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IIT-JEE  
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Paper - I  
“2011”  
(Chemistry)

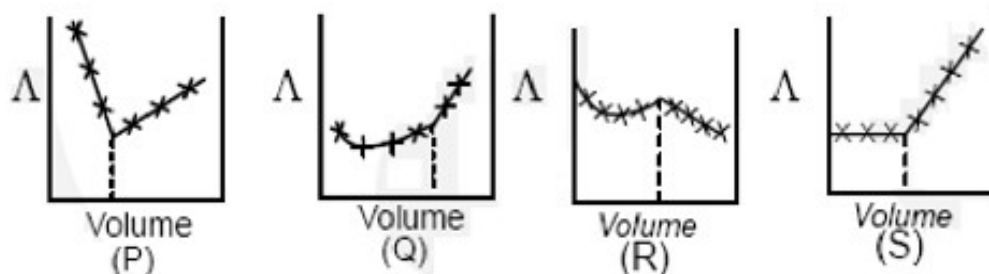
**CHEMISTRY PAPER-I**  
**PART I –CHEMISTRY**  
**SECTION –I (TOTAL MARKS: 21)**  
**(SINGLE CORRECT CHOICE TYPE)**

This section contains 7 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which **ONLY ONE** is correct.

1. Dissolving 120g of urea (mol. wt 60) in 1000g of water gave a solution of density 1.15g/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)

2.  $\text{AgNO}_3(\text{aq.})$  was added to an aqueous KCl solution gradually and the conductivity of the solution was measured. The plot of conductance ( $\Lambda$ ) versus the volume of  $\text{AgNO}_3$  is



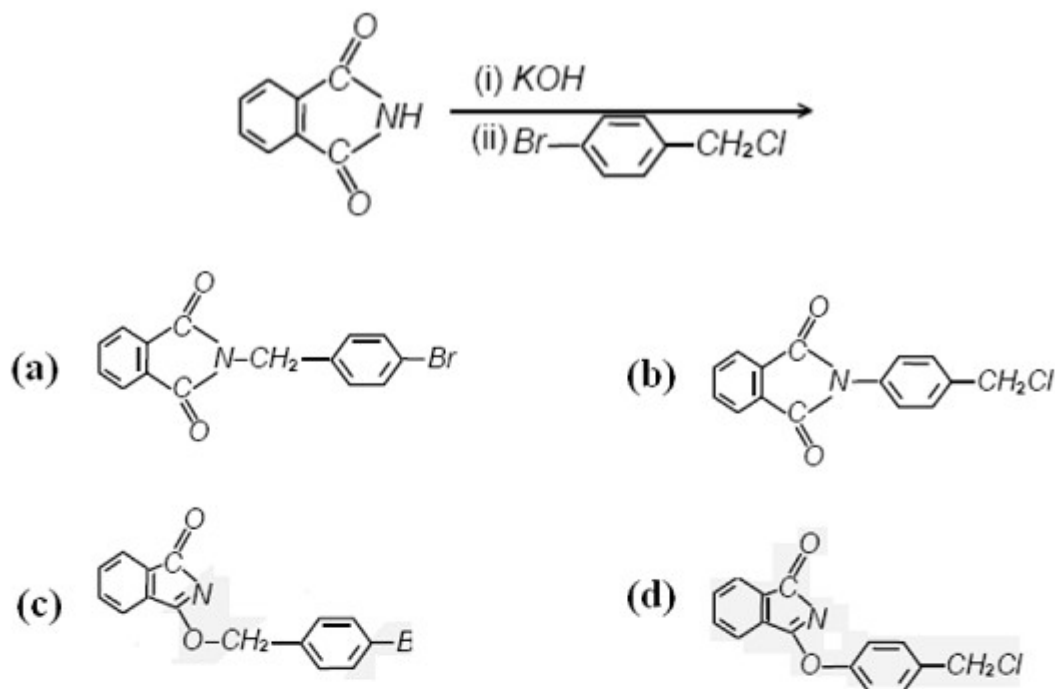
- (a) (P)                      (b) (Q)                      (c) (R)                      (d) (S)

Ans: (d)  $\text{AgNO}_3 + \text{KCl} \rightarrow \text{AgCl} \downarrow + \text{KNO}_3$   
 Conductivity will remain same for some time then gradually increase due to excess of KCl.

