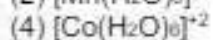
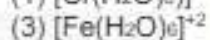
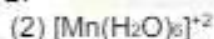
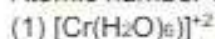


PART : CHEMISTRY

1. Which one of the following complexes will exhibit the least paramagnetic behaviour ?

Atomic number Cr = 24, Mn = 25, Fe = 26, Co = 27



Ans. (4)

Sol. $[\text{Cr}(\text{H}_2\text{O})_6]^{+2}$

$$x + 6 \times 0 = 2$$

$$x = 2$$



$$n = 4$$



$$n = 5$$



$$n = 4$$



$$n = 3$$

2. Consider the following statements :

Statement – I : Stability of +1 oxidation state increases down the group in group-13.

Statement – II : Atomic radius of Ga is greater than that of Al.

(1) Both Statement I and Statement II are true.

(2) Both Statement I and Statement II are false.

(3) Statement I is true but statement II is false.

(4) Statement I is false but statement II is true.

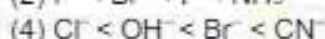
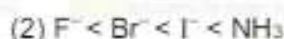
Ans. (3)

Sol. Statement I : due to inert pair effect

Statement II : $r_{\text{Al}} > r_{\text{Ga}}$

${}_{31}\text{Ga}$ has less radius because of poor shielding by d-electrons.

3. The correct order of ligand field strength is :



Ans. (1)

Sol. Theory based

4. The molar conductivities of a divalent cation (M^{2+}) and divalent anion (A^{2-}) are $57 \text{ Scm}^{-1}\text{mol}^{-1}$ and $73 \text{ Scm}^{-1}\text{mol}^{-1}$ at infinite dilution respectively. Then find the total molar conductivity shown by their compound at infinite dilution in $\text{Scm}^{-1}\text{mol}^{-1}$

(1) 130

(2) 187

(3) 260

(4) 203

Ans. (1)

Sol. $\Lambda_m^0 = 57 + 73 = 130$

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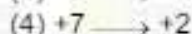
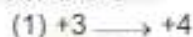
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5. Identify the change occurring in oxidation state of Mn in cell reaction of dry cell of clock during its use at cathode



Ans. (3)

Sol. Anode: $\text{Zn(s)} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$

Cathode: $\text{MnO}_2 + \text{NH}_4^+ + \text{e}^- \rightarrow \text{MnO(OH)} + \text{NH}_3$

In the reaction at cathode, manganese is reduced from the +4 oxidation state to the +3 state. Ammonia produced in the reaction forms a complex with Zn^{2+} to give $[\text{Zn}(\text{NH}_3)_4]^{2+}$. The cell has a potential of nearly 1.5 V.



Fig : A commercial dry cell consists of a graphite (carbon) cathode in a zinc container; the latter acts as the anode.

6. According to Dalton's atomic theory which of the following statements are correct ?

(i) Matter consists of indivisible atoms.

(ii) All the atoms of a given element have not identical properties including different mass. Atoms of different elements differ in mass.

(iii) Compounds are formed when atoms of different elements combine in a fixed ratio.

(iv) Chemical reactions involve reorganisation of atoms. These are neither created nor destroyed in a chemical reaction. Dalton's theory could explain the laws of chemical combination

(1) i, ii and iii

(2) i, ii and iv

(3) ii, iii and iv

(4) i, iii and iv

Ans. (4)

Sol. Theory based

7. Which of the following are correct statement(s) for given species ?

O^{2-} , F^- , Na^+ , Mg^{2+}

(a) O^{2-} is largest in size.

(b) Mg^{2+} is smallest in size

(c) All have same effective nuclear charge

(d) All are isoelectronic

Select correct options :

(1) a, b and c

(2) a, b and d

(3) b, c and d

(4) a, c and d

Ans. (2)

Sol. Radius order

${}_{8}\text{O}^{2-} > {}_{9}\text{F}^- > {}_{11}\text{Na}^+ > {}_{12}\text{Mg}^{2+}$

$$Z_{\text{eff}} \propto \frac{1}{r}$$

8. One litre solution of 0.2 M glucose is separated with its pure solvent with semi-permeable membrane, 0.1 moles of NaCl is added to the solution. The change in osmotic pressure of solution (in atm) will be at 300

K.....take ($R = 0.083 \frac{\text{atm lit}}{\text{mol K}}$)

Ans. (5)

