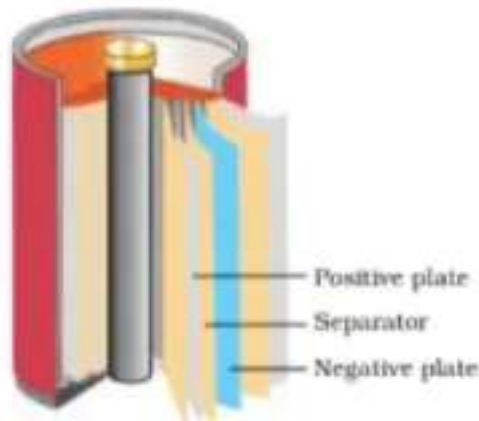# PART : CHEMISTRY

1. Which of the following metals used in battery industry?

(I) Fe   (II) Mn   (III) Ni   (IV) Cd   (V) Cr

(1) (I) and (II)   (2) (II) and (IV)   (3) (I) and (IV)   (4) (III) and (IV)

Ans. **(4)**

Sol.

— Positive plate
— Separator
— Negative plate

A rechargeable nickel-cadmium cell in a jelly roll arrangement and separated by a layer soaked in moist sodium or potassium hydroxide.

Another important secondary cell is the nickel-cadmium cell which has longer life than the lead storage cell but more expensive to manufacture. We shall not go into details of working of the cell and the electrode reactions during charging and discharging. The overall reaction during discharge is:

$Cd (s) + 2Ni(OH)_3 (s) \rightarrow CdO (s) + 2Ni(OH)_3 (s) + H_2O (l)$
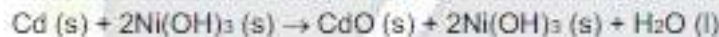
2. Select the correct option for isobaric process :
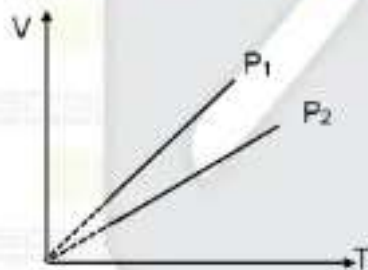
(1) $P_1 = P_2$ (2) $P_1 > P_2$ (3) $P_2 > P_1$ (4) $P_2 \geq P_1$

Ans. **(3)**

Sol. $PV_{(fixed)} = nRT$

$P \propto T$

∴ order of pressure : $P_2 > P_1$

3. Among the following solution showing positive deviation :

(1) Acetone + $CHCl_3$ (2) Acetone + CS_2

(3) $HNO_3 + H_2O$ (4) $HCOOH + H_2O$

Ans. **(2)**

Sol. Remaining shows negative derivation.

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4. **Statement-I :** Noble gases have very high boiling point.

Statement-II : Noble gases molecules have strong dispersion forces.

(1) Both statements are correct.

(2) Statement I is correct and statement II is incorrect.

(3) Statement I is incorrect and statement II is correct.

(4) Both statements are incorrect.

Ans. **(4)**

5. Amongs the following white precipitate is :

(1) PbI_2 (2) $(NH_4)_2S$ (3) $(NH_4)_3AsO_4.12MoO_3$ (4) $PbSO_4$

Ans. **(4)**

Sol. (1) $PbI_2 \longrightarrow$ yellow ppt

(2) $(NH_4)_2S \longrightarrow$ soluble

(3) $(NH_4)_3AsO_4.12MoO_3 \longrightarrow$ yellow ppt

6. What is the correct order of electron gain enthalpy of following?

(1) $S > Ar > F > Br$ (2) $F > Br > S > Ar$ (3) $Ar > S > Br > F$ (4) $Ar > F > Br > S$

Ans. **(3)**

Sol. We have to take with sign, if magnitude wise electron gain enthalpy is not asked

Element	Electron gain enthalpy (KJ/mol)
F	− 333
S	− 200
Br	− 325
Ar	+ 96

7. $Fe^{3+}_{(aq)} + SCN^-_{(aq)} \rightleftharpoons Fe(SCN)^{2+}_{(aq)}$

Value of K_c is :

(1) $\dfrac{[Fe(SCN)^{2+}]}{[Fe^{+3}][SCN^-]}$ (2) $\dfrac{[Fe^{-3}][SCN^-]}{[Fe(SCN)^{2+}]}$ (3) $\dfrac{[Fe^{+3}]+[SCN^-]}{[Fe(SCN)^{2+}]}$ (4) $\dfrac{[SCN^-]}{[Fe^{+3}][Fe(SCN)^{2+}]}$

Ans. **(1)**

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

8. Two combining atomic orbitals :

(A) Must have same energy

(B) Must have same symmetry about the molecular axis

(C) Must overlap to less extent

(D) Must have unsymmetry about the molecular axis.