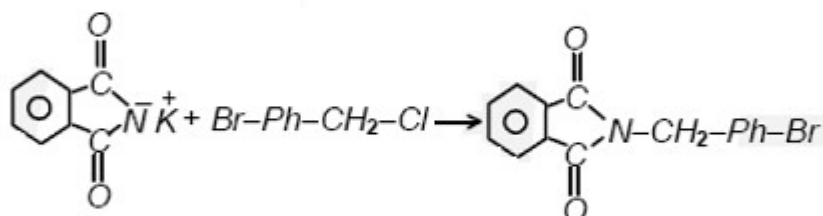
3. Among the following compounds, the most acidic is  
 (a) p-nitrophenol                      (b) p-hydroxybenzoic acid  
 (c) o-hydroxybenzoic acid                      (d) p-toluic acid

Ans: (c) Due to ortho effect

4. The major product of the following reaction is



Ans: (a)



5. Extra pure N<sub>2</sub> can be obtained by heating

- (a) NH<sub>3</sub> with CuO
- (b) NH<sub>4</sub>NO<sub>3</sub>
- (c) (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- (d) Ba(N<sub>3</sub>)<sub>2</sub>

Ans: (d)  $\text{Ba}(\text{N}_3)_2 \xrightarrow{\Delta} \text{Ba} \downarrow + 3\text{N}_2$

6. Geometrical shapes of the complexes formed by the reaction of Ni<sup>2+</sup> with Cl<sup>-</sup>, CN<sup>-</sup> and H<sub>2</sub>O respectively are

- (a) Octahedral, tetrahedral and square planar
- (b) Tetrahedral, square planar and octahedral
- (c) Square planar, tetrahedral and octahedral
- (d) Octahedral, square planar and octahedral

Ans: (b)  $[\text{NiCl}_4]^{2-} \text{ sp}^3$   
 $[\text{Ni}(\text{CN})_4]^{2-} \text{ dsp}^2$   
 $[\text{Ni}(\text{H}_2\text{O})_6]^{2+} \text{ sp}^3 \text{d}^2$

7. Bombardment of aluminium by  $\alpha$  - particle leads to its disintegration in two ways, (i) and (ii) as shown. Products X, Y and Z respectively are,

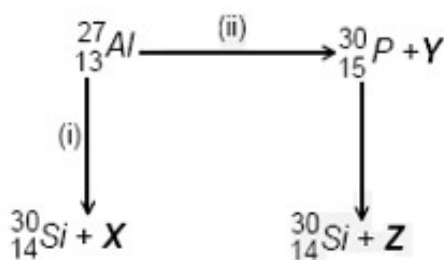
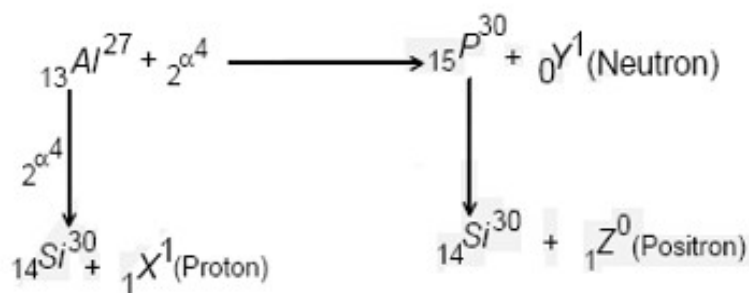
(a) Proton, neutron, positron

(b) Neutron, positron, proton

(c) Proton, Positron, neutron

(d) proton, neutron

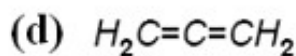
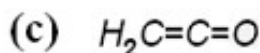
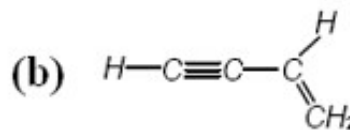
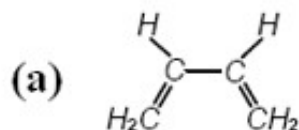
Ans: (a)



**SECTION –II (TOTAL MARKS: 16)**  
**(MULTIPLE CORRECT ANSWER TYPE)**

This section contains 4 multiple choice questions. Each question has four choices (a), (b), (c) and (d) out of which **One OR MORE** may be correct.

8. 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: (a,b,c) Taking only stable conformers in account

9. According to kinetic theory of gases  
 (a) Collisions 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 collisions, the molecules move in straight lines with constant velocities.

Ans: (a,d) Option c is correct but not mentioned in the kinetic theory of gases

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 chemisorptions at high temperature.  
 (c) Physisorption increases with increasing temperature but chemisorptions decreases with increasing temperature.  
 (d) Chemisorptions is more exothermic than physisorption, however it is very slow due to higher energy of activation.

Ans: (abd) Physisorption

11. Extraction of metal from the ore cassiterite involves  
 (a) Carbon reduction of an oxide ore  
 (b) self-reduction of a sulphide ore  
 (c) Removal of copper impurity  
 (d) Removal of iron impurity

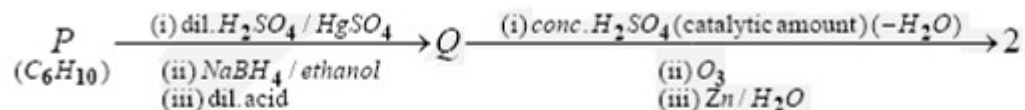
Ans: (acd)  $SnO_2 + 2C \rightarrow Sn + 2CO$   
 Tin is purified by liquation and polling

**SECTION-III (TOTAL MARKS 15)**  
**(PARAGRAPH TYPE)**

This section contains 2 paragraphs. Based upon one of the paragraphs 2 multiple choice questions and based on the other paragraph 3 multiple choice questions have to be answered. Each of these questions has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

