towards reactivity. Identify an incorrect statement about them,

1. Noble gases have very high melting and boiling points
2. Noble gases have weak dispersion forces.
3. Noble gases have large positive values of electron gain enthalpy.
4. Noble gases are sparingly soluble in water.

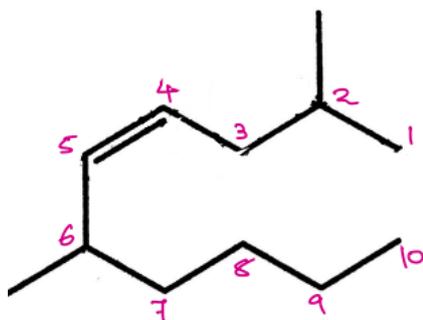
Solution: (1)

Due to weak dispersion forces noble gases have very low melting and boiling point.

62. The correct structure of 2,6 -Dimethyl-dec-4-ene is :

- 1.
- 2.
- 3.
- 4.

Solution: (4)



2,6-Dimethyl-dec-4-ene

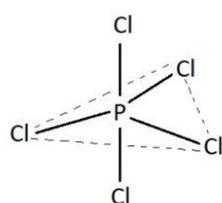
63 Match List - I with List - II.

List - I	List-II
(a) $\text{PCl}_5$	(i) Square pyramidal
(b) $\text{SF}_6$	(ii) Trigonal planar
(c) $\text{BrF}_5$	(iii) Octahedral
(d) $\text{BF}_3$	(iv) Trigonal bipyramidal

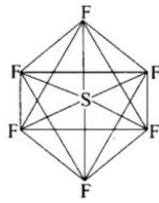
Choose the correct answer from the options given below.

- (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

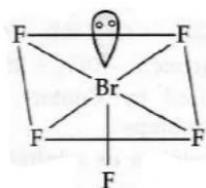
Solution: (4)



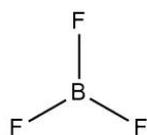
Trigonal bipyramidal



Octahedral

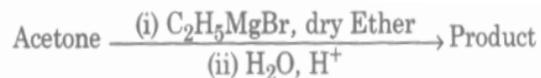


Square pyramidal



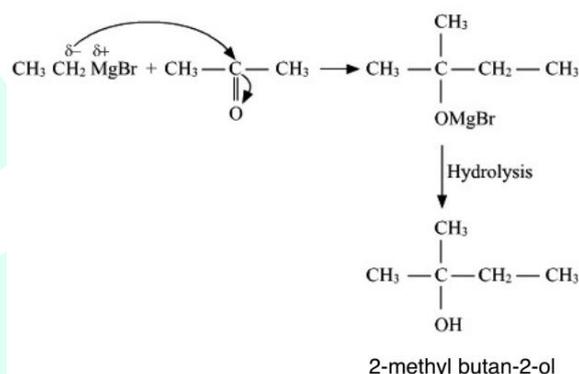
Trigonal planar

64. What is the IUPAC name of the organic compound formed in the following chemical reaction?



- pentan-2-ol
- pentan-3-ol
- 2-methyl butan-2-ol
- 2-methyl propan-2-ol

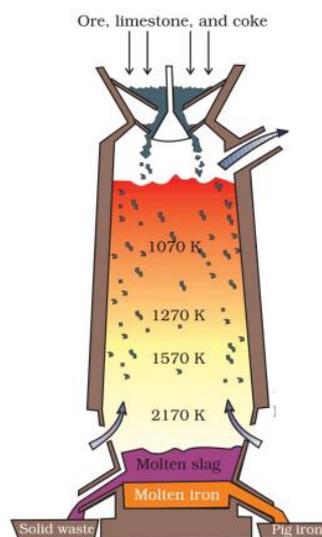
Solution: (3)



65. The maximum temperature that can be achieved in blast furnace is :

- upto 2200 K
- upto 1900 K
- upto 5000 K
- upto 1200 K

Solution: (1)



66. The  $pK_b$  of dimethylamine and  $pK_a$  of acetic acid are 3.27 and 4.77 respectively at T(K). The correct option for the pH of dimethylammonium acetate solution is :

1. 5.50
2. 7.75
3. 6.25
4. 8.50

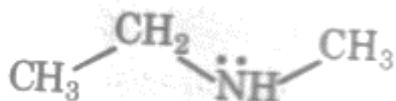
Solution: (2)

Dimethyl ammonium acetate is the salt of weak acid and weak base.

