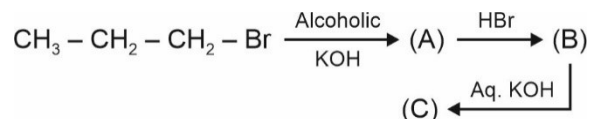# CHEMISTRY

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.
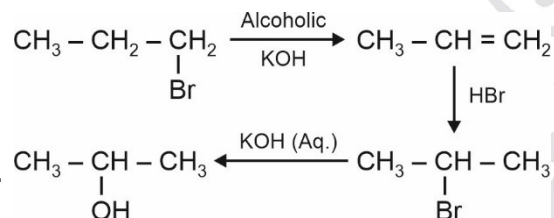
Choose the correct answer :

1. Find out final product (C).

$$CH_3 - CH_2 - CH_2 - Br \xrightarrow[KOH]{Alcoholic} (A) \xrightarrow{HBr} (B)$$
$$(C) \xleftarrow{Aq.\ KOH}$$

   (1) Propan-1-ol

   (2) Propan-2-ol

   (3) Propene

   (4) Propane

Answer (2)

Sol.

$$CH_3 - CH_2 - \underset{\underset{Br}{|}}{CH_2} \xrightarrow[KOH]{Alcoholic} CH_3 - CH = CH_2$$

$$\downarrow HBr$$

$$CH_3 - \underset{\underset{OH}{|}}{CH} - CH_3 \xleftarrow{KOH\ (Aq.)} CH_3 - \underset{\underset{Br}{|}}{CH} - CH_3$$

$$\underset{Propan-2-ol}{(C)}$$

2. Which of the following option contain amphoteric oxide(s) only?

   (1) SnO_2 and SiO

   (2) SiO_2

   (3) SnO_2 and PbO_2

   (4) CO and SiO

Answer (3)
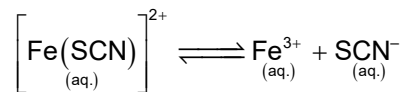
Sol. SnO_2 and PbO_2 are amphoteric oxide.

   SiO is weakly acidic oxide.

   SiO_2 is acidic oxide.

   CO is neutral oxide.

3. Consider the following reaction, the expression for K_c is :

$$\left[\underset{(aq.)}{Fe(SCN)} \right]^{2+} \rightleftharpoons \underset{(aq.)}{Fe^{3+}} + \underset{(aq.)}{SCN^-}$$

   (1) $K_c = \dfrac{\left[Fe^{3+} \right]\left[SCN^- \right]}{\left[\left[Fe(SCN) \right]^{2+} \right]}$

   (2) $K_c = \dfrac{\left[Fe^{3+} \right]^2 \left[SCN^- \right]}{\left[\left[Fe(SCN) \right]^{2+} \right]}$

   (3) $K_c = \dfrac{\left[Fe^{3+} \right]^2 \left[SCN^- \right]^2}{\left[\left[Fe(SCN) \right]^{2+} \right]}$

   (4) $K_c = \dfrac{\left[Fe^{3+} \right]^3 \left[SCN^- \right]}{\left[\left[Fe(SCN) \right]^{2+} \right]}$

Answer (1)

Sol. $K_C = \dfrac{\text{Product ion conc.}}{\text{Reactant ion conc.}} = \dfrac{\left[Fe^{3+} \right]\left[SCN^- \right]}{\left[\left[Fe(SCN) \right]^{2+} \right]}$

Hence, option (1) is correct

4. On which factor, electrical conductivity of electrolytic cell doesn't depend

   (1) Concentration of electrolyte

   (2) Nature of electrolyte added

   (3) Temperature

   (4) Nature of electrode

Answer (4)

Sol. Conductivity of electrolytic cell is affected by Conc. of electrolyte, nature of electrolyte and temperature

5. Decreasing order of electron gain enthalpy of the following elements (magnitude only).

   Sulphur → A

   Bromine → B

   Fluorine → C

   Argon → D

(1) A > B > C > D   (2) D > C > B > A

(3) C > B > A > D   (4) A > B > D > C

Answer (3)

Sol. Electron gain enthalpy values in kJ/mol
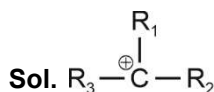
S = –200

Br = –325

F = –333

Ar = 96

The correct answer is C > B > A > D

(Magnitude only) 333 > 325 > 200 > 96

6. Species having carbon with sextet of valence electrons and acts as an electrophile is called

(1) Carbanion   (2) Carbocation

(3) Free radical   (4) Nitrene

Answer (2)

Sol. $R_3 - \overset{\overset{\displaystyle R_1}{|}}{\underset{}{\overset{\oplus}{C}}} - R_2$

Carbon has 6 electrons in valence shell.

