Sample Paper-03

Dropper NEET (2024)

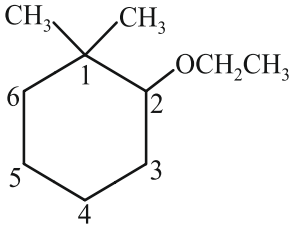
CHEMISTRY

ANSWER KEY

1.	(2)	26.	(1)
2.	(3)	27.	(3)
3.	(4)	28.	(3)
4.	(2)	29.	(3)
5.	(3)	30.	(2)
6.	(2)	31.	(3)
7.	(2)	32.	(3)
8.	(1)	33.	(2)
9.	(3)	34.	(3)
10.	(1)	35.	(2)
11.	(1)	36.	(1)
12.	(2)	37.	(1)
13.	(3)	38.	(1)
14.	(4)	39.	(4)
15.	(4)	40.	(4)
16.	(3)	41.	(3)
17.	(3)	42.	(1)
18.	(4)	43.	(4)
19.	(2)	44.	(4)
20.	(3)	45.	(2)
21.	(1)	46.	(4)
22.	(2)	47.	(4)
23.	(2)	48.	(4)
24.	(2)	49.	(3)
25.	(3)	50.	(1)

HINTS AND SOLUTIONS

1. **(2)**



2-Ethoxy-1,1-dimethylcyclohexane

2. **(3)**

$$\overset{+2}{Mn}SO_4 \longrightarrow \overset{+4}{MnO_2}$$

$$E = \frac{M}{2}$$

3. **(4)**

Solubility increases with increase in branching.

4. **(2)**

Aromatic amine (aniline) forms stable diazonium salt at 273 K to 278 K.

5. **(3)**

Mole fraction is a temperature independent quantity.

6. **(2)**

At anode : $Zn(s) \rightarrow Zn^{2+} + 2e^-$

7. **(2)**

From the value of the dipole moment, the geometry of molecule can be predicted.

8. **(1)**

An ideal solution is a solution that obeys Raoult's law over entire range of concentration and temperature.

9. **(3)**

$$\Delta x.\Delta p \geq \frac{h}{4\pi}$$

$$\Delta p = \sqrt{\frac{h}{4\pi}} \qquad [\text{When } \Delta x = \Delta p]$$

$$m\Delta v = \sqrt{\frac{h}{4\pi}}$$

$$\Delta v = \frac{1}{2m}\sqrt{\frac{h}{\pi}}$$

10. **(1)**

No. of moles of $CaCl_2$ = Molarity × volume (L)

$$= 0.5 \times \frac{500}{1000}$$

$$= 0.25 \text{ mol}$$

11. **(1)**

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$$

12. **(2)**

$$\text{Mole fraction of } O_2 = \frac{\frac{8}{32}}{\frac{2}{2} + \frac{8}{32}} = 0.2$$

13. **(3)**

$$2KClO_3 \longrightarrow 2KCl + 3O_2 \uparrow$$

245 g $KClO_3$ on heating shows a mass loss = 96 g

$\therefore$ 1 g $KClO_3$ on heating shows a mass loss

$$= \frac{96 \times 100}{245}$$

$$= 39.18\%$$

14. **(4)**

For a cycloalkene to show geometrical isomerism it should have minimum eight carbon atoms.

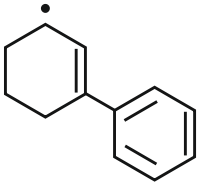
15. **(4)**

	Column-I (Distinguish)		**Column-II (By)**
A	Methanol and ethanol	R	Iodoform test
B	Phenol and cyclohexanol	S	Ferric chloride
C	n-Butyl alcohol and tert-butyl alcohol	P	Lucas reagent
D	Methanol and diethyl ether	Q	Sodium metal

Hence, option (4) is correct.

16. **(3)**

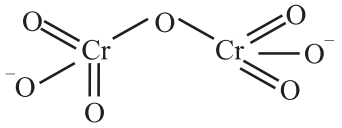
Most stable free radical is:



It is due to conjugation.

