1 Mark Questions

1. Which of the following will not conduct electricity?
(a) Solid metallic Na
(b) Solid NaCl
(c) Aqueous NaCl
(d) Fused NaCl

2. The region in which the following spectral lines are observed is
P. Lyman series Q. Balmer series
R. Paschen series
(a) P-UV, Q-UV/Visible, R–IR
(b) P-UV/Visible, Q-UV, R-IR
(c) P-IR, Q-UV, R-Visible/IR
(d) P-UV, Q-IR, R-UV/Visible

3. The pH of a 10^{-8} molar hydrochloric acid solution is
(a) exactly 8
(b) between 7 and 8
(c) exactly 7
(d) between 6 and 7

4. The plot of concentration of *A* against time is a straight line with negative slope for the reaction

$$A \rightarrow \text{products}$$

The order of the reaction is
(a) −1 (b) 0
(c) 1 (d) 2

5. Among the following four amines, which one is least basic in aqueous solution?
(a) CH_3NH_2 (b) $(CH_3)_2NH$
(c) $(CH_3)_3N$ (d) $CH_3NHC_6H_5$

6. Which of the following acids is used for the preparation of cyclohexene from cyclohexanol?
(a) conc. HNO_3 (b) 48% HBr
(c) 85% H_3PO_4 (d) $(COOH)_2$

2 Marks Questions

7. An aqueous mixture solution is prepared which contains 0.1 M of KCl and 0.1 M KI. To this solution, a drop of 0.01 M aqueous solution of $AgNO_3$ is added. Which of the following statements is correct?
(a) A precipitate forms which is primarily AgI
(b) A precipitate forms which is primarily AgCl
(c) A precipitate forms which has equimolar amounts of AgCl and AgI
(d) There will be no precipitation as there is no common ion between potassium and silver salts

8. 1 g/ L solution of a protein exerts an osmotic pressure of 8.3×10^{-3} bar at 300 K. Calculate the molar mass of the protein.
(a) 2490 g/mol (b) 3000 g/mol
(c) 4578 g/mol (d) 6100 g/mol

9. An electrochemical cell of the following representation was found to be galvanic cell, where *A* and *B* represent different metals.

$$A(s) \mid A^{2+}(aq)\ 1M \mid\mid B^{2+}(aq)\ 1M \mid B(s)$$

Which of the following statements with respect to the cell is correct?
(a) The cell converts electrical energy to chemical energy spontaneously
(b) The cell uses electrical energy to deposit *A* and dissolve *B* spontaneously
(c) (A^{2+}/A) is a stronger reducing agent than (B^{2+}/B)
(d) (A^{2+}/A) is a stronger oxidising agent than (B^{2+}/B)

10. For a first order reaction at a particular temperature, the half-life was found to be (100 ln 2) seconds. The specific rate constant of the reaction is
(a) 0.01 s^{-1} (b) 100 s^{-1}
(c) 230 s^{-1} (d) 693 s^{-1}

11. Liquid bromine boils at 59°C. Assuming it to be a normal liquid, which of the following gives its standard molar enthalpy of vaporisation?

(a) (8.314 × 332) J/mol
(b) (85 × 332) J/mol
(c) (332/85) J/mol
(d) (332/8.314) J/mol

12. The limiting molar conductivities of some species are given in (S cm^2/mol) units

Λ^0 (HCl) = 425.9; Λ^0 (NaCl) = 126.4;
λ^0 (H^+) = 349.6

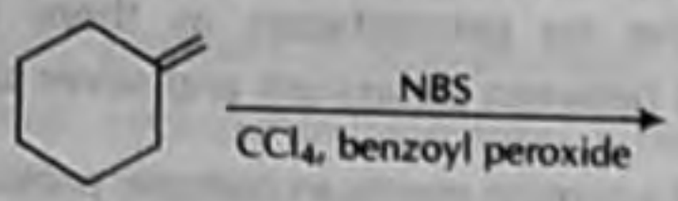
Find the limiting molar conductivity of Na^+ ion.

(a) 50.1 (b) 76.3
(c) 299.5 (d) 476.0

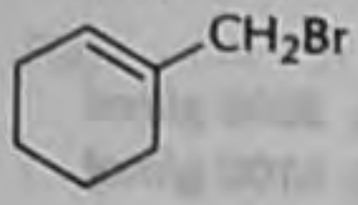
13. The reactivity order for nitration of benzene, chlorobenzene, phenol and nitrobenzene is

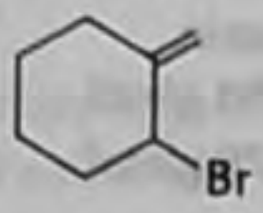
(a) benzene > chlorobenzene > phenol > nitrobenzene
(b) phenol > benzene > chlorobenzene > nitrobenzene
(c) nitrobenzene > phenol > chlorobenzene > benzene
(d) phenol > chlorobenzene > benzene > nitrobenzene

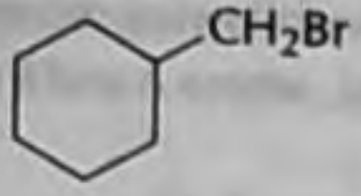
14.