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

Ans. **(2)**

Sol. (A) The combining atomic orbitals must have the same or nearly the same energy.

(B) The combining atomic orbitals must have the same symmetry about the molecular axis.

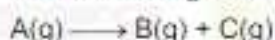(C) The combining atomic orbitals must overlap to the maximum extent.

9. For first order gaseous reaction

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

Initial pressure is P_i and total pressure after time t is P_t. Then the rate constant of reaction is _____.

(1) $\dfrac{2.303}{t} \log \dfrac{P_i}{(2P_i - P_t)}$

(2) $\dfrac{2.303}{t} \log \dfrac{P_i}{(P_i - P_t)}$

(3) $\dfrac{2.303}{t} \log \dfrac{2P_i}{(P_i - P_t)}$

(4) None of these

Ans. **(1)**

Sol.

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

t = 0	P_i	0	0
t = t	$P_i - x$	x	x
t = ∞	0	P_i	P_i

$K = \dfrac{2.303}{t} \log \dfrac{P_\infty - P_i}{P_\infty - P_t} = 2.303 \log \dfrac{2P_i - P}{2P_i - P_t}$

$K = \dfrac{2.303}{t} \log \dfrac{P_i}{2P_i - P_t}$

10. Calculate the Gibbs free energy (ΔG^0) in KJ for the reaction given below if

$K_p = 70.95$ at 300 K

$CO_{2(g)} + H_{2(g)} \rightleftharpoons CO_{(g)} + H_2O_{(g)}$

log 70.95 = 1.8509

(1) –10.632 KJ   (2) –12.653 KJ   (3) –15.982 KJ   (4) None of these

Ans. **(1)**

Sol. Given $K_p = 70.95$ at 300K

The reaction is

$CO_{2(g)} + H_{2(g)} \rightleftharpoons CO_{(g)} + H_2O_{(g)}$

We know the relation

$\Delta G^0 = -2.303 \, RT \log K_p$

$\Delta G^0 = -2.303 \times 8.314 \times 300 \log (70.95)$

$= -10632.4 \text{ J}$

$= -10.632 \text{ KJ}$

11. Electrolytic conductance does not depend on

(1) Nature of electrolyte   (2) Nature of electrode

(3) Nature of solvent added   (4) Concentration of electrolyte

Ans. **(2)**

Sol. As per NCERT.

The conductance of electricity by ions present in the solutions is called electrolytic or ionic conductance.

The conductivity of electrolytic (ionic) solutions depends on:

(i) the nature of the electrolyte added

(ii) size of the ions produced and their solvation

(iii) the nature of the solvent and its viscosity

(iv) concentration of the electrolyte

(v) temperature (it increases with the increase of temperature).

12. **Statement-I :** CFT can explains the strength of anionic ligands.

Statement-II : VBT does not explain the colour exhibited by co-ordination compounds.

(1) Both statements are correct.

(2) Both Statements are incorrect.

(3) Statement I is correct and statement II is incorrect.

(4) Statement I is incorrect and statement II is correct.

**Ans.** **(1)**

Sol. Theory based.

13. **Assertion:** K_2MnO_4 changes into $KMnO_4$ in neutral or acidic solution

Reason: K_2MnO_4 under goes disproportionation in neutral or acidic medium.

(1) Both A and R are true and R is the correct explanation of A.

(2) Both A and R are true but R is NOT the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

Ans. **(1)**

Sol. Potassium permanganate is prepared by fusion of MnO_2 with an alkali metal hydroxide and an oxidising agent like KNO_3. This produces the dark green K_2MnO_4 which disproportionates in a neutral or acidic solution to give permanganate.
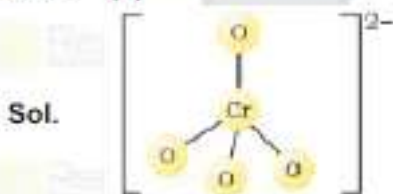
$$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$$

$$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$$
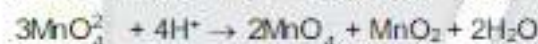
14. **Statement-I :** The structure of CrO_4^{2-} ion square planar

Statement-II : Chromate ion charges to dichromate ion in acidic medium.

