

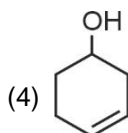
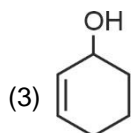
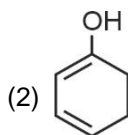
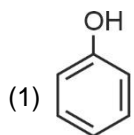
## CHEMISTRY

### SECTION – A

**Multiple Choice Questions:** This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

**Choose the correct answer :**

1. Which of the following compound shows fastest rate of dehydration?



**Answer (3)**

**Sol.** The alcohol which produces stable carbocation shows faster rate of dehydration.

2. Which one of the following complexes has maximum splitting?

- (1)  $[\text{Fe}(\text{CN})_6]^{4-}$   
 (2)  $[\text{Fe}(\text{NH}_3)_6]^{2+}$   
 (3)  $[\text{FeCl}_6]^{4-}$   
 (4)  $[\text{Fe}(\text{OX})_3]^{4-}$

**Answer (1)**

**Sol.**  $\text{CN}^-$  is strongest field ligand out of given ligands.

3. Average kinetic energy of an ideal gas depends on

- (1) Nature of the gas  
 (2) Pressure of the gas  
 (3) Temperature of the gas  
 (4) Volume of the gas

**Answer (3)**

**Sol.** Average kinetic energy of an ideal gas per mole is given by

$$\overline{\text{KE}} = \frac{3}{2} RT$$

$\therefore \overline{\text{KE}}$  depends on temperature

4. **Assertion :** Hydrogen is an environment/eco-friendly fuel

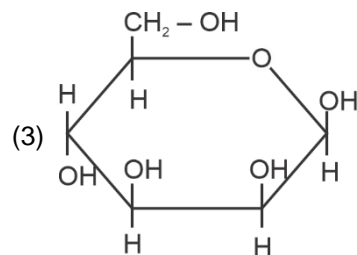
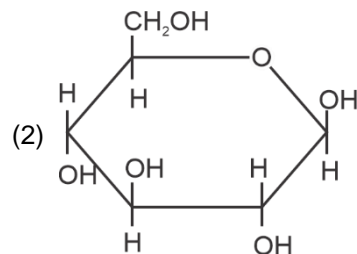
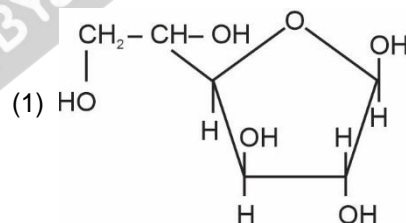
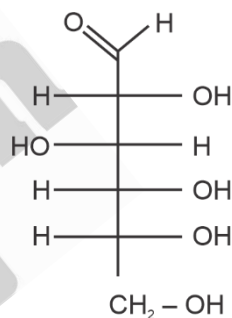
**Reason :** Hydrogen is the lightest element

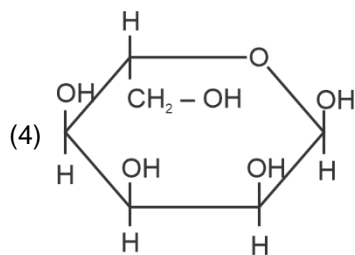
- (1) Assertion is true and reason is true and reason is the correct explanation of assertion  
 (2) Assertion is true and reason is true but reason is not the correct explanation of assertion  
 (3) Assertion is true but reason is false  
 (4) Assertion is false but reason is true

**Answer (2)**

**Sol.** The correct option is (2)

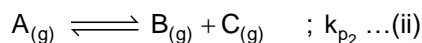
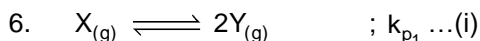
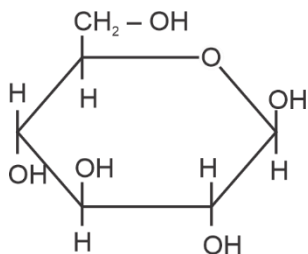
5. Pyranose form of the given compound is?





**Answer (2)**

**Sol.** The correct pyranose form of the given compound is



If degree of dissociation is same for both the reactions. Find out ratio of total pressure  $p_1$  and  $p_2$  respectively.

