

Part I

Section-I

Straight Objective Type

This section contains 7 multiple choice questions numbered 1 to 7. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. Geometrical shapes of the complexes formed by the reaction of Ni^{2+} with Cl^- , CN^- and H_2O , respectively, are
 (A) octahedral, tetrahedral and square (B) tetrahedral, square planar and octahedral
 (C) square planar, tetrahedral and octahedral (D) octahedral, square planar and octahedral

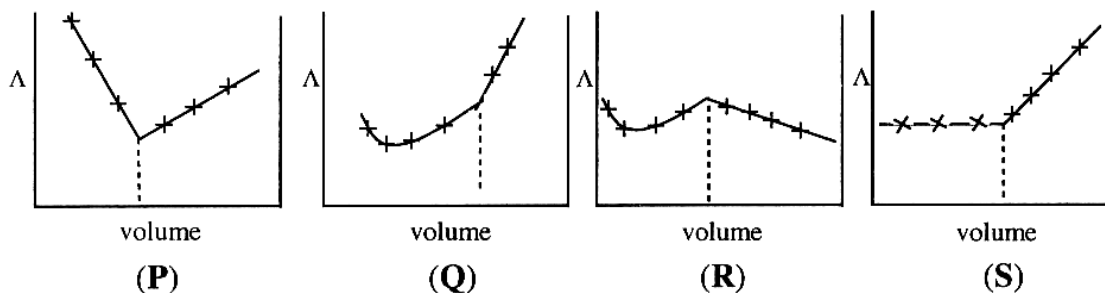
Ans. (B)

Sol. $[\text{NiCl}_4]^{2-}$ – Tetrahedral

$[\text{Ni}(\text{CN})_4]^{2-}$ – Square planar

$[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ – Octahedral

2. AgNO_3 (aq.) was added to an aqueous KCl solution gradually and the conductivity of the solution was measured. the plot of conductance (Λ) versus the volume of AgNO_3 is



(A) (P)

(B) (Q)

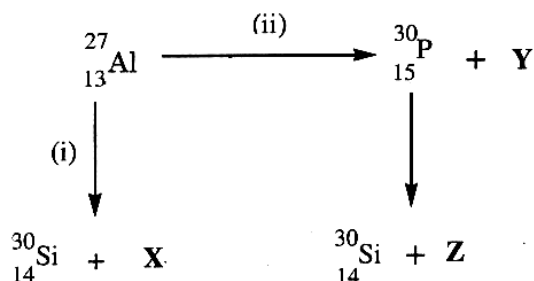
(C) (R)

(D) (S)

Ans. (D)

CHEMISTRY

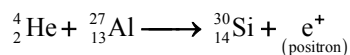
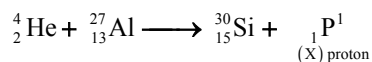
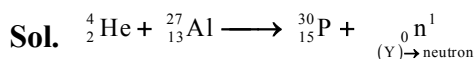
3. Bombardment of aluminum by α - particle leads to its artificial disintegration in two ways, (i) and (ii) as shown. Products X, Y and Z respectively are



- (A) proton, neutron, positron
(C) proton, positron, neutron

- (B) neutron, positron, proton
(D) positron, proton, neutron

Ans. (A)

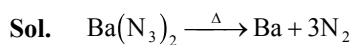


4. Extra pure N_2 can be obtained by heating

- (A) NH_3 with CuO
(C) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

- (B) NH_4NO_3
(D) $\text{Ba}(\text{N}_3)_2$

Ans. (D)



5. Among the following compounds, the most acidic is

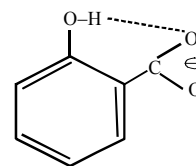
- (A) *p*-nitrophenol
(C) *o*-hydroxybenzoic acid

- (B) *p*-hydroxybenzoic acid
(D) *p*-toluic acid

Ans. (C)