(1) Both statements are correct.

(2) Both Statements are incorrect.

(3) Statement I is correct and statement II is incorrect.

(4) Statement I is incorrect and statement II is correct.

Ans. **(4)**

Sol.

Chromate ion
Tetrahedral

$$\Rightarrow 2CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$$

15. (I) Shape of $[Ni(CN)_4]^{2-}$ is square planar

(II) VBT cannot explain ligand field strength

(III) For cis-$[Pt(en)_2Cl_2]^{+2}$ isomerism is not exhibited

(IV) $[NiCl_4]^{2-}$ is square planar

select current statements

(1) I, II   (2) III, IV   (3) I, III   (4) II, IV

Ans. **(1)**

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Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) – 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555   7340010333   facebook.com/ResonanceEdu   twitter.com/ResonanceEdu   www.youtube.com/resowatch   blog.resonance.ac.in

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Sol. (I) dsp^2, sq. planar

(II) True

(III) It is optically active {d- & l-forms }

(IV) sp^3, tetrahedral

16. Match the column:
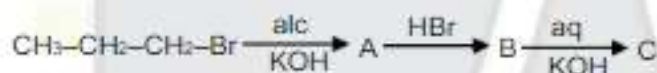
	Column-I		Column-II
(A)	Glucose + red P/HI	(1)	No reaction
(B)	Glucose + HNO_3	(2)	Gluconic acid
(C)	Glucose + $NaHCO_3$	(3)	Saccharic acid
(D)	Glucose + Br_2/H_2O	(4)	n-Hexane

(1) A – 1, B – 2, C – 3, D – 4   (2) A – 3, B – 1, C – 4, D – 2

(3) A – 2, B – 3, C – 4, D – 1   (4) A – 4, B – 3, C – 1, D – 2

Ans. **(4)**

17. Find out the final product (C)

$$CH_3\text{–}CH_2\text{–}CH_2\text{–}Br \xrightarrow[\text{KOH}]{\text{alc}} A \xrightarrow{\text{HBr}} B \xrightarrow[\text{KOH}]{\text{aq}} C$$

(1) Propane   (2) Propan-1-ol   (3) Propan-2-ol   (4) Propene

Ans. **(3)**

Sol.

18. Adsorption method is used in

(1) Chromatography   (2) Extraction

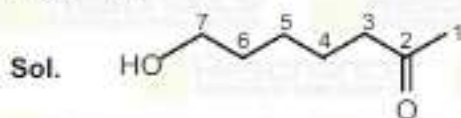(3) Distillation   (4) Sublimation

Ans. **(1)**

19. Correct IUPAC name of

(1) 7-Hydroxyheptan-2-one   (2) 6-Hydroxyheptan-2-one

(3) 2-Oxoheptan-7-ol   (4) Hydrogen-6-oxoheptane

Ans. **(1)**

Sol.

7-Hydroxyheptan-2-one

20. **Statement-I :** pKa of phenol = 10 and pKa of ethyl alcohol = 15.6
    Statement-II : Ethyl alcohol is more acidic than phenol.
    (1) Both Statement-I & Statement-II are correct.
    (2) Both Statement-I & Statement-II are incorrect.
    (3) Statement-I is correct whereas Statement-II is incorrect.
    (4) Both Statement-I and Statement-II are incorrect.

Ans. **(3)**
Sol. (3) Statement-I is correct whereas Statement-II is incorrect.

21. The sextet carbon species eligible as electrophile is
    (1) Carbocation   (2) Carbanion
    (3) Pentavatent carbon   (4) Free radial carbon

Ans. **(1)**
Sol. Carbocation is every charge electrophile with six electron in valence shell.

22. **Statement-I :** Alcohol act as both nucleophile and electrophile.
    Statement-II : Alcohol reacts with active metals like Na, K to product H_2 gas.
    (1) Both Statement-I & Statement-II are correct.
    (2) Both Statement-I & Statement-II are incorrect.
    (3) Statement-I is incorrect whereas Statement-II is correct.
    (4) Both Statement-I and Statement-II are incorrect.

Ans. **(3)**
Sol. (3) Statement-I is incorrect whereas Statement-II is correct.

23. In the reaction of combustion of CH_4, it gives 22g of CO_2. Find the moles of CH_4 in terms of $x \times 10^{-2}$ mol.