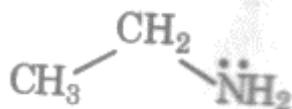
$$\begin{aligned} \therefore \text{PH of solution} &= 7 + \frac{1}{2}(pk_a - pk_b) \\ &= 7 + \frac{1}{2}(4.77 - 3.27) \\ &= 7.75 \end{aligned}$$

67. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali.

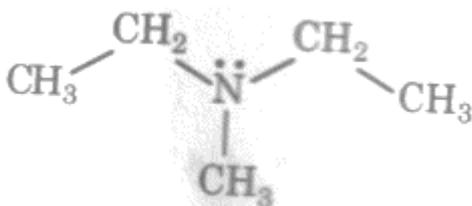
1.



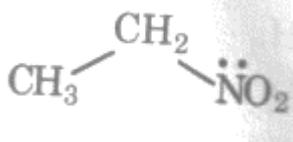
2.



3.



4.



Solution: (2)

Hinsberg reagent reacts with primary amines to give a solid which is soluble in alkali.

68. The molar conductance of NaCl, HCl and  $\text{CH}_3\text{COONa}$  at infinite dilution are 126.45, 426.16 and  $91.0 \text{ S cm}^2 \text{ mol}^{-1}$  respectively. The molar conductance of

$\text{CH}_3\text{COOH}$  at infinite dilution is. Choose the right option for your answer.

1.  $390.71 \text{ S cm}^2 \text{ mol}^{-1}$
2.  $698.28 \text{ S cm}^2 \text{ mol}^{-1}$
3.  $540.48 \text{ S cm}^2 \text{ mol}^{-1}$
4.  $201.28 \text{ S cm}^2 \text{ mol}^{-1}$

Solution: (1)

$$\begin{aligned} \Lambda_{\text{NaCl}}^\circ &= 126.4 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda_{\text{HCl}}^\circ &= 426.16 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda_{\text{CH}_3\text{COONa}}^\circ &= 91.0 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda_{\text{CH}_3\text{COOH}}^\circ &= \Lambda_{\text{CH}_3\text{COONa}}^\circ + \Lambda_{\text{HCl}}^\circ \\ &\quad - \Lambda_{\text{NaCl}}^\circ \\ &= 91.0 + 426.16 - 126.4 \\ &= 390.71 \text{ S cm}^2 \text{ mol}^{-1} \end{aligned}$$

69. Tritium, a radioactive isotope of hydrogen, emits which of the following particles?

1. Alpha ( $\alpha$ )
2. Gamma ( $\gamma$ )
3. Neutron (n)
4. Beta ( $\beta^-$ )

Solution: (4)

Tritium is radioactive and emits low energy  $\beta^-$  particles.

70. Which of the following reactions is the metal displacement reaction ?

Choose the right option.

1.  $\text{Cr}_2\text{O}_3 + 2\text{Al} \xrightarrow{\Delta} \text{Al}_2\text{O}_3 + 2\text{Cr}$
2.  $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2 \uparrow$
3.  $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2 \uparrow$
4.  $2\text{KClO}_3 \xrightarrow{\Delta} 2\text{KCl} + 3\text{O}_2$

Solution: (1)

Metal displacement reaction involves displacement reaction.

71. Given below are two statements:

Statement I :

Aspirin and Paracetamol belong to the class of narcotic analgesics.