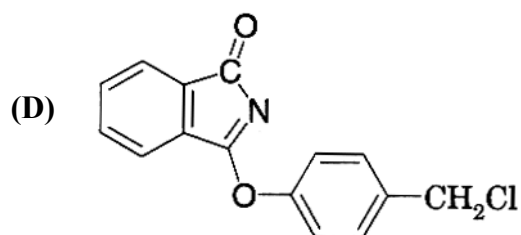
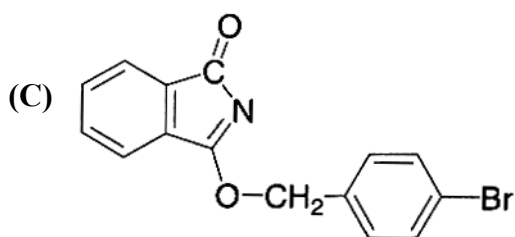
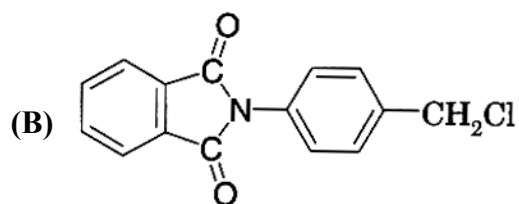
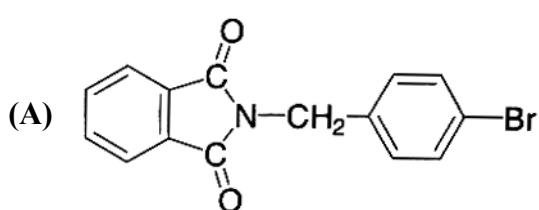
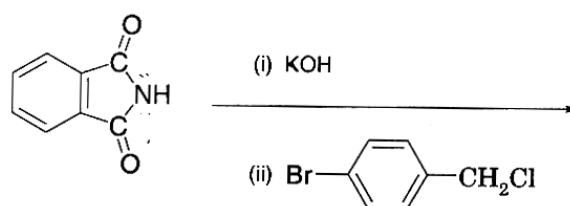
CHEMISTRY

Sol. because its carboxylate ion is stabilised due to intramolecular hydrogen bonding

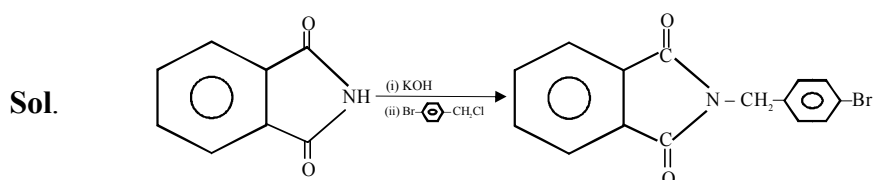


and due to ortho effect.

6. The major product of the following reaction is



Ans. (A)



7. Dissolving 120 g of urea (mol. wt. 60) in 1000 g of water gave a solution of density 1.15 g/mL. The molarity of the solution is

(A) 1.78 M

(B) 2.00 M

(C) 2.05 M

(D) 2.22 M

Ans. (C)

Sol. Total mass of the solution = 1000 + 120 = 1120 g

$$V = \frac{1120}{1.15} = 0.973 \text{ L}$$

$$n_{\text{urea}} = \frac{120}{60} = 2 \text{ mol}$$

$$M = \frac{2}{0.973} = 2.05 \text{ M}$$

Section-II

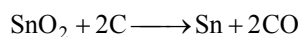
Multiple Correct Answer Type

This section contains 5 multiple choice questions numbered 8 to 14. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE** is / are correct.

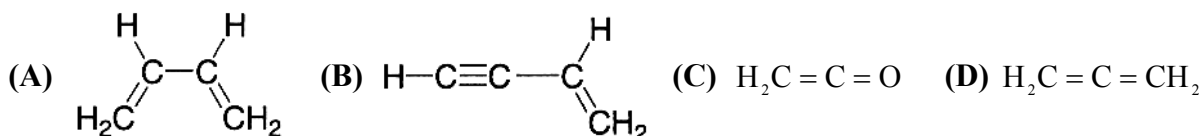
8. Extraction of metal from the ore **casiterite** involves
 (A) carbon reduction of an oxide ore (B) self-reduction of a sulphide ore
 (C) removal of copper (D) removal of iron impurity

Ans. (A, D)

Sol. Cassiterite contains impurity of FeWO_4



9. Amongst the given options, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is (are)



Ans. (B, C)

10. The correct statement (s) pertaining to the adsorption of a gas on a solid surface is (are)
 (A) Adsorption is always exothermic
 (B) Physisorption may transform into chemisorption at high
 (C) Physisorption increases with increasing temperature but chemisorption decreases with increasing temperature
 (D) Chemisorption is more exothermic than physisorption, however it is very slow due to higher energy of activation.

Ans. (A, B, D)

11. According to kinetic theory of gases

- (A) collision are always elastic
- (B) heavier molecules transfer more momentum to the wall of the container
- (C) only a small number of molecules have very high velocity
- (D) between collision, the mmolecules mvoe in straight lines with constnat velocities.