Ans. **(50)**
Sol. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$
      $ 22g$

$$mol = \frac{22}{44} = \frac{1}{2} \ mol$$

$$\frac{n_{CH_4}}{1} = \frac{n_{CO_2}}{1} \quad \text{no of moles of } CH_4 = \frac{1}{2}$$

$$n_{CH_4} = \frac{1}{2} \quad \Rightarrow \quad \frac{1}{2} \times 100 \times 10^{-2}$$

$$50 \times 10^{-2}$$

24. If one faraday of electricity is used in the discharging of Cu^{2+}. Then find the mass in (g) of Cu deposited (Nearest integer) (Cu = 63.5)

Ans. **(32)**
Sol. $Cu^{2+} + 2e^- \longrightarrow Cu$
      $1 F \longrightarrow Eq.wt$
      n-factor = 2

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

$$E_w = \frac{63.5}{2} \approx 32g$$

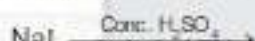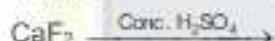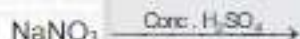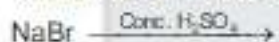**25.** For $[Ni(NH_3)_6]^{+2}$ spin only magnetic moment is $x \times 10^{-1}$ BM. Value of x is_____. (Nearest integer)
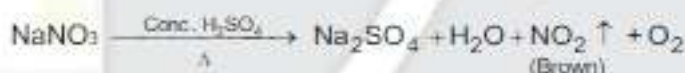
Ans. (28)

Sol.

$$_{28}Ni^{+2} = [Ar]$$

(3d⁶: ⇅ ⇅ ⇅ ↑ ↑) (4s) (4p) (4d)

sp^3d^2
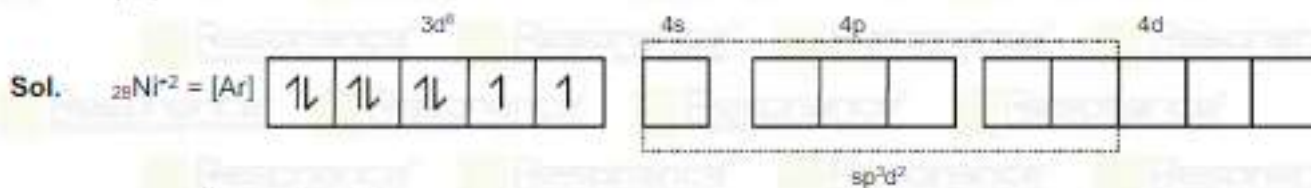
$n = 2$, $\sqrt{2(2+2)} = \sqrt{8}$ BM = 2.8 BM = 28×10^{-1} BM

26. What is molar mass (in g/mol) of salt, which will not produce coloured gas in the following

$NaBr \xrightarrow{Conc. H_2SO_4}$

$NaNO_3 \xrightarrow{Conc. H_2SO_4}$

$CaF_2 \xrightarrow{Conc. H_2SO_4}$

$NaI \xrightarrow{Conc. H_2SO_4}$

Ans. (78)

Sol.

$NaBr \xrightarrow[\Delta]{Conc. H_2SO_4} Na_2SO_4 + Br_2 \uparrow + SO_2$
(Red brown)

$NaI \xrightarrow[\Delta]{Conc. H_2SO_4} Na_2SO_4 + I_2 \uparrow + SO_2$
(Violet)

$CaF_2 \xrightarrow[\Delta]{Conc. H_2SO_4} CaSO_4 + HF \uparrow$
(colourless)

$NaNO_3 \xrightarrow[\Delta]{Conc. H_2SO_4} Na_2SO_4 + H_2O + NO_2 \uparrow + O_2$
(Brown)

$CaF_2 = 78$ g/mol

27. How many of the following have sp^3 hybridisation ?
SO_2, H_2O, NH_3, BCl_3, SiO_2, CO_2, $BeCl_2$

Ans. (3)

Sol. sp^2 : SO_2, BCl_3
sp^3 : H_2O, NH_3, SiO_2
sp : $BeCl_2$, CO_2

28. The total number of different alkanes formed when the following mixture is subjected to electrolysis (does not consider dispropotional product).
$CH_3COONa + C_2H_5COONa \rightarrow$

Ans. (3)

Sol.

$CH_3-\overset{O}{\overset{\|}{C}}-ONa$
$C_2H_5-\overset{O}{\underset{\|}{C}}-ONa$ $\Bigg\}$ $\longrightarrow$ $CH_3 - CH_3$
$C_2H_5 - C_2H_5$
$CH_3 - C_2H_5$

29.