7. The compound which is white in colour is

(1) $ZnSO_4$ (2) $CuSO_4$

(3) $FeSO_4$ (4) $FeCl_3$

Answer (1)

Sol. $Zn^{2+} : 4s^0\, 3d^{10}$ (Colourless)

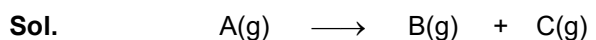8. Find the rate constant for first order gaseous reaction.

$$A(g) \longrightarrow B(g) + C(g)$$

(1) $k = \dfrac{2.303}{t} \log \dfrac{p_i}{2p_i - p_t}$

(2) $k = \dfrac{2.303}{t} \log \dfrac{2p_i}{p_i - p_t}$

(3) $k = \dfrac{2.303}{t} \log \dfrac{p_i - p_t}{2p_i}$

(4) $k = \dfrac{2.303}{t} \log \dfrac{2p_t}{2p_i - p_t}$

Answer (1)

Sol.

	A(g)	$\longrightarrow$	B(g)	+	C(g)
At t = 0	p_i atm		0 atm		0 atm
At t = t	$(p_i - x)$ atm		x atm		x atm

where p_i is initial pressure

$p_t = p_i - x + x + x$

$p_t = p_i + x$

$x = p_t - p_i$

$k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_i - x}$

$k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_i - (p_t - p_i)}$

$k = \dfrac{2.303}{t} \log \dfrac{p_i}{2p_i - p_t}$

9. **Assertion :** pK_a value of phenol is 10.0 while that of ethanol is 15.9

Reason : Ethanol is stronger acid than phenol

(1) Both assertion and reason are correct and reason is the correct explanation for assertion

(2) Assertion is correct and reason is incorrect

(3) Both assertion and reason are correct but reason is not correct explanation for assertion

(4) Both assertion and reason are incorrect

Answer (2)

Sol. Since pK_a of phenol is less than ethanol, phenol is the stronger acid.

10. Which of the following solution shows positive deviation from Raoult's law?

(1) $CHCl_3 + C_6H_6$

(2) $CH_3COCH_3 + CS_2$

(3) $CH_3COCH_3 + CHCl_3$

(4) $CH_3COCH_3 + C_6H_5NH_2$

Answer (2)

Sol. Acetone and CS_2 is an example of solutions showing positive deviation from Raoult's law. Since acetone – CS_2 attractions are weaker than acetone-acetone attractions.

11. **Assertion (A):** Noble gases have very high boiling point.

    Reason (R): Noble gases have strong dispersion forces hence they liquify at low temperature, hence they have high boiling point.

    (1) (A) and (R) are true and (R) explains (A)

    (2) (A) and (R) are true and (R) does not explain (A)

    (3) (A) and (R) are false

    (4) (A) is true but (R) is false

Answer (3)

Sol. Noble gases have very low boiling point due to weak van der Waals forces of attraction. Noble gases do not have interatomic forces other than weak dispersion forces.

Therefore, both (A) and (R) are false.

12. **Statement-I:** IUPAC name of compound

    $$HO - CH_2 - (CH_2)_3 - CH_2 - \overset{\overset{\displaystyle O}{\|}}{C} - CH_3 \text{ is}$$
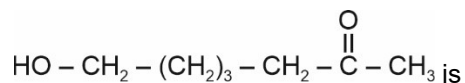
    7-hydroxyheptan-2-one.

    Statement-II: In IUPAC name –OH is taken as main functional group.

    (1) Both statements I and II are correct

    (2) Both statements I and II are incorrect

    (3) Statement-I is correct, statement-II is incorrect

    (4) Statement-I is incorrect, statement-II is correct

Answer (3)

Sol.
$$\underset{7}{HO - CH_2} - \underset{6}{CH_2} - \underset{5}{CH_2} - \underset{4}{CH_2} - \underset{3}{CH_2} - \underset{2}{\overset{\overset{\displaystyle O}{\|}}{C}} - \underset{1}{CH_3}$$

7-Hydroxyheptan-2-one
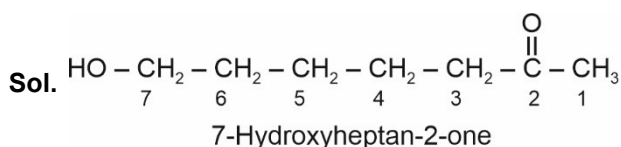
13. Adsorption principle is used in

    (1) Distillation

    (2) Differential extraction

    (3) Chromatography

    (4) Vacuum distillation

Answer (3)

Sol. Adsorption principle is used in chromatography in which different compounds are adsorbed on an adsorbent to different degrees.