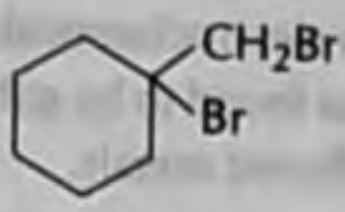


The major product in the above reaction is

(a) 

(b) 

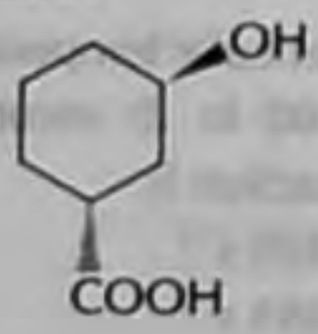
(c) 

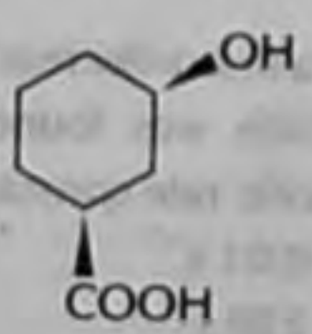
(d) 

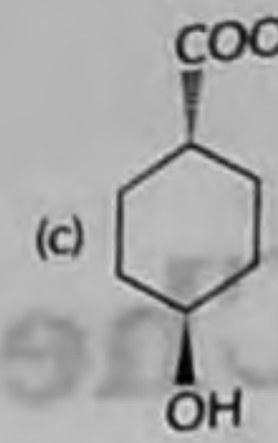
15. When a compound (*M*) is slowly heated with chloroform in alcoholic KOH solution, it produces an offensive smell. The compound *M* is

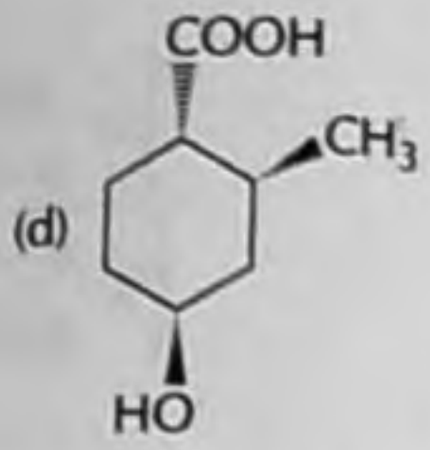
(a) N,N-Diethylaniline
(b) Diethylamine
(c) Ethylamine
(d) Triethylamine

16. Which one of the following will lactonize in presence of acid?

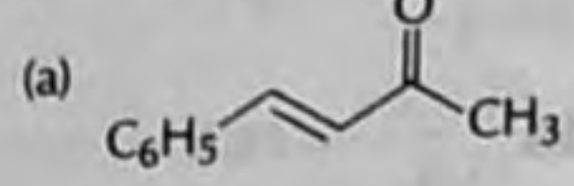
(a) 

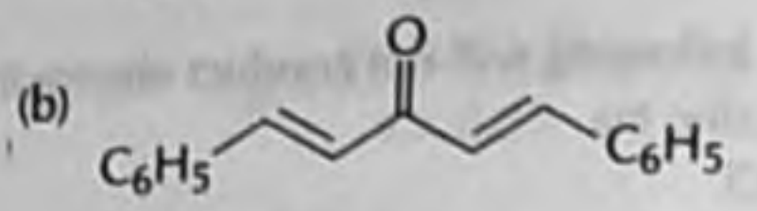
(b) 

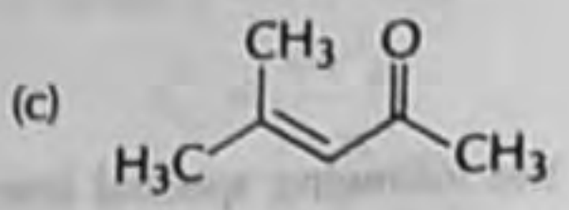
(c) 

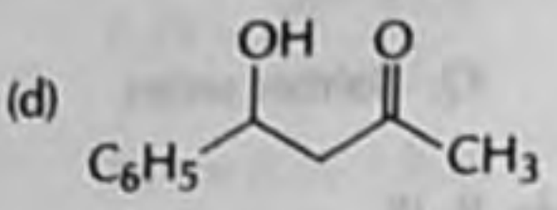
(d) 

17. The major condensation product in the reaction benzaldehyde with excess amount of acetone presence of dilute NaOH solution is

(a) 

(b) 

(c) 

(d) 

18. Ammonia gas can be dried over

(a) conc. H_2SO_4
(b) anhydrous P_2O_5
(c) anhydrous CaO
(d) anhydrous $CaCl_2$

19. Which of the following molecules will have zero dipole moment?

H_2O, $SiCl_4$, CO_2, NH_3, BF_3

(a) H_2O, $SiCl_4$, BF_3
(b) CO_2, NH_3, $SiCl_4$
(c) H_2O, NH_3, BF_3
(d) CO_2, BF_3, $SiCl_4$