Statement II :

Morphine and Heroin are non-narcotic analgesics.

In the light of the above statements, choose the correct answer from the options given below.

- Both Statement I and Statement II are false.
- Statement I is correct but Statement II is false.
- Statement I is incorrect but Statement II is true.
- Both Statement I and Statement II are true.

Solution: (1)

Aspirin and paracetamol are belong to the class of non-narcotic analgesics where as morphine & Heroin are narcotic analgesiss.

72.  $BF_3$  is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

- $sp^3$  and 6
- $sp^2$  and 6
- $sp^2$  and 8
- $sp^3$  and 4

Solution: (2)

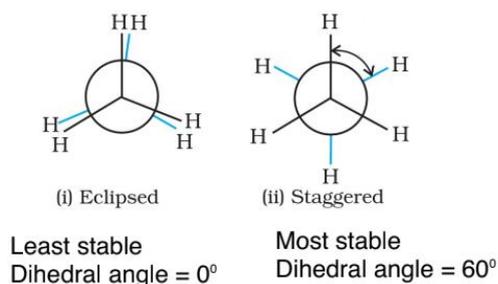
$$\text{In } BF_3, \frac{3+3}{2} = 3$$

$\therefore sp^2$  hybridisation with 3 electron pairs ( 6 electrons)

73. Dihedral angle of least stable conformer of ethane is :

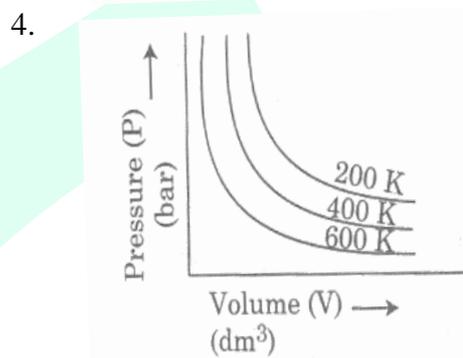
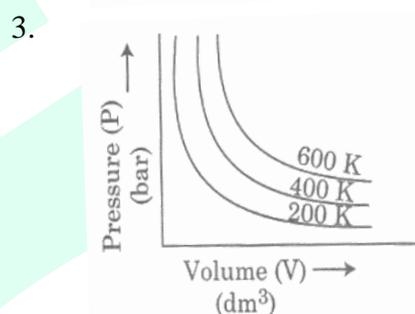
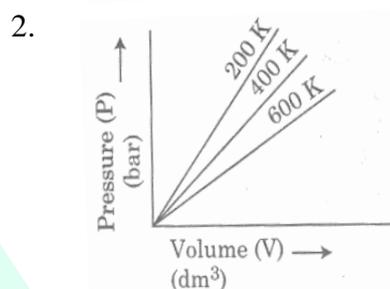
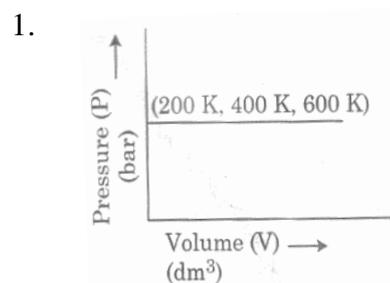
- $180^\circ$
- $60^\circ$
- $0^\circ$
- $120^\circ$

Solution: (3)

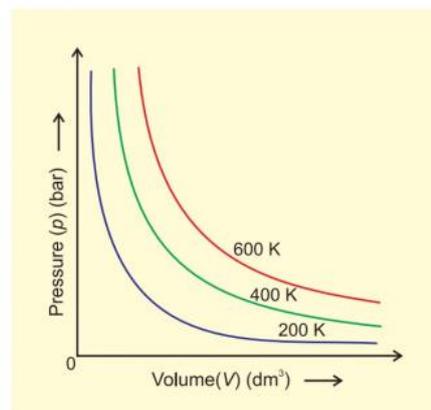


74. Choose the correct option for graphical representation of Boyle's law, which shows a

graph of pressure vs. volume of a gas at different temperatures:



Solution: (3)



Pressure and volume are inversely related

75. The right option for the statement "Tyndall effect is exhibited by", is :

1. Glucose solution
2. Starch solution
3. Urea solution
4. NaCl solution

Solution: (2)

Tyndall effect is exhibited by colloidal solutions (starch solution)

76. The following solutions were prepared by dissolving 10 g of glucose ( $C_6H_{12}O_6$ ) in 250ml of water ( $P_1$ ), 10 g of urea ( $CH_4 N_2O$ ) in 250ml of water ( $P_2$ ) and 10 g of sucrose ( $C_{12}H_{22}O_{11}$ ) in 250ml of water ( $P_3$ ). The right option for the decreasing order of osmotic pressure of these solutions is :

1.  $P_1 > P_2 > P_3$
2.  $P_2 > P_3 > P_1$
3.  $P_3 > P_1 > P_2$
4.  $P_2 > P_1 > P_3$

Solution: (4)

Osmotic pressure  $\propto n$

$$\text{no. of moles of glucose} = \frac{10}{180}$$

$$\text{no. of moles of urea} = \frac{10}{60}$$

$$\text{no. of moles of sucrose} = \frac{10}{342}$$

$\therefore$  order of osmotic pressure: urea  $>$  glucose  $>$  sucrose

77. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is :

1. 5
2. 2
3. 3
4. 7

Solution: (3)

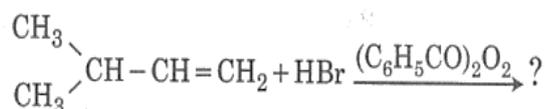
Cubic, Tetragonal and orthorhombic have BCC unit cells.

78. The RBC deficiency is deficiency disease of:

1. Vitamin B<sub>6</sub>
2. Vitamin B<sub>1</sub>
3. Vitamin B<sub>2</sub>
4. Vitamin B<sub>12</sub>

Solution: (4)

79. The major product of the following chemical reaction is:



1.  $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{COC}_6\text{H}_5 \\ \diagup \\ \text{CH}_3 \end{array}$
2.  $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{CH} - \text{CH}_3 \\ \diagup \quad | \\ \text{CH}_3 \quad \text{Br} \end{array}$
3.  $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CBr} - \text{CH}_2 - \text{CH}_3 \\ \diagup \\ \text{CH}_3 \end{array}$
4.  $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{Br} \\ \diagup \\ \text{CH}_3 \end{array}$

Solution: (4)

Addition of HBr in presence of peroxide follows anti Markovnikov rule.

80. Which one among the following is the correct option for right relationship between  $C_p$  and  $C_v$  for one mole of ideal gas ?

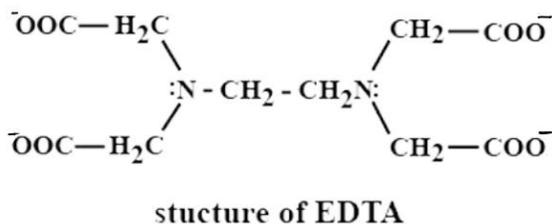
1.  $C_p - C_v = R$
2.  $C_p = RC_v$
3.  $C_v = RC_p$
4.  $C_p + C_v = R$

Solution: (1)

81. Ethylene diaminetetraacetate (EDTA) ion is:

1. Unidentate ligand
2. Bidentate ligand with two "N" donor atoms
3. Tridentate ligand with three "N" donor atoms
4. Hexadentate ligand with four "O" and two "N" donor atoms

Solution: (4)



82. **Statement I :**

Acid strength increases in the order given as  $\text{HF} \ll \text{HCl} \ll \text{HBr} < \text{HI}$

**Statement II :**

As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

In the light of the above statements, choose the correct answer from the options given below.