Ans. (A, B, C, D)

Section-III

Paragraph Type

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 12 to 14

When a metal rod **M** is dipped into an aqueous colourless concentrated solution of compound **N**, the solution turns light blue. Addition of aqueous NaCl to the blue solution gives a white precipitate **O**. Addition of aqueous NH_3 dissolves **O** and gives an intesne blue solution.

12. The metal rod **M** is

- (A) Fe
- (B) Cu
- (C) Ni
- (D) CO

Ans. (B)

13. The compound **N** is

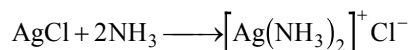
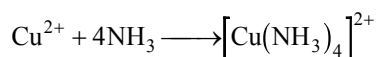
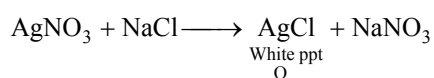
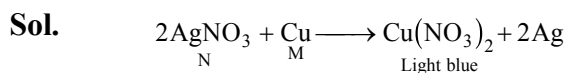
- (A) AgNO_3
- (B) $\text{Zn}(\text{NO}_3)_2$
- (C) $\text{Al}(\text{NO}_3)_3$
- (D) $\text{Pb}(\text{NO}_3)_2$

Ans. (A)

14. The final solution contains

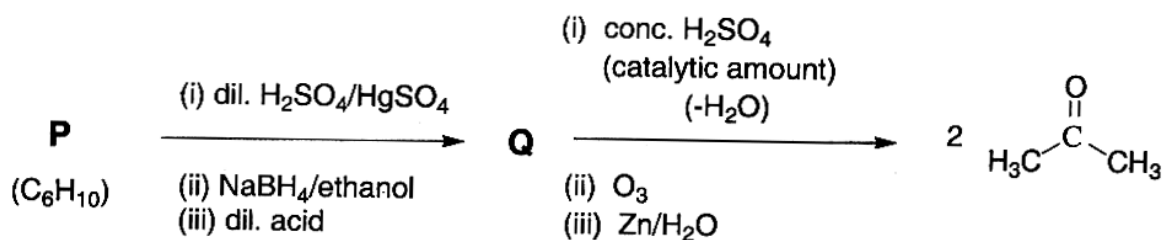
- (A) $[\text{Pb}(\text{NH}_3)_4]^{2+}$ and $[\text{CoCl}_4]^{2-}$
- (B) $[\text{Al}(\text{NH}_3)_4]^{3+}$ and $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (C) $[\text{Ag}(\text{NH}_3)_2]^+$ and $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (D) $[\text{Ag}(\text{NH}_3)_2]^+$ and $[\text{Ni}(\text{NH}_3)_6]^{2+}$

Ans. (C)

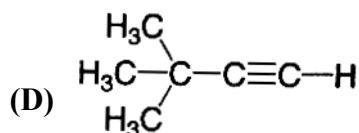
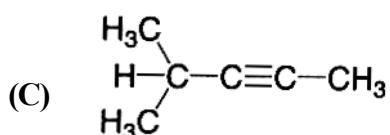
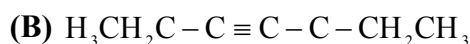


Paragraph for Question Nos. 15 to 16

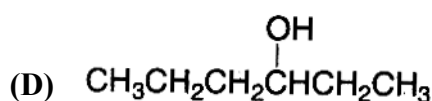
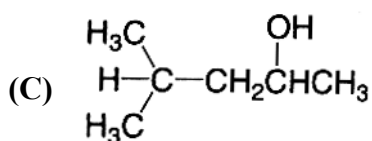
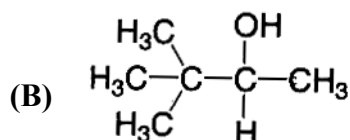
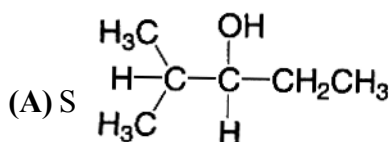
An acyclic hydrocarbon **P**, having molecular formula C_6H_{10} gave acetone as the only organic product through the following sequence of reactions, in which **Q** is an intermediate organo compound.



