

Chemistry JEE Solutions 2022

Chemistry

1. Which of the following has least spin only magnetic moment.

- (1) Fe^{+3} (2) Fe^{+2}
 (3) Cu^{+2} (4) Ni^{+2}

Sol. Answer (3)

Electronic configurations are,

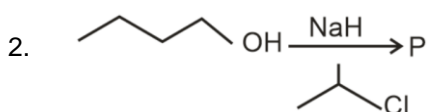
$\text{Fe}^{+3} = [\text{Ar}] 3d^5$ (5 unpaired electrons)

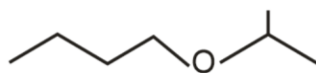
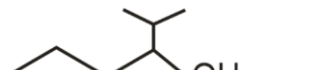


$\text{Fe}^{+2} = [\text{Ar}] 3d^6$ (4 unpaired electrons)

$\text{Cu}^{+2} = [\text{Ar}] 3d^9$ (1 unpaired electrons)

$\text{Ni}^{+2} = [\text{Ar}] 3d^8$ (2 unpaired electrons)

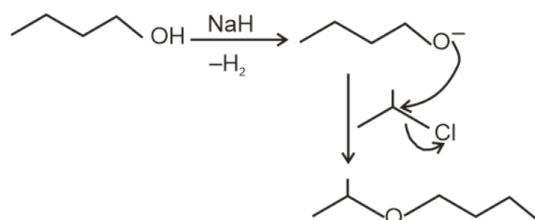
\therefore least spin only magnetic moment is of Cu^{+2} .



- (1) 
 (2) 
 (3) 
 (4) 

Sol. Answer (1)

NaH is a very strong base and will undergo acid base reaction very quickly

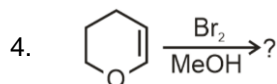
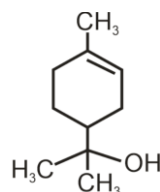


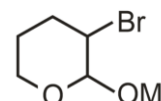
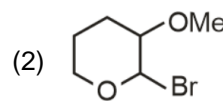
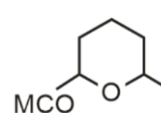
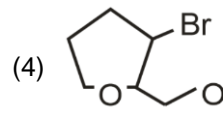
3. Dettol has two components, A has 6π e⁻s. What is B

- (1) Terpineol (2) Bithionol
 (3) Chloroxylenol (4) none of these

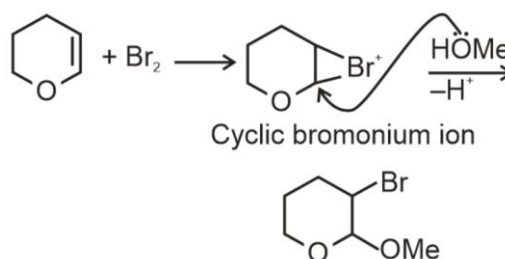
Sol. Answer (1)

B is terpineol. Its structure is



- (1)  (2) 
 (3)  (4) 

Sol. Answer (1)



5. $t_{1/2}$ of a reaction and pressure of reactant is given. Find the order of reaction

P_R^0	$t_{1/2}$
10 atm	5 min
20 atm	10 min

- (1) 1st order (2) 2nd order
 (3) zero order (4) $\frac{1}{2}$ order

Sol. Answer (3)

Since, $t_{1/2}$ of reaction is directly proportional to the initial pressure of the reactant. Hence, reaction will be zero order.

For zero order

$$t_{1/2} \propto P_0$$

6. **Assertion:** from a mixture of benzoic acid and naphthalene, benzoic acid can be separated using benzene.

Reason: Benzoic acid is soluble in hot water.

Sol. Answer (Assertion is false, Reason is true)

Assertion: Benzoic acid is soluble in alcohol, ether and benzene.

But a mixture of benzoic acid and naphthalene cannot be separated using benzene because both are soluble. (like dissolves like concept)

∴ Assertion is false

Benzoic acid is poorly soluble in water at room temperature and more soluble in hot water. Hence reason a true.

7. Correct order of electron gain enthalpy in magnitude is,

(1) F > Cl > Te > Po

(2) Cl > F > Te > Po

(3) Po > Te > Cl > F

(4) Cl > Te > Po > F

Sol. Answer (2)

$|\Delta H_{eg}|$ of group-17 elements

Cl > F > Br > I

$|\Delta H_{eg}|$ of group-16 elements

S > Se > Te > Po > O

∴ correct order of ΔH_g

Cl > F > Te > Po

Generally as the size increase, $|\Delta H_{eg}|$ decreases i.e. option (2) is correct answer.

8. Arrange the following species in decreasing order to their standard reduction potential value

1. Cl_2/Cl^{-1}

2. F_2/F^{-}

3. Na^+/Na

4. Li^+/Li

5. I_2/I^{-}

(1) 2 > 1 > 5 > 3 > 4

(2) 5 > 4 > 3 > 1 > 1

(3) 2 > 1 > 4 > 5 > 3

(4) 5 > 1 > 2 > 4 > 3

Sol. Answer (1)

Order of oxidising power of halogens is

$F_2 > Cl_2 > Br_2 > I_2$

∴ E_{red}^0 of $F_2 > Cl_2 > I_2$

Order of reducing power of alkali metal is
Li > Na

∴ of Li > Na or E_{red}^0 of Na > Li

∴ The decreasing order of E_{red}^0 is

$F_2 > Cl_2 > I_2 > Na > Li$ i.e. 2 > 1 > 5 > 3 > 4

9. If electron, proton, neutron and alpha particