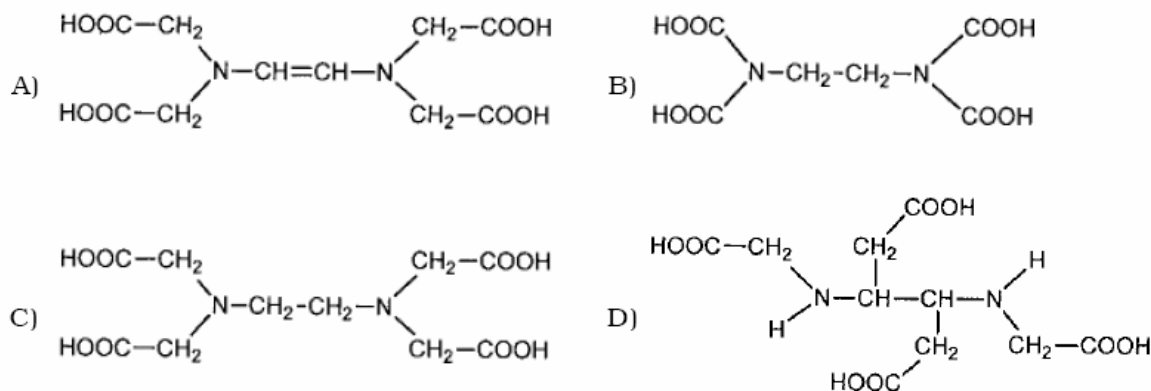


## PART – I : CHEMISTRY

## SECTION – I (Single Correct Choice Type)

This Section contains **8 multiple choice questions**. Each question has four choices A), B), C) and D) out of which **ONLY ONE** is correct.

1. The correct structure of ethylenediaminetetraacetic acid (EDTA) is



**ANSWER: C**

2. The ionization isomer of  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{NO}_2)]\text{Cl}$  is

- A)  $[\text{Cr}(\text{H}_2\text{O})_4(\text{O}_2\text{N})]\text{Cl}_2$   
 B)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2](\text{NO}_2)$   
 C)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}(\text{ONO})]\text{Cl}$   
 D)  $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2(\text{NO}_2)] \cdot \text{H}_2\text{O}$

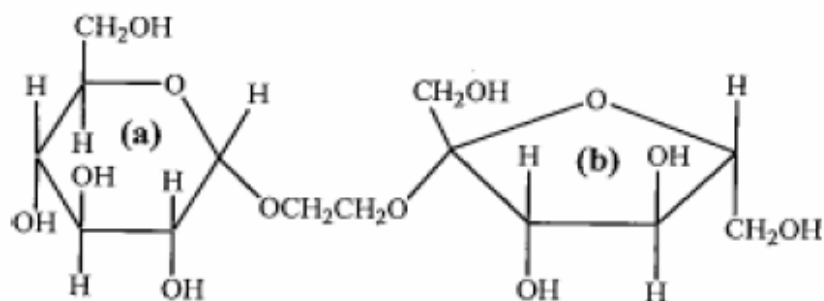
**ANSWER: B**

3. The synthesis of 3-octyne is achieved by adding a bromoalkane into a mixture of sodium amide and an alkyne. The bromoalkane and alkyne respectively are

- A)  $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$   
 B)  $\text{BrCH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{CH}$   
 C)  $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{C}\equiv\text{CH}$   
 D)  $\text{BrCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$

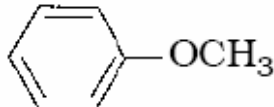
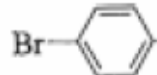
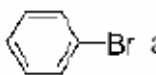
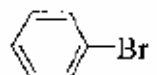
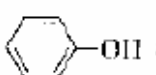
**ANSWER: D**

4. The correct statement about the following disaccharide is



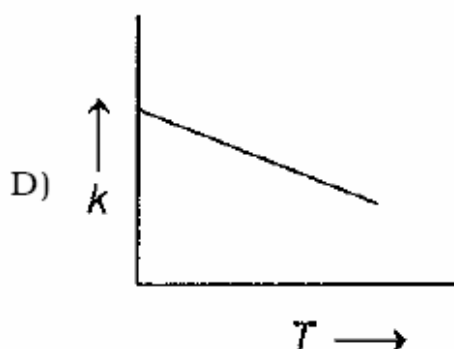
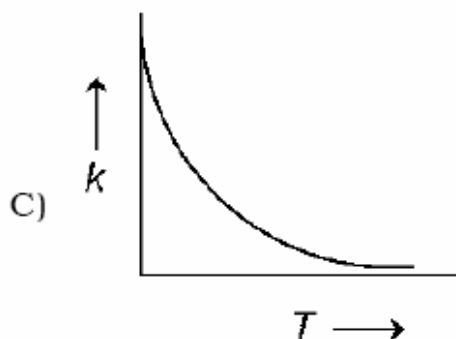
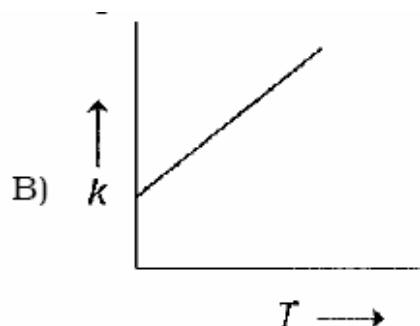
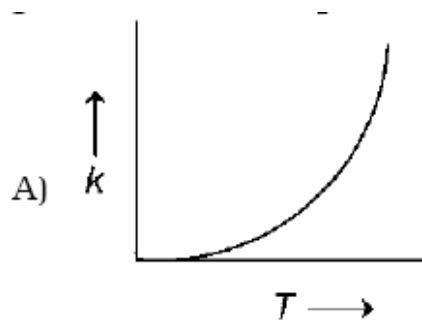
- A) Ring **(a)** is pyranose with  $\alpha$ -glycosidic link
- B) Ring **(a)** is furanose with  $\alpha$ -glycosidic link
- C) Ring **(b)** is furanose with  $\alpha$ -glycosidic link
- D) Ring **(b)** is pyranose with  $\beta$ -glycosidic link

**ANSWER: A**

5. In the reaction   $\xrightarrow{\text{HBr}}$  the products are
- A)  and  $\text{H}_2$
  - B)  and  $\text{CH}_3\text{Br}$
  - C)  and  $\text{CH}_3\text{OH}$
  - D)  and  $\text{CH}_3\text{Br}$

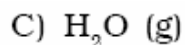
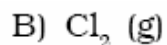
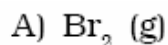
**ANSWER: D**

6. Plots showing the variation of the rate constant ( $k$ ) with temperature ( $T$ ) are given below. The plot that follows Arrhenius equation is



**ANSWER: A**

7. The species which by definition has **ZERO** standard molar enthalpy of formation at 298 K is



**ANSWER: B**

8. The bond energy (in  $\text{kcal mol}^{-1}$ ) of a C-C single bond is approximately

A) 1

B) 10

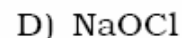
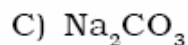
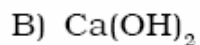
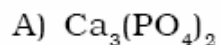
C) 100

D) 1000

**ANSWER: C**

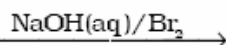
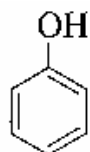
**SECTION – II (Multiple Correct Choice Type)**

9. The reagent(s) used for softening the temporary hardness of water is(are)

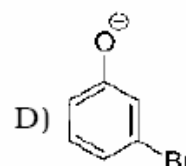
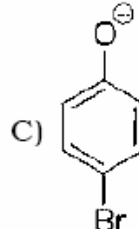
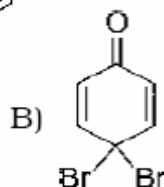
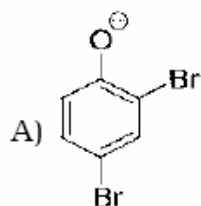


**ANSWER: B**

10. In the reaction

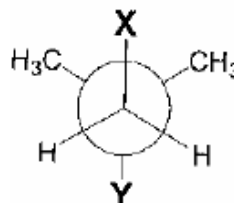


the intermediate(s) is(are)