**Paragraph for Questions Nos. 12 and 13**

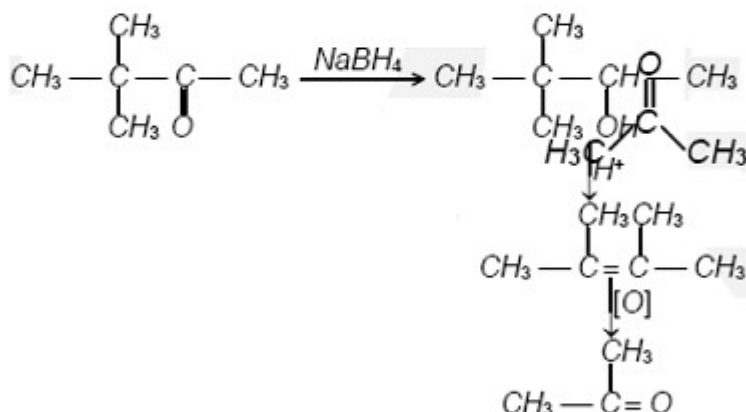
An acyclic hydrocarbon P, having molecular  $C_6H_{10}$ , gave acetone as the only organic product through the following sequence of reactions, in which Q is an intermediate organic compound.



12. The structure of compound P is

- (a)  $CH_3CH_2CH_2CH_2 - C \equiv C - H$       (b)  $H_3CH_2C - C \equiv C - CH_3CH_3$   
 (c)  $\begin{array}{c} H_3C \\ | \\ H - C - C = C - CH_3 \\ | \\ H_3C \end{array}$       (d)  $\begin{array}{c} H_3C \\ | \\ H_3C - C - C = C - H \\ | \\ H_3C \end{array}$

Ans : (d)



13. The structure of the compound Q is

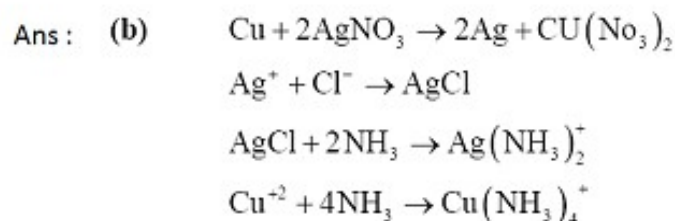
- (a)  $\begin{array}{c} OH \\ | \\ H_3C - C - CH_2CH_3 \\ | \\ H \end{array}$       (b)  $\begin{array}{c} OH \\ | \\ H_3C - C - CH_3 \\ | \\ H \end{array}$   
 (c)  $\begin{array}{c} OH \\ | \\ H_3C - CH_2 - CH - CH_3 \\ | \\ H \end{array}$       (d)  $CH_3CH_2CH_2 - \begin{array}{c} OH \\ | \\ CH \end{array} - CH_2CH_3$

Ans : (b)

**Paragraph for Questions Nos. 14 and 16**

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  $\text{NH}_3$  dissolves O and gives an intense blue solution.

14. The metal rod M is  
 (a) Fe (b) Cu (c) Ni (d) Co



15. The compound N is  
 (a)  $\text{AgNO}_3$  (b)  $\text{An}(\text{NO}_3)_2$  (c)  $\text{Al}(\text{NO}_3)_3$  (d)  $\text{Pb}(\text{NO}_3)_2$

Ans: (a)

16. 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)



**SECTION –IV (TOTAL MARKS: 28)**  
**(INTEGER ANSWER TYPE)**

This section contains 7 questions. The answer to each of the questions is a **single-digit integer**, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the ORS.

17. The work function ( $\phi$ ) of some metals is listed below. The number of metals which will show photoelectric effect when light of 300nm wavelength falls on the metals is
- | Metal          | Li  | Na  | K   | Mg  | Cu  | Ag  | Fe  | Pt  | W    |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ( $\phi$ )(eV) | 2.4 | 2.3 | 2.2 | 3.7 | 4.8 | 4.3 | 4.7 | 6.3 | 4.75 |

Ans : 4       $3000\text{\AA} \approx 4.1 \text{ eV}$ .  
 $\therefore$  All below this value will eject photo electron

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

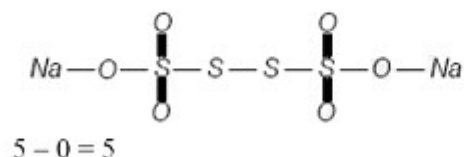
Ans : 7       $0.1 \times \frac{1}{12} \times \frac{273}{0.32} = 7$

19. Reaction of  $\text{Br}_2$  with  $\text{Na}_2\text{CO}_3$  in aqueous solution gives sodium bromide and sodium bromate with evolution of  $\text{CO}_2$  gas. The number of sodium bromide molecules involved in the balanced chemical equation is

Ans : 5       $3\text{Br}_2 + 3\text{Na}_2\text{CO}_3 \rightarrow 5\text{NaBr} + \text{NaBrO}_3 + 3\text{CO}_2$

20. 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



21. 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 : 5       $\frac{0.47 \times 796}{75} \approx 5$

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

Ans : 5