17. **(3)**

In dichromate ion, two CrO_3 units have been joined by O i.e., each Cr is linked to four O-atoms. The structure of dichromate ion is as follows:



(Dichromate ion)

18. **(4)**

$$Ph-NH_2 \xrightarrow[0°C]{HNO_2} Ph-\underset{(A)}{\overset{+}{N}}\equiv N \xrightarrow[BF_3]{HF}$$

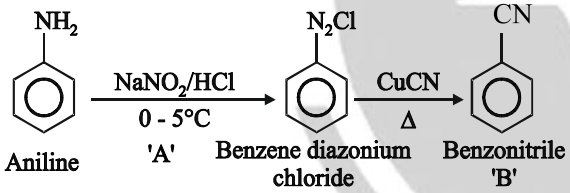
$$Ph-\underset{(B)}{\overset{+}{N}}\equiv N.BF_4^- \xrightarrow{\Delta} \underset{(C)}{Ph-F} + BF_3 + N_2$$

19. **(2)**

$K_p = K_c (RT)^{\Delta n}$ where, Δ_n = [number of moles of gaseous products – number of moles of gaseous reactants].

Here, Δn = zero. Hence, $K_p = K_c (RT)^0$.

20. **(3)**

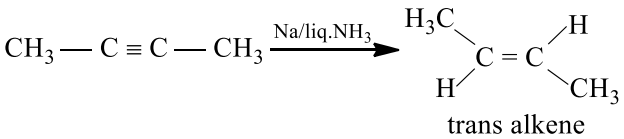


21. **(1)**

$$2R-Cl + Ag_2O \longrightarrow \underset{\text{Ether}}{R-O-R} + 2AgCl\downarrow$$

22. **(2)**

Na in liquid ammonia is used to get trans alkene from alkyne.



trans alkene

23. **(2)**

Rate of reaction depends upon slowest step of the reaction.

24. **(2)**

E^o_{cell} is not an additive property but $\Delta G°$ is an additive property.

$\Delta G° = -nFE°$

$Fe^{3+}(aq) + 3e^- \rightarrow Fe(s)$ ……(i)

$\Delta G_1^o = -3Fx$

$Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$ …...(ii)

$\Delta G_2^o = -2Fy$

From equation (i) and (ii);

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ ……(iii)

If reduction potential for half-cell reaction (iii) is z then,

$\Delta G_3^o = \Delta G_1^o - \Delta G_2^o$

$-Fz = -3Fx - (-2Fy)$

$-Fz = -3Fx + 2Fy$

Multiply by (–) sign;

$Fz = 3Fx - 2Fy$

$Fz = F(3x - 2y)$

$z = (3x - 2y)$

25. **(3)**

For isoelectronic species;

$$\text{Ionic size} \propto \frac{\text{Negative charge}}{\text{Positive charge}}$$

Thus, correct ionic size order is:

$K^+ < Cl^- < S^{2-} < P^{3-}$

26. **(1)**

CO_2 molecule is a linear molecule (O = C = O) hence bond angle is 180° in it.

27. **(3)**

$$K_a(HA) = \frac{K_w}{K_h} = \frac{10^{-14}}{10^{-8}} = 10^{-6}$$

$$K_a(HB) = \frac{K_w}{K_h} = \frac{10^{-14}}{10^{-6}} = 10^{-8}$$

K_a (HC) = 10^{-2}

Greater the value of dissociation constant (K_a), more is the acidic strength.

28. **(3)**

If the reaction is reversed, the value of equilibrium constant is reciprocated $\left(\frac{1}{K}\right)$.

If the reaction is multiplied by a factor (n) then the value of equilibrium constant becomes K^n.

Therefore,

For the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$, K is the equilibrium constant.

Then for the reaction $NH_3 \rightleftharpoons \frac{1}{2}N_2 + \frac{3}{2}H_2$,

Equilibrium constant would be $= \frac{1}{\sqrt{K}}$ or $\frac{1}{K^{1/2}}$.

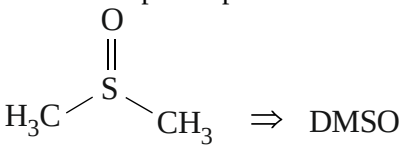
29. **(3)**

Statement I: In presence of DMSO solvent, the rate of S_N2 reaction increases. **(True)**

S_N2 reaction is favoured in presence of polar aprotic solvent.

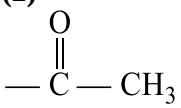
Statement II: DMSO is a polar protic solvent. **(False)**

DMSO is a polar aprotic solvent.

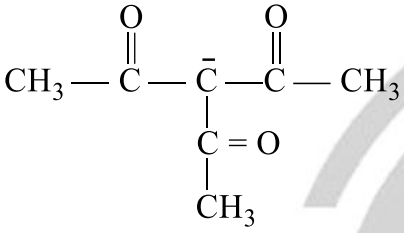


$\Rightarrow$ DMSO

30. **(2)**



group exerts –I as well as strong –R effect in $(CH_3CO)_3\bar{C}$.