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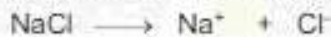
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Sol. $\pi_1 = i_1 C_1 RT = 1 \times 0.2 \times 0.083 \times 300$



$$1 \text{ mol} \quad 1 \text{ mol} \quad 1 \text{ mol}$$

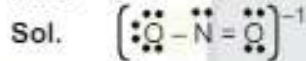
$$\pi_2 = i_2 C_2 RT = (0.2 + 0.1 \times 2) \times 0.083 \times 300$$

$$\pi_{\text{change}} = (0.4 - 0.2) \times 0.083 \times 300$$

$$= 0.2 \times \frac{1}{12} \times 300 = 5$$

9. In the Lewis dot structure for NO_2^- total number of valence electron around nitrogen is :

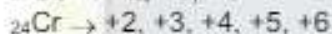
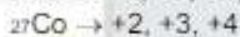
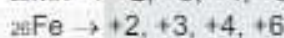
Ans. 8



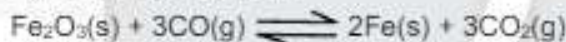
10. Which metal shows highest and maximum number of oxidation state?

- (1) Mn (2) Fe (3) Co (4) Cr

Ans. (1)



11. Consider the reaction :



Which of the following will not affect the equilibrium state ?

- (I) Addition of Fe_2O_3 (II) Addition of CO
(III) Decreasing mass of Fe_2O_3 (IV) Removal of CO
(1) (III) & (IV) (2) (I) & (IV)
(3) (I) & (III) (4) All will affect the equilibrium

Ans. (3)

Sol. Solid will not exist in equilibrium constant

12. If the value of mass of electron is 9.1×10^{-31} kg. Find out the velocity of electron in first orbit of H-atom

.... $\times 10^5 \frac{\text{m}}{\text{s}}$ (Answer to the nearest integer)

Ans. 22

Sol. $V_n = 2.18 \times 10^6 \frac{Z}{n} \frac{\text{m}}{\text{s}}$

$$= 2.18 \times 10^6 \frac{\text{m}}{\text{s}}$$

$$= 21.8 \times 10^5 \frac{\text{m}}{\text{s}}$$

13. If C = 42.11%, H = 6.4% & O = 51.49% by mass and molar mass is 342 g/mol, then molecular formula of the compound is -

- (1) $\text{C}_{11}\text{H}_{22}\text{O}_{12}$ (2) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (3) $\text{C}_{10}\text{H}_{22}\text{O}_{11}$ (4) $\text{C}_{11}\text{H}_{22}\text{O}_{11}$

Ans. (2)





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14. **Assertion :** Enthalpy of neutralisation of monobasic strong acid and monoacidic strong base is always almost 57 kJ/mol.

Reason : Enthalpy of neutralisation is when 1 mol OH⁻ and 1 mol H⁺ reacts to form 1mol H₂O

Select correct option

- (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. Theory based

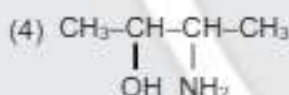
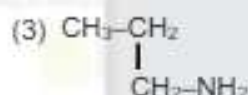
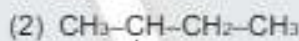
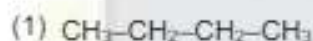
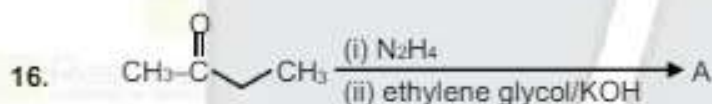
15. What is the spin only magnetic moment in BM (to the nearest integer) of ion which acts as strong oxidising agent in aqueous solution ?

${}_{23}\text{V}^{2+}$, ${}_{22}\text{Ti}^{2+}$, ${}_{27}\text{Co}^{3+}$, ${}_{25}\text{Mn}^{2+}$, ${}_{24}\text{Cr}^{2+}$

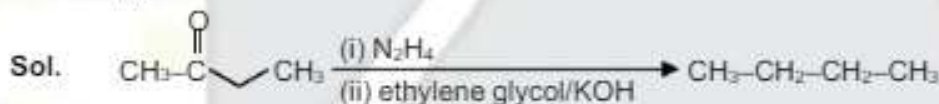
Ans. (5)