$\xrightarrow[\text{(ii) NH}_4\text{Cl}]{\text{(i) PhMgBr}}$ P

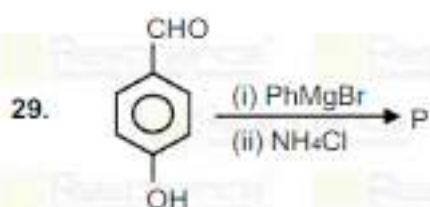Find the number of OH group in (P)

Ans. (2)

Sol.

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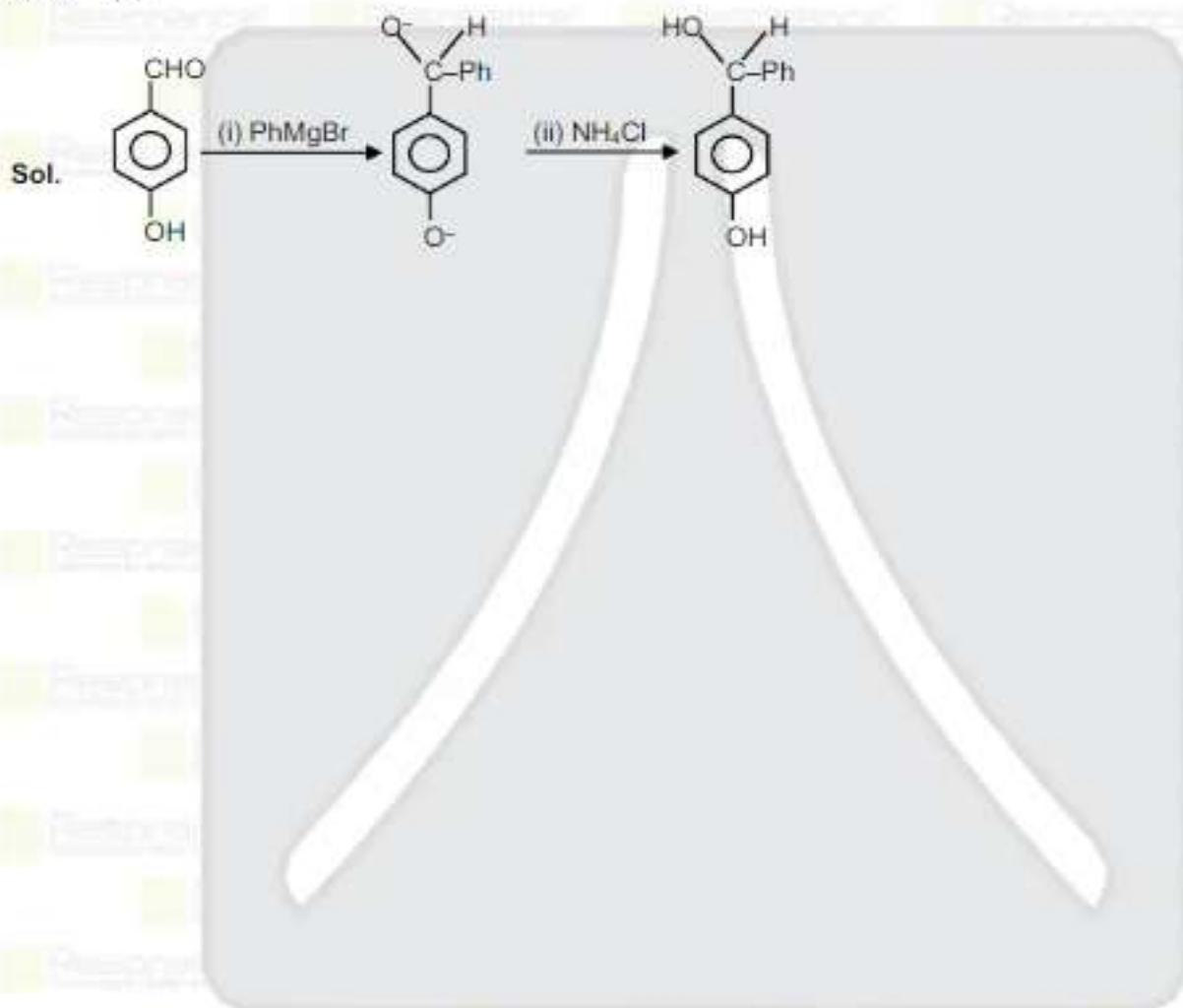Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222
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