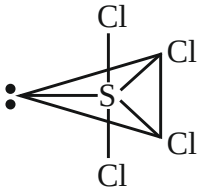


31. **(3)**

Ketones (RCOR) on reaction with RMgX followed by hydrolysis produces a tertiary alcohol.

32. **(3)**

S in SCl_4 undergoes sp^3d, hybridization. Thus, the molecule has see-saw structure whereas $SiCl_4$ is tetrahedral.



33. **(2)**

$CaCl_2 + Na_2CO_3 \longrightarrow CaCO_3 + 2NaCl$

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

Moles of $CaCl_2$ = moles of $CaCO_3$ = moles of CaO = $\left(\frac{1.62}{56}\right)$

Mass of $CaCl_2$ = Moles × Molar mass of $CaCl_2$

$= \left(\frac{1.62}{56}\right) \times 111 \text{ g} = 3.21 \text{ g}$

% of $CaCl_2 = \frac{3.21}{10} \times 100 = 32.1\%$.

34. **(3)**

$$h = \sqrt{\frac{K_h}{C}} = \sqrt{\frac{K_W}{K_a.C}} = \sqrt{\frac{10^{-14}}{K_a \times (0.01)}}$$

$$\Rightarrow \quad 0.01 = \sqrt{\frac{10^{-14}}{K_a \times (0.01)}}$$

$$\Rightarrow \quad 10^{-4} = \frac{10^{-14}}{K_a \times 10^{-2}}$$

$$\Rightarrow \quad K_a = 10^{-8}$$

35. **(2)**

Transition metal oxide with highest oxidation states is most acidic in character because of the very less difference in the values of electronegativity between Mn^{7+} and O^{2-}, and the decreasing order of acidic character is:

$$\overset{+7}{Mn_2O_7} > \overset{+4}{MnO_2} > \overset{+3}{Mn_2O_3} >> \overset{+2}{MnO}$$

36. **(1)**

$N_2: \sigma(2s)^2 \overset{*}{\sigma}(2s)^2 \pi(2p_x)^2 \pi(2p_y)^2 \sigma(2p_z)^2;$

$$\text{Bond order} = \frac{1}{2}(8-2) = 3$$

$O_2: (\sigma 2s)^2 (\overset{*}{\sigma} 2s)^2 (\sigma 2p_z)^2 (\pi 2p_y)^2 (\pi 2p_x)^2 (\overset{*}{\pi} 2p_y)^1 (\overset{*}{\pi} 2p_x)^1;$

$$\text{Bond order} = \frac{1}{2}(8-4) = 2$$

$F_2: (\sigma 2s)^2 (\overset{*}{\sigma} 2s)^2 (\sigma 2p_z)^2 (\pi 2p_y)^2 (\pi 2p_x)^2 (\overset{*}{\pi} 2p_y)^2 (\overset{*}{\pi} 2p_x)^2;$

$$\text{Bond order} = \frac{1}{2}(8-6) = 1$$

$O_2^+: (\sigma 2s)^2 (\overset{*}{\sigma} 2s)^2 (\sigma 2p_z)^2 (\pi 2p_y)^2 (\pi 2p_x)^2 (\overset{*}{\pi} 2p_y)^1;$

$$\text{Bond order} = \frac{1}{2}(8-3) = 2.5$$

37. **(1)**

$$i = \frac{\text{Normal molar mass}}{\text{Observed molar mass}}$$

$$= \frac{164}{65.6} = 2.5$$

$$\alpha = \frac{i-1}{n-1}, \qquad n = 3 \text{ (number of ions)}$$

$$= \frac{2.5-1}{3-1} = \frac{1.5}{2} = 0.75$$

$\therefore$ Percentage ionization of MX_2 will be 75 %.

38. (1)

Poor shielding by f- and d- electrons enhances the effective nuclear charge in Bi. This causes contraction in size.

39. (4)

Both are same molecule.

40. (4)

Rate = k_1 [M] [Z] …. (1)

From equation (1) $K_{eq} = \frac{[M]}{[X][Y]}$.