14.

15.

16.

17.

18.

19.

20.

SECTION - B

Numerical Value Type Questions: This section contains 10 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. How many of the following compounds have sp^3 hybridized central atom?

    H_2O, NH_3, SiO_2, SO_2, CO, BF_3
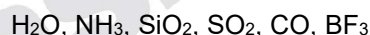
Answer (3)

Sol. H_2O, NH_3, SiO_2 have sp^3 hybridized central atom.

Structure of SiO_2 is
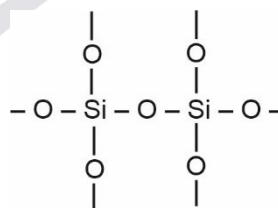
22. The spin only magnetic moment of complex ion $[Ni(NH_3)_6]^{2+}$ is x × 10^{-1} BM

    The value of x is _____ (Nearest integer)

Answer (28)

Sol. NH_3 acts as WFL with Ni^{+2} and hybridisation of complex $[Ni(NH_3)_6]^{2+}$ is sp^3d^2

$Ni^{+2} = 3d^8$

No. of unpaired electron = 2

$$\mu = \sqrt{n(n+2)} = \sqrt{2(4)} = \sqrt{8}$$
$$= 2.82$$
$$= 28.2 \times 10^{-1}\,BM \Rightarrow x = 28$$

23. If one Faraday of electricity is used in the discharging of Cu^{2+}, then find the mass (in g) of Cu deposited (Nearest integer)

Answer (32)

Sol. $Cu^{2+} + 2e^- \rightarrow Cu$

Since one mol Cu is deposited by 2 mol or say 2 Faraday charge hence the mol of Cu deposited will be 0.5 mol

Mass of Cu deposited = 63.5 g mol^{-1} × 0.5 mol

$$= 31.75\,g \simeq 32\,g$$

24. The total number of different alkanes formed when the following mixture is subjected to electrolysis: $CH_3COONa(aq.)$ and $C_2H_5COONa(aq.)$ (do not consider disproportionation reaction).

Answer (03.00)

Sol. Ethane, butane and propane are formed when CH_3COONa and C_2H_5COONa undergo electrolysis.

25. Moles of CH_4 required for formation of 22 gm of CO_2 is m × 10^{-2}.

The value of m is

Answer (50)

Sol.

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$
$$\text{22 gm}$$
$$\text{0.5 mole} = 0.5\,\text{mole}$$

m × 10^{-2} = 0.5

m = 50

26. How many of the following compounds have sp^3 hybridized central atom?

BF_3, $BeCl_2$, NH_3, CH_4, H_2O, SO_2, CO_2

Answer (3)

Sol. NH_3, CH_4, H_2O have sp^3 hybridized central atoms.

27. How many of the following can be used as electrode in batteries?
    (i) Zinc
    (ii) Zinc-Mercury amalgam
    (iii) Lead
    (iv) Graphite

Answer (4)

Sol. All 4 given species can be used as electrode in batteries.

28. If the energy of radiation having wavelength of 242 nm is x × 10^{-19}J, then find nearest integer value of x.

Given : Plank's constant = 6.6 × 10^{-34} Joule-Second, C = 3 × 10^8 ms^{-1}

Answer (8)

Sol. $E = \dfrac{hC}{\lambda} = \dfrac{6.6 \times 10^{-34} \times 3 \times 10^8}{242 \times 10^{-9}}$ Joule

$$= \frac{19.8 \times 10^{-26}}{242 \times 10^{-9}}$$

$$= 8.2 \times 10^{-19}\,\text{Joule}$$

$$\simeq 8 \times 10^{-19}\,\text{Joule}$$

29. How many of the following statements are true?
    (i) Chromate ion is square planar.
    (ii) Green manganate ion is diamagnetic.
    (iii) Dichromate can be prepared using chromate.
    (iv) Dark green $KMnO_4$ disproportionate in acidic medium and neutral medium.
    (v) For d-block elements, ionic character decreases for increasing oxidation no. of metal in oxides.

Answer (02)

Sol. (iii) and (v) are correct.

The green manganate ion is paramagnetic with one unpaired e$^-$ but the permanganate is diamagnetic

$$Na_2CrO_4 + H^+ \rightarrow Na_2Cr_2O_7 + Na^+ + H_2O$$

(Ref : NCERT)

30.