(1)  $\frac{k_{p_1}}{k_{p_2}}$

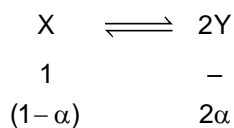
(2)  $\frac{4k_{p_1}}{k_{p_2}}$

(3)  $\frac{k_{p_1}}{4k_{p_2}}$

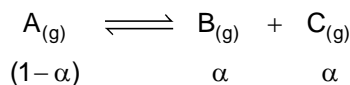
(4)  $\frac{k_{p_1}}{2k_{p_2}}$

**Answer (3)**

**Sol.**



$$k_{p_1} = \frac{2\alpha \cdot 2\alpha (1+\alpha)}{(1+\alpha)(1+\alpha)(1-\alpha)} \cdot p_1$$



$$k_{p_2} = \frac{\alpha \cdot \alpha}{(1+\alpha)(1-\alpha)} \cdot p_2$$

$$\frac{k_{p_1}}{k_{p_2}} = \frac{4p_1}{p_2}$$

$$\Rightarrow \frac{p_1}{p_2} = \frac{k_{p_1}}{4k_{p_2}}$$

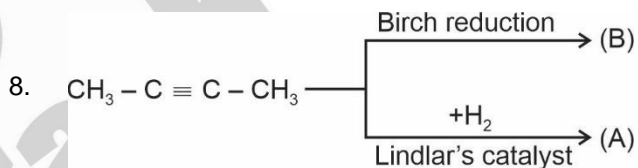
7. Which of the following is not correctly matched?

List-I	List-II
(A) Antibiotic	Penicillin
(B) Antiseptic	Chloroxylonol
(C) Tranquilizer	Erythromycin
(D) Analgesic	Aspirin
(1) A	(2) B
(3) C	(4) D

**Answer (3)**

**Sol.** Erythromycin is an antibiotic

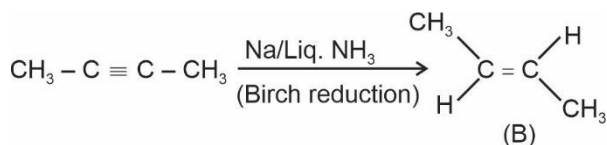
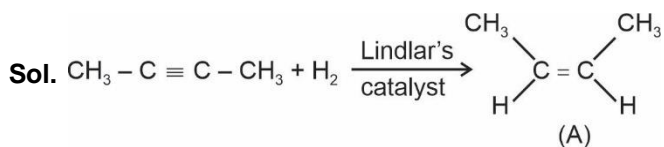
Hence correct answer is option (3)



Identify the correct statement on physical properties of (A) and (B)

- (1) Melting point:  $A > B$   
Boiling point:  $A > B$   
(2) Melting point:  $A < B$   
Boiling point:  $A > B$   
(3) Melting point:  $A > B$   
Boiling point:  $A < B$   
(4) Melting point:  $A < B$   
Boiling point:  $A < B$

**Answer (2)**



Compound (A) is polar and has a permanent dipole moment whereas compound (B) is non-polar. Compound (A) will have higher boiling point than (B) due to dipole-dipole interaction. However, compound (B) is more symmetrical than compound (A). Therefore, (B) will have higher melting point than (A).

9. Which of the following option contains the correct match?

List-I	List-II
(A) Caustic soda	(P) $\text{CaSO}_4$
(B) Washing soda	(Q) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
(C) Dead burnt plaster	(R) $\text{Ca}(\text{OH})_2$
(D) Slaked lime	(S) $\text{NaOH}$
(1) $A \rightarrow S, B \rightarrow Q, C \rightarrow P, D \rightarrow R$	
(2) $A \rightarrow P, B \rightarrow Q, C \rightarrow R, D \rightarrow S$	
(3) $A \rightarrow S, B \rightarrow P, C \rightarrow Q, D \rightarrow R$	
(4) $A \rightarrow R, B \rightarrow S, C \rightarrow Q, D \rightarrow P$	

#### Answer (1)

<b>Sol.</b> Caustic soda	$\rightarrow \text{NaOH}$
Washing soda	$\rightarrow \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
Dead burnt plaster	$\rightarrow \text{CaSO}_4$
Slaked lime	$\rightarrow \text{Ca}(\text{OH})_2$