Sol. (i) $E_{\text{RPCo}^{3+}|\text{Co}^{2+}}^0 = 1.81 \text{ V}$ (ii) ${}_{27}\text{Co}^{3+}$ has 4 unpaired electrons

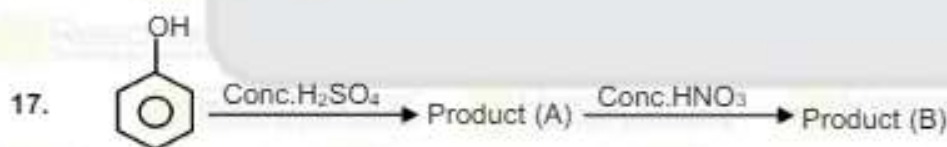
(iii) $\sqrt{4(4+2)} = \sqrt{24} \approx 5 \text{ BM}$



Ans. (1)

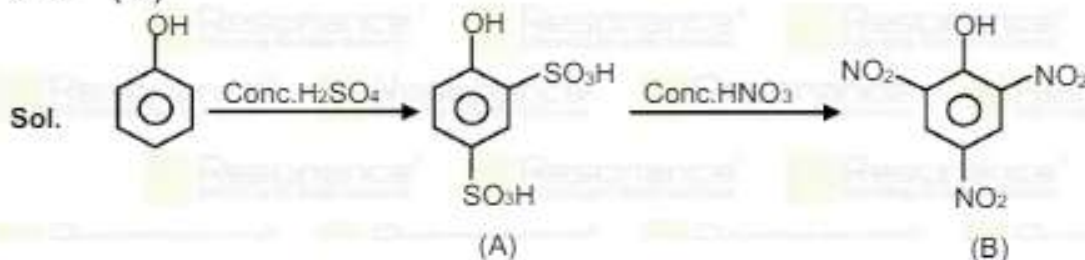


Wolf kischner reaction



Total sum of oxygen atoms in product (A) and product (B) are.

Ans. (14)



Total sum of oxygen atoms in product (A) and product (B) are 14.

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18. **Statement-1** : Cis has more dipole moment than trans always.

Statement-2 : Trans But-2-ene has dipole moment = 0.

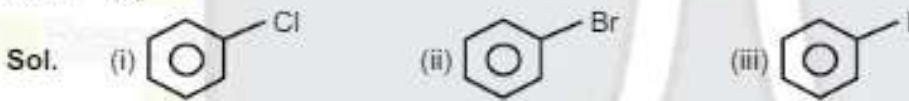
- (1) **Statement-1** is correct and **Statement-2** is correct.
- (2) **Statement-1** is correct whereas **Statement-2** is incorrect.
- (3) Both **Statement-1** & **Statement-2** are correct.
- (4) Both **Statement-1** & **Statement-2** are incorrect.

Ans. (1)



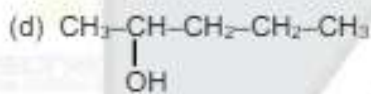
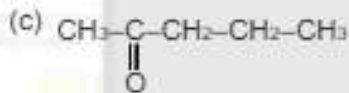
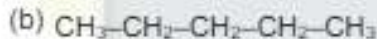
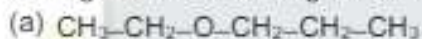
Which of the following Haloarenes can be obtained by sandmeyer reaction.

Ans. (3)



Give the sandmeyer reaction.

20. Arrange them increasing order of boiling point.



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

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

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

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

Ans. (1)

Sol. Alcohols make H-bonding $\text{BP} \propto \text{polarity} \propto \text{H-Bonding} \propto \frac{1}{\text{Branching}}$

21. Ninhydrin test is given by-

(1) Starch

(2) Cellulose

(3) PVC

(4) Egg Albumin

Ans. (4)

Sol. Egg Albumin contains protein so it is give Ninhydrin test.

22. Sum of sigma and π -bond present in ethylene.

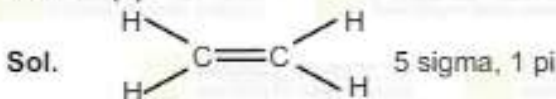
(1) 4 sigma, 1 pi

(2) 5 sigma, 1 pi

(3) 6 sigma, 0 pi

(4) 4 sigma, 2 pi

Ans. (2)








Option (2) is correct.