20. Which of the following pairs of complexes will not show any ligand field *d-d* transitions?

(a) $K_4[Fe(CN)_6]$, $[Ni(H_2O)_2(NH_3)_4]SO_4$
(b) $[Cu(CH_3CN)_4]Cl$, $Na_3[CoCl_2(CN)_4]$
(c) $[Cu(CH_3CN)_4]Cl$, $[Zn(NH_3)_4Cl_2]$
(d) $[Cu(H_2O)_2(NH_3)_4]Cl_2$, $[Zn(H_2O)_4(NH_3)_4]SO_4$

21. Which of the following substances will produce acidic oxides when burnt in excess air? Sodium (*P*), Sulphur(*Q*) and Methane (*R*)

(a) All the three (b) Both *Q* and *R*
(c) Only *Q* (d) Both *P* and *R*

22. In the ring test for nitrate ion, the brown colour is due to the formation of

(a) $[Fe(H_2O)_5(NO)]SO_4$

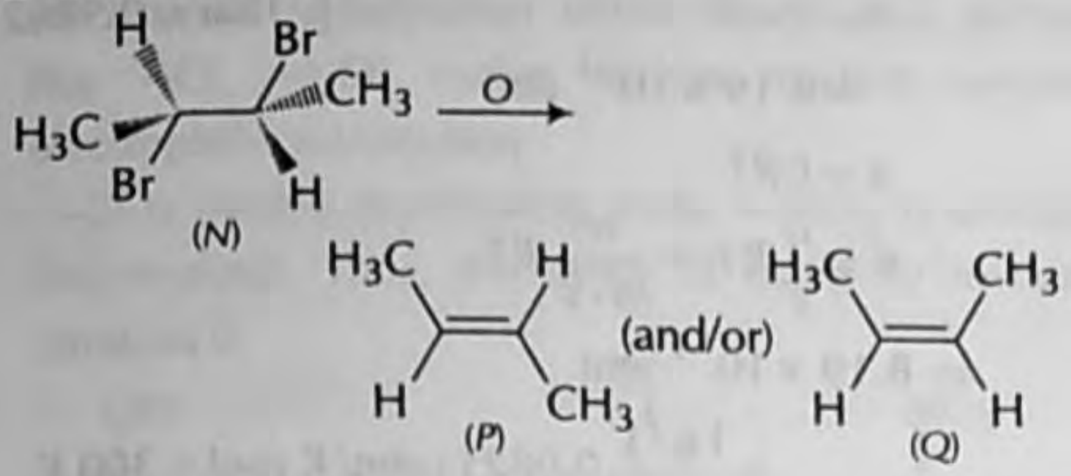
(b) $[Fe(H_2O)_5(NO_2)]SO_4$

(c) $[Fe(H_2O)_3(NO)_3]SO_4$

(d) $[Fe(H_2O)_5(NO_3)]SO_4$

Common Data for Questions 23 and 24

The compound (*N*) on treatment with the reagent (*O*) gives an alkene.



23. The appropriate reagent (O) required for this transformation is

(a) KOH/EtOH (b) NaOMe/MeOH

(c) NaI/Acetone (d) $NaNH_2$

24. The alkene will be produced as

(a) *P* exclusively since it is going through E2 mechanism

(b) *Q* exclusively since it is going through E2 mechanism

(c) Equal amount of *P* and *Q* since it is going through E1 mechanism

(d) *P* as major amount since it is going through E1CB mechanism.

Statements for Linked Answer Questions 25 and 26

$CuSO_4$ solution when treated with aqueous alkali (*W*) forms a blue precipitate (*X*), which dissolves on addition of excess *W*. Another aqueous alkali (*Y*) precipitates blue solid (*Z*) when reacted with $CuSO_4$ but the blue precipitate (*Z*) does not dissolve with excess alkali (*Y*).

25. Identify *W* and *X*

(a) NH_4OH and $Cu(OH)_2 \cdot CuSO_4$

(b) NH_4OH and $Cu(OH)_2$

(c) NaOH and $Cu(OH)_2 \cdot CuSO_4$

(d) NaOH and $Cu(OH)_2$

26. Identify *Y* and *Z*

(a) NH_4OH and $Cu(OH)_2 \cdot CuSO_4$

(b) NH_4OH and $Cu(OH)_2$

(c) NaOH and $Cu(OH)_2 \cdot CuSO_4$

(d) NaOH and $Cu(OH)_2$

Statements for Linked Answer Questions 27 and 28

For a first order reversible reaction $A \underset{k_b}{\overset{k_f}{\rightleftharpoons}} B$ at a temperature *T*, the standard molar free energy (ΔG°) is equal to $-2.303\ RT$ and the rate constant of forward reaction (k_f) is $1 \times 10^{-3}\ s^{-1}$.

27. The equilibrium constant of the reaction is

(a) 23.03 (b) 19.09

(c) 10 (d) 1

28. The rate constant of the backward reaction (k_b) is

(a) $5.26 \times 10^{-5}\ s^{-1}$ (b) $1 \times 10^{-2}\ s^{-1}$

(c) $4.35 \times 10^{-5}\ s^{-1}$ (d) $1 \times 10^{-4}\ s^{-1}$