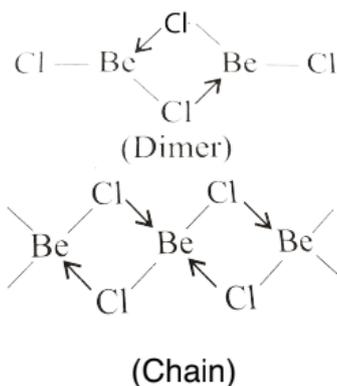
1. Both Statement I and Statement II are false
2. Statement I is correct but Statement II is false
3. Statement I is incorrect but Statement II is true
4. Both Statement I and Statement II are true

Solution: (4)

83. The structures of beryllium chloride in solid state and vapour phase, are:

1. Linear in both
2. Dimer and Linear, respectively
3. Chain in both
4. Chain and dimer, respectively

Solution: (4)



84. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]

1.  $\text{CH}_2$
2.  $\text{CH}_3$
3.  $\text{CH}_4$
4. CH

Solution: (2)

C	H
$\frac{78}{12} = 6.5$	$\frac{22}{1}$
$\frac{6.5}{6.5} = 1$	$\frac{22}{6.5} = 3.38$

85. Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are:

1. 6,12
2. 2,1
3. 12,6
4. 8,4

Solution: (3)

$$\text{no. of tetrahedral voids} = 2N = 2 \times 6 = 12$$

$$\text{no. of octahedral voids} = N = 6$$

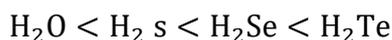
86. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it?

1.  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$  : Increasing  $\text{pK}_a$  values
2.  $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$  : Increasing

3.  $\text{CO}_2 < \text{SiO}_2 < \text{SnO}_2 < \text{PbO}_2$  : Increasing acidic character  
oxidizing power
4.  $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$  : Increasing acidic strength

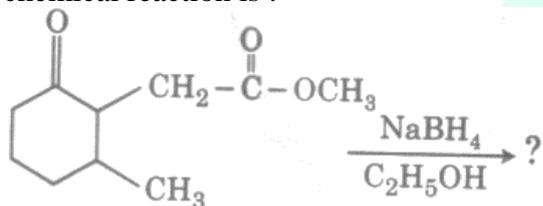
Solution: (1)

Increasing order of acidic character is



$\therefore k_a$  value increases &  $pK_a$  decreases.

87. The product formed in the following chemical reaction is :

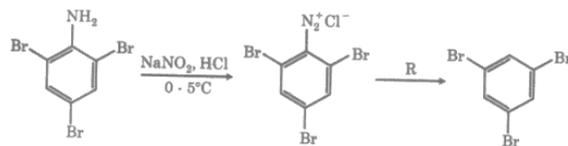


- 
- 
- 
- 

Solution: (3)

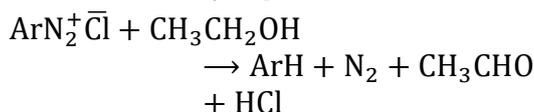
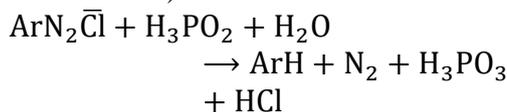
$\text{NaBH}_4$  will reduce ketone into secondary alcohol

88. The reagent 'R' in the given sequence of chemical reaction is :



- $\text{CH}_3\text{CH}_2\text{OH}$
- $\text{HI}$
- $\text{CuCN/KCN}$
- $\text{H}_2\text{O}$

Solution: (1)



89. Match List - I with List - II.

- | List - I   | List - II                          |
|--|------------------------------------|
| (a) $\xrightarrow[\text{CuCl}]{\text{CO, HCl, Anhyd. AlCl}_3}$   | (i) Hell-Volhard-Zelinsky reaction |
| (b) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NaOX} \rightarrow$             | (ii) Gattermann-Koch reaction      |
| (c) $\text{R}-\text{CH}_2-\text{OH} + \text{R}'\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$    | (iii) Haloform reaction            |
| (d) $\text{R}-\text{CH}_2\text{COOH} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) X}_2/\text{Red P}}$ | (iv) Esterification                |

Choose the correct answer from the options given below.