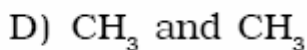
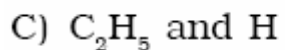
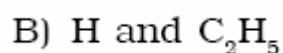
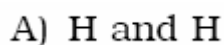


**ANSWER: A and C**

11. In the Newman projection for 2,2-dimethylbutane

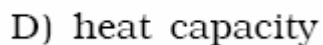
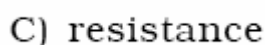
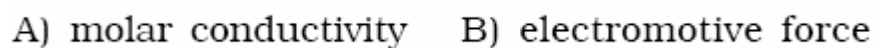


**X and Y can respectively be**



**ANSWER: B and D**

12. Among the following, the intensive property is (properties are)



**ANSWER: A and B**

13. Aqueous solutions of  $\text{HNO}_3$ ,  $\text{KOH}$ ,  $\text{CH}_3\text{COOH}$ , and  $\text{CH}_3\text{COONa}$  of identical concentrations are provided. The pair(s) of solutions which form a buffer upon mixing is(are)

- A)  $\text{HNO}_3$  and  $\text{CH}_3\text{COOH}$                       B)  $\text{KOH}$  and  $\text{CH}_3\text{COONa}$   
C)  $\text{HNO}_3$  and  $\text{CH}_3\text{COONa}$                       D)  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{COONa}$

**ANSWER: C and D**

**SECTION – III (Paragraph Type)**

**Paragraph for Questions 14 to 16**

Copper is the most noble of the first row transition metals and occurs in small deposits in several countries. Ores of copper include chalcantite ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ), atacamite ( $\text{Cu}_2\text{Cl}(\text{OH})_3$ ), cuprite ( $\text{Cu}_2\text{O}$ ), copper glance ( $\text{Cu}_2\text{S}$ ) and malachite ( $\text{Cu}_2(\text{OH})_2\text{CO}_3$ ). However, 80% of the world copper production comes from the ore chalcopyrite ( $\text{CuFeS}_2$ ). The extraction of copper from chalcopyrite involves partial roasting, removal of iron and self-reduction.

14. Partial roasting of chalcopyrite produces

- A)  $\text{Cu}_2\text{S}$  and  $\text{FeO}$   
B)  $\text{Cu}_2\text{O}$  and  $\text{FeO}$   
C)  $\text{CuS}$  and  $\text{Fe}_2\text{O}_3$   
D)  $\text{Cu}_2\text{O}$  and  $\text{Fe}_2\text{O}_3$

**ANSWER: A**

15. Iron is removed from chalcopyrite as

- A)  $\text{FeO}$                       B)  $\text{FeS}$   
C)  $\text{Fe}_2\text{O}_3$                       D)  $\text{FeSiO}_3$

**ANSWER: D**

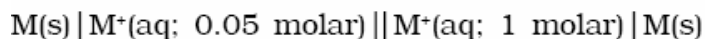
16. In self-reduction, the reducing species is

- A) S                      B)  $\text{O}^{2-}$   
C)  $\text{S}^{2-}$                 D)  $\text{SO}_2$

**ANSWER: C**

**Paragraph for Questions 17 to 18**

The concentration of potassium ions inside a biological cell is at least twenty times higher than the outside. The resulting potential difference across the cell is important in several processes such as transmission of nerve impulses and maintaining the ion balance. A simple model for such a concentration cell involving a metal M is:



For the above electrolytic cell the magnitude of the cell potential  $|E_{\text{cell}}| = 70 \text{ mV}$ .