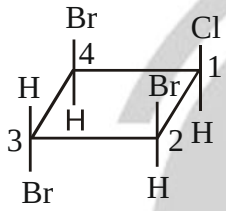
M = k_{eq} [X] [Y]

Put the value of M from eq. (2) to (1)

Rate = $k_1 k_{eq}$ [X] [Y] [Z]

Rate = k [X] [Y] [Z]

41. (3)

The structure 

has plane of symmetry across C-1 and C-3 but there is no centre of symmetry.

42. (1)

All the elements of actinide series are highly radioactive.

43. (4)

Paramagnetic species have at least one unpaired electron. Write the electronic configuration and observed the unpaired orbital.

Na^+: $1s^2, 2s^2\ 2p^6$ — All paired; (11)

Zn^{2+}: $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^{10}$ — All paired; (30)

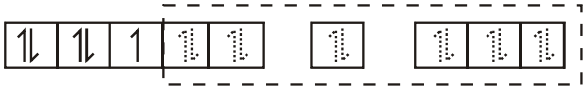
Cu^+: $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^{10}$ — All paired; (29)

Fe^{3+}: $1s^2, 2s^2\ 2p^6, 3s^2\ 3p^6\ 3d^5$ — 5 unpaired es^- (26)

44. (4)

$\overset{I}{[Cr}\overset{0}{(NH_3)}\overset{-4}{(CN)_4}\overset{+1}{(NO)}]^{2-}$

d^2sp^3



Central metal ion has one unpaired electron and thus d-d transition of electron is possible. This attributes to the colour of the solution. As different types of ligands are attached to central metal ion, the complex is called heteroleptic complex.

45. (2)

$Cu^{2+} + 1e^- \rightarrow Cu^+ : \quad E_1^o = 0.15V\ ;\ \Delta G_1^o = -n_1E_1^oF$

$Cu^+ + 1e^- \rightarrow Cu \quad : \quad E_2^o = 0.50V;\ \Delta G_2^o = -n_2E_2^oF$

$Cu^{2+} + 2e^- \rightarrow Cu \quad : \quad \Delta G^\circ = \Delta G_1^o + \Delta G_2^o$

$(-1)n\ E^\circ F = (-1)n_1\ E_1^oF + (-1)n_2E_2^oF$

$$E^\circ = \frac{n_1E_1^o + n_2E_2^o}{n} = \frac{0.15\times1 + 0.50\times1}{2} = 0.325\ V$$

46. (4)

Element	Percent	R.A.M	No. of atoms	Atomic ratio
C	74	12	74/12 = 6.16	6.16/1.23=5
H	8.7	1	8.7/1 = 8.7	8.7/1.23=1
N	17.3	14	17.3/14 =1.23	1.23/1.23=1

The ratio of atoms = C : H : N = 5 : 7 : 1

Empirical formula = C_5H_7N

Empirical formula mass = 5C + 7H + N

= 5 × 12 + 7 × 1 + 14

= 81

Molecular mass = 162 (given)

No. of empirical units per molecule = n

Molecular formula = (Empirical formula) × 2

= $(C_5H_7N) \times 2 = C_{10}H_{14}N_2$

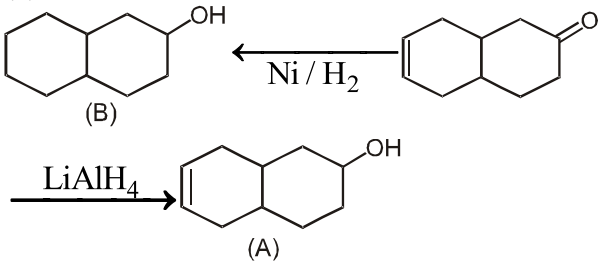
$$= \frac{\text{Molecular mass}}{\text{Empirical formula mass}} = \frac{162}{81} = 2$$

47. (4)

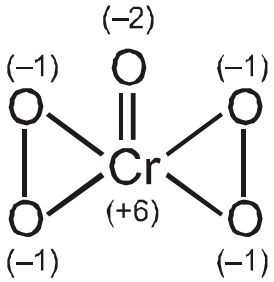
The number of electrons present are not same.

F^- = 10 electrons, S^{2-} = 18 electrons, N^{3-} = 10 electrons.

48. **(4)**



49. **(3)**



50. **(1)**

$$\text{Molality, } m = \frac{w_B}{m_B} \times \frac{1000}{w_A}$$

$$b = \frac{c}{m_B} \times \frac{1000}{(a-c)}$$

$$m_B = \frac{c}{b} \times \frac{1000}{(a-c)}$$