- (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)
- (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

Solution: (3)

90. From the following pairs of ions which one is not an iso-electronic pair?

- $\text{Na}^+, \text{Mg}^{2+}$
- $\text{Mn}^{2+}, \text{Fe}^{3+}$
- $\text{Fe}^{2+}, \text{Mn}^{2+}$
- $\text{O}^{2-}, \text{F}^-$

Solution: (3)

$\text{Fe}^{2+}$  has 24 electrons and  $\text{Mn}^{2+}$  has 23 electrons.

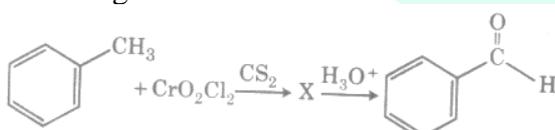
91. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g  $\text{O}_2$  and 2 g  $\text{H}_2$  confined in a total volume of one litre at  $0^\circ\text{C}$  is :  
[Given  $R = 0.082 \text{ L atm mol}^{-1} \text{ K}^{-1}$ ,  $T = 273 \text{ K}$ ]
- 2.602
  - 25.18
  - 26.02
  - 2.518

Solution: (2)

$$P = \frac{nRT}{V}, n = \frac{4}{32} + \frac{2}{2} = 9/8$$

$$= \frac{9/8 \times 0.821 \times 273}{1}$$

92. The intermediate compound 'X' in the following chemical reaction is :



- 
- 
- 
- 

Solution: (4)

Etard reaction gives dichromyl complex.

93. The slope of Arrhenius Plot ( $\ln kv/s \frac{1}{T}$ ) of first order reaction is  $-5 \times 10^3 \text{ K}$ . The value of  $E_a$  of the reaction is. Choose the correct

option for your answer.

[Given  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

- $83.0 \text{ kJ mol}^{-1}$
- $166 \text{ kJ mol}^{-1}$
- $-83 \text{ kJ mol}^{-1}$
- $41.5 \text{ kJ mol}^{-1}$

Solution: (4)

$$\ln K = \ln A - \frac{E_a}{RT}$$

$$-\frac{E_a}{R} = -5 \times 10^3 \text{ (slope)}$$

$$E_a = 15 \times 10^3 \times 8.314$$

$$= +41.5 \text{ kJ mol}^{-1}$$

94. Match List - I with List - II.

List - I

List - II

- |  |                       |
|--|-----------------------|
| (a) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$                   | (i) Acid rain         |
| (b) $\text{HOCl}(\text{g}) \xrightarrow{h\nu} \text{OH} + \text{Cl}$                                     | (ii) Smog             |
| (c) $\text{CaCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$ | (iii) Ozone depletion |
| (d) $\text{NO}_2(\text{g}) \xrightarrow{h\nu} \text{NO}(\text{g}) + \text{O}(\text{g})$                  | (iv) Tropospheric     |

Choose the correct answer from the options given below.

- (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
- (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

Solution: (2)

95. Consider the above reaction and identify the missing reagent/chemical.

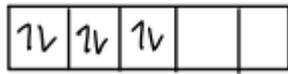
- Red Phosphorus
- CaO
- DIBAL-H
- $\text{B}_2\text{H}_6$

Solution: (2)

It is an example for decarboxylation using soda lime.

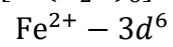
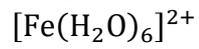
96. Which of the following molecules is non-polar in nature ?



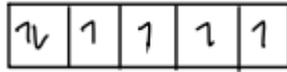


$$n = 0$$

$$\mu = 0$$



In presence of weak ligand



$$n = 4$$

$$\mu = \sqrt{24} = 4.90\text{BM}$$