10. How photochemical smog can be controlled in automobiles?
- (1) Using catalytic convertors which will increase release of nitrogen oxide
  - (2) Using catalytic convertors which will decrease the release of nitrogen oxide
  - (3) By increasing sulphur content in fuel
  - (4) By decreasing sulphur content in fuel

#### Answer (2)

**Sol.** Catalytic convertors will prevent the release of nitrogen oxide and hydrocarbons to the atmosphere.

11. When  $\text{K}_4[\text{Fe}(\text{CN})_6]$  is added to  $\text{FeCl}_3$ , the Prussian blue complex compound formed is

- (1)  $\text{Fe}_3[\text{Fe}(\text{CN})_6]_4$
- (2)  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
- (3)  $\text{K}_2\text{Fe}[\text{Fe}(\text{CN})_6]$
- (4)  $\text{K}_2\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$

#### Answer (2)

**Sol.** Prussian blue is  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$

12. Match the tests given in column-I with the compounds given in column-II

Column-I	Column-II
(A) Schiff's test	1. Carbohydrate
(B) Carbylamine test	2. Peptide
(C) Molisch test	3. Aldehyde
(D) Biuret Test	4. $1^\circ$ Amine
(1) A-1; B-2; C-4; D-3	
(2) A-2; B-4; C-3; D-1	
(3) A-4; B-3; C-2; D-1	
(4) A-3; B-4; C-1; D-2	

#### Answer (4)

**Sol.**

- Schiff's test is given by aldehydes.
- Carbylamine test is given by  $1^\circ$  amines only
- Molisch test is given by carbohydrates
- Biuret test is given by peptide.

13. Electrons are emitted in cathode ray tube with a velocity of 1000 m/s. Select the correct statement among the following.

- (1) The de-Broglie wavelength of  $e^-$  is 666.67 nm
- (2) The cathode rays travel from cathode to anode
- (3) The characteristics of  $e^-$  depends on the metal used in cathode
- (4) The characteristics of the  $e^-$  depends on the gas field inside the cathode tube

#### Answer (2)

**Sol.**  $\lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34} \text{ Js}}{9.1 \times 10^{-31} \text{ kg} \times 10^3}$

$$= 725 \times 10^{-9} \text{ m}$$

$$= 725 \text{ nm}$$

Cathode rays travel from cathode to anode.

14. Choose correct statement from following statements

- A : Beryllium Oxide is an Acidic Oxide.  
 B : Beryllium Sulphate is soluble in aqueous medium  
 C : Beryllium Carbonate is thermally stable  
 D : Beryllium shows anomalous behaviour in comparison to other Group-2 elements.

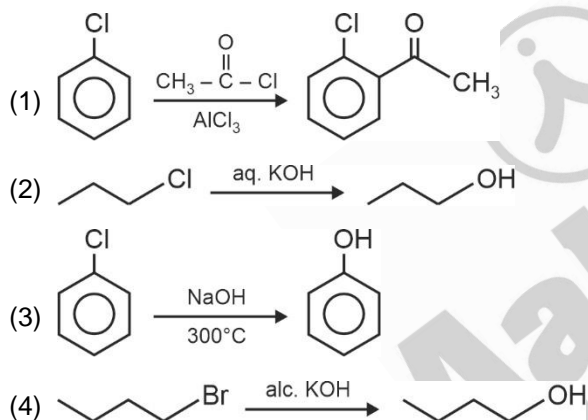
- (1) A & B                      (2) B & C  
 (3) B & D                      (4) C & D

**Answer (3)**

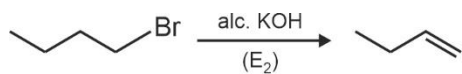
**Sol.** BeO : Amphoteric Oxide

BeSO<sub>4</sub> : Soluble in water

15. In which of the following options the reaction does not match with its correct product?



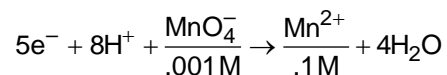
**Answer (4)**



**Sol.**

With alc. KOH alkyl halides elimination reaction.