17. For the above cell

- A)  $E_{\text{cell}} < 0$ ;  $\Delta G > 0$       B)  $E_{\text{cell}} > 0$ ;  $\Delta G < 0$   
C)  $E_{\text{cell}} < 0$ ;  $\Delta G^0 > 0$       D)  $E_{\text{cell}} > 0$ ;  $\Delta G^0 < 0$

**ANSWER: B**

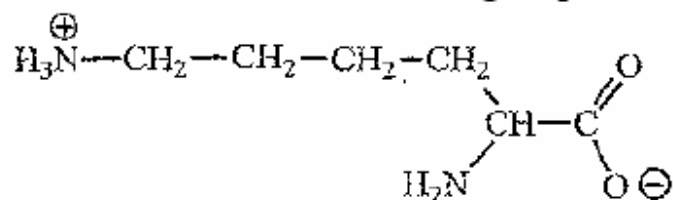
18. If the 0.05 molar solution of  $\text{M}^+$  is replaced by a 0.0025 molar  $\text{M}^+$  solution, then the magnitude of the cell potential would be

- A) 35 mV                      B) 70 mV  
C) 140 mV                    D) 700 mV

**ANSWER: C**

#### SECTION – IV (Integer Type)


19. The total number of basic groups in the following form of lysine is



**ANSWER: 2**

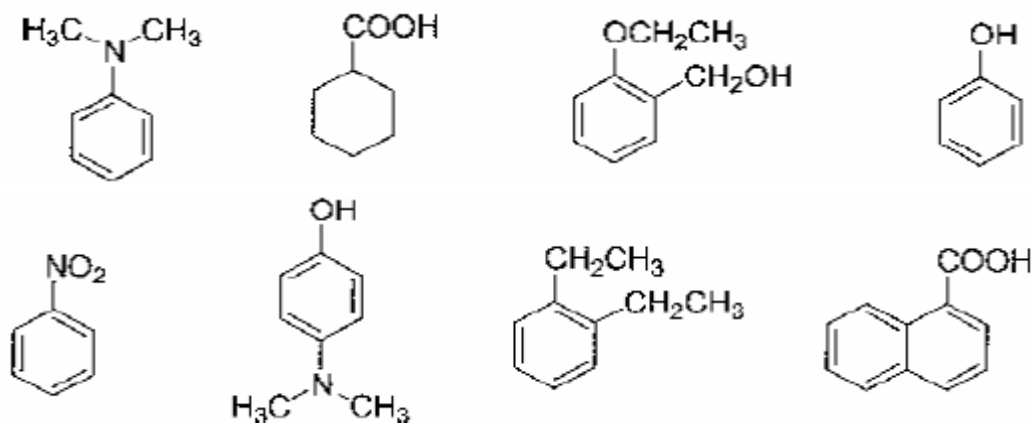
20. The total number of cyclic isomers possible for a hydrocarbon with the molecular formula  $C_4H_6$  is

**ANSWER: 5**

21. In the product   $\xrightarrow[2. \text{Zn, H}_2\text{O}]{1. \text{O}_3}$  **Y**  $\xrightarrow[2. \text{heat}]{1. \text{NaOH(aq)}}$  molecular aldol condensation

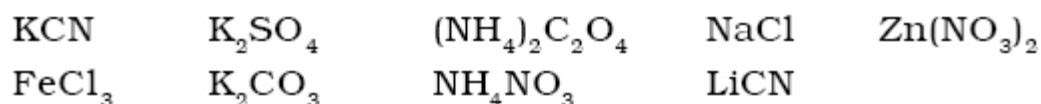
**ANSWER: 1**

22. Amongst the following, the total number of compounds soluble in aqueous NaOH is



**ANSWER: 4**

23. Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is



**ANSWER: 3**

24. Based on VSEPR theory, the number of 90 degree F-Br-F angles in  $BrF_5$  is

**ANSWER: either 0 or 8**

25. The value of n in the molecular formula  $Be_nAl_2Si_6O_{18}$  is

**ANSWER: 3**

26. A student performs a titration with different burettes and finds titre values of 25.2 mL, 25.25 mL, and 25.0 mL. The number of significant figures in the average titre value is

**ANSWER: 3**

27. The concentration of R in the reaction  $R \rightarrow P$  was measured as a function of time and the following data is obtained:

[R] (molar)	1.0	0.75	0.40	0.10
t(min.)	0.0	0.05	0.12	0.18

The order of the reaction is

**ANSWER: 0**

28. The number of neutrons emitted when  $^{235}_{92}U$  undergoes controlled nuclear fission to  $^{142}_{54}Xe$  and  $^{90}_{38}Sr$  is

**ANSWER: 4**