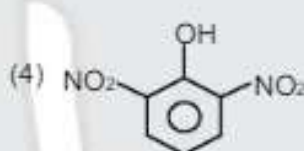
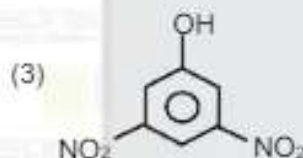
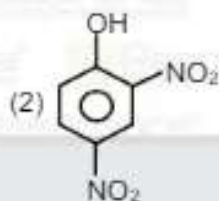
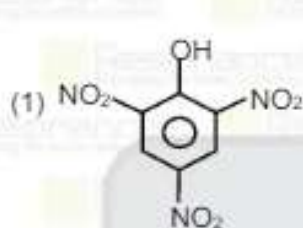
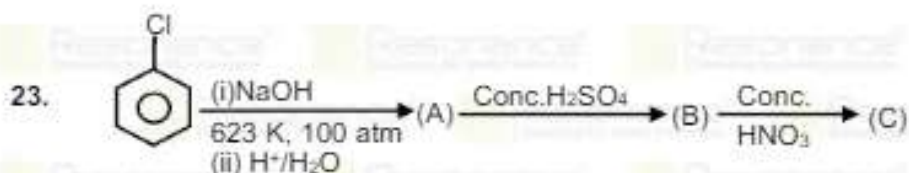
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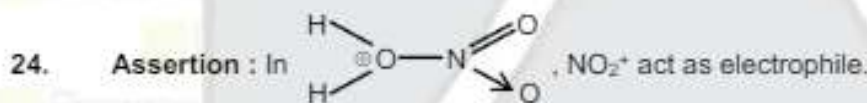
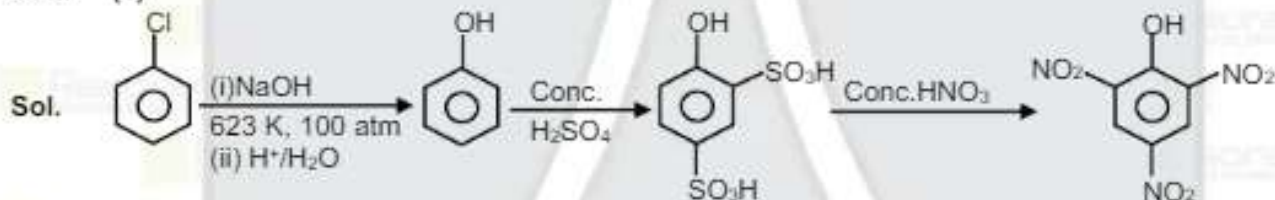
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Ans. (1)



Reason : Increasing lewis base concentration on benzene increasing electrophilic reaction which helps in protonation in electrophilic substitution reaction.

- (1) Both Assertion & Reason are correct. (2) Both Assertion & Reason are incorrect.
(3) Assertion is correct and reason is incorrect. (4) Assertion is incorrect and reason is incorrect

Ans. (1)

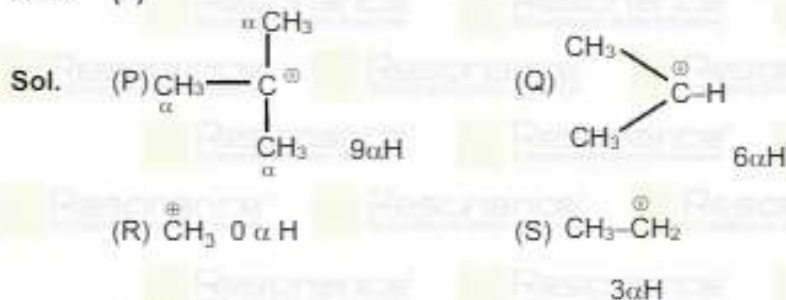
Sol. (1) Both Assertion & Reason are correct.

25. Arrange the following carbocation in increasing order of their stability.

- (P) $(\text{CH}_3)_3\text{C}^+$ (Q) $(\text{CH}_3)_2\text{C}^+\text{H}$ (R) C^+H_3 (S) $\text{CH}_3\text{-C}^+\text{H}_2$

- (1) $\text{P} > \text{Q} > \text{S} > \text{R}$ (2) $\text{S} > \text{P} > \text{Q} > \text{R}$ (3) $\text{R} > \text{Q} > \text{S} > \text{P}$ (4) $\text{Q} > \text{S} > \text{P} > \text{R}$

Ans. (1)



Stability : $\text{P} > \text{Q} > \text{S} > \text{R}$

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