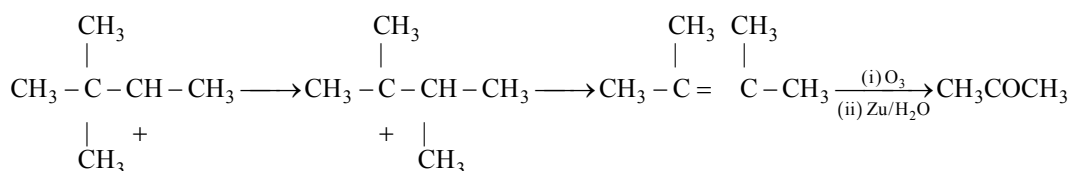
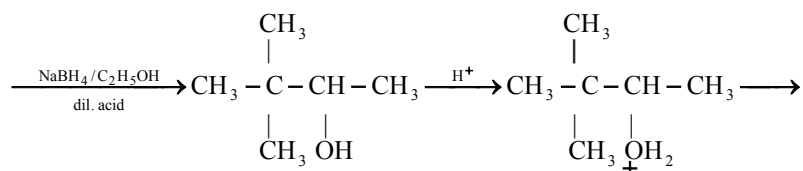
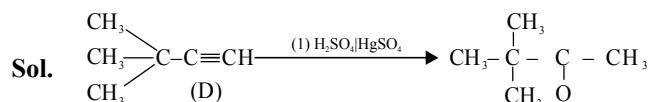
15 The structure of compound **P** is



16. The structure of the compound **Q** is



Ans. (D, B)

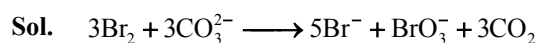


Section – IV

Integer Answer Type

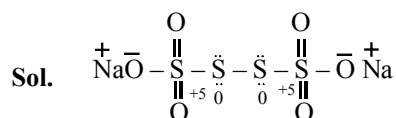
This section contains 8 questions. The answer to each of the questions is a single-digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the SORS have to be darkened.

17. Reaction of Br_2 with Na_2CO_3 in aqueous solution gives sodium bromide and sodium bromate with evolution of CO_2 gas. The number of sodium bromide molecules involved in the balanced chemical equation is
Ans. (5)



18. The difference in the oxidation numbers of the two types of sulphur atoms in $\text{Na}_2\text{S}_4\text{O}_6$ is

Ans. (5)



19. The maximum number of electrons that can have principal quantum number, $n = 3$, and spin quantum number, $m_s = -\frac{1}{2}$, is

Ans. (9)

Sol. Number of orbital for $n = 3$ is $= n^2 = 9$

Number of electron $n = 3$ and $m_s = -\frac{1}{2} = 9$

20. A decapeptide (Mol. Wt. 796) on complete hydrolysis gives glycine (Mol. Wt. 75), alanine and phenylalanine. Glycine contributes 47.0% to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is

Ans. (6)

Sol. Let number of glycine units = n

mass of decapeptide = 796

mass of H_2O needed = 162 g

Total mass = 958 g

$$958 \times \frac{47}{100} = 75 \times n$$

$$\therefore n = \frac{958 \times 47}{100 \times 75} \approx 6$$

21. To an evacuated vessel with movable piston under external pressure of 1 atm, 0.1 mol of He and 1.0 mol. of an unknown compound (vapour pressure 0.68 atm. at $0^\circ C$) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at $0^\circ C$ is close to

Ans. (7)

Sol. Let unknown is X.

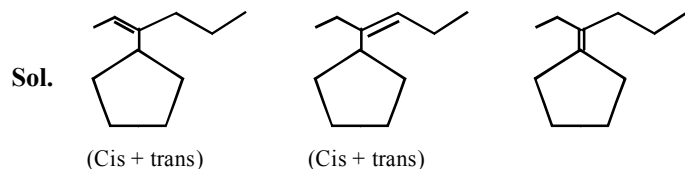
$$p_{He} = p_{total} - p_x = (1 - 0.68) \text{ atm} \\ = 0.32 \text{ atm}$$

$$\text{Now } p_{He} = n_{He} \frac{RT}{V}$$

$$\therefore v = \frac{RT}{p_{He}} = \frac{0.10 \times 0.082 \times 273}{0.32} \\ = 7$$

22. The total number of alkenes possible by dehydromination of 3-bromo-3-cyclopentylhexane using alcoholic KOH is

Ans. (5)



23. The work function (ϕ) of some metals is listed below. The number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal is

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
ϕ (eV)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

Ans. (4)

Sol. For photoelectric effect to happen,

$$E \geq \phi \Rightarrow \phi \leq 4.14 \text{ eV}$$

\therefore Li, Na, K, Mg will show photoelectric effect when light of 300 nm wavelength falls on the metal is (4).