16. For given reaction in Acidic medium,



$$E_{cell}^\circ = 1.54 V$$

$$E_{cell} = 1.2832 V$$

Find out pH of solution

- (1) 2.46                      (2) 3.52  
 (3) 6.38                      (4) 1.02

**Answer (1)**

**Sol.**  $1.2832 = 1.54 - \frac{.0591}{5} \log \frac{10^{-1}}{(10^{-3})(H^+)^8}$

$$-.2568 = \frac{-.0591}{5} (\log 10^2 - 8 \log H^+)$$

$$21.72 = 2 + 8pH$$

$$19.72 = 8pH$$

$$pH = \frac{19.72}{8} = 2.46$$

17. Statement I : Chlorine easily forms oxides and the compounds are explosive

Statement II: The higher oxidation states of chlorine, bromine and iodine are realised when the halogens form oxides and fluorides

- (1) Statement I is correct  
 Statement II is incorrect  
 (2) Statement I is incorrect  
 Statement II is correct  
 (3) Both the statements are correct  
 (4) Both the statements are incorrect

**Answer (3)**

**Sol.** The oxides of chlorine are easily formed and the compounds are explosive. The higher oxidation states of chlorine, bromine and iodine are stable in their oxides and fluorides.

Therefore, both the statements are correct.

18.

19.

20.

### SECTION - B

**Numerical Value Type Questions:** This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE**. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g. 06.25, 07.00, -00.33, -00.30, 30.27, -27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

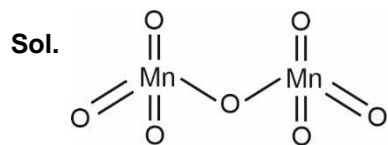
21. Consider structure of  $Mn_2O_7$

X : No. of Mn–Mn bonds

Y : No. of Mn–O–Mn bonds

Find out (X + Y)

**Answer (1)**



$$\frac{X=0}{Y=1} \Rightarrow (X + Y) = 1$$

22. X : oxidation No. of Br in Bromic Acid

Y : oxidation No. of Br in perbromic acid

Find out (X + Y)

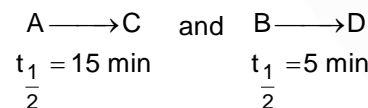
**Answer (12)**

**Sol.** Bromic Acid ( $HBrO_3$ ) Br = +5 = X

Perbromic acid ( $HBrO_4$ ) Br = +7 = Y

$$(X + Y) = 12$$

23. Consider the following first order reactions



The initial concentration of A and B are 1 molar and 8 molar respectively. The time when concentration of A and B becomes equal is 'X' min. Then find 2X (to the nearest integer)

**Answer (45)**

**Sol.** Let final conc. becomes k

$$\therefore \frac{1}{k_1} \ln \frac{1}{[A]} = \frac{1}{k_2} \ln \frac{8}{[A]}$$

$$A = \frac{1}{\sqrt{8}}$$

$$\therefore t = \frac{15}{0.693} \ln(\sqrt{8})$$

$$= 22.5 \text{ min}$$

$$\therefore 2X \approx 45$$

24. H-atom in ground state absorbs 12.75 eV of energy.

The orbital angular momentum of the electron

becomes  $\frac{nh}{2\pi}$ , the value of n is

**Answer (4)**

**Sol.**  $\Delta E = 13.6 \left(1 - \frac{1}{n^2}\right) = 12.75$

$$\Rightarrow -\frac{1}{n^2} = \frac{12.75}{13.60} - 1$$

$$\Rightarrow n^2 = 16 \Rightarrow n = 4$$

25. The density of a 3 M NaCl solution is 1 g/ml. The

molality of the solution is 'x'. Then find 2x. (Round off to nearest integer)

**Answer (7)**

**Sol.** Molality =  $\frac{3}{824.5} \times 1000$

$$= 3.63 \text{ molal}$$

$$\therefore 2x \approx 7$$

26. Find out ( $\Delta T_F$ ) (Depression in Freezing point) of a

KCl solution having ( $i = 2$ ). If 25 ml of this KCl solution requires 20 mL of 1 m  $AgNO_3$  solution for complete precipitation of KCl solution.  $K_F = 1.86 \text{ K.kg mole}^{-1}$  (closest Integer assuming molarity = molality)

**Answer (03.00)**

**Sol.**  $20 \times 1 = 25 \times m$

$$m = \frac{20}{25} = \frac{4}{5} = 0.8$$

$$\Delta T_F = (i) (K_F) (m)$$

$$= (2) (1.86)(0.8)$$

$$\Rightarrow 2.976$$

$$\approx 3 \text{ K}$$

27.

28.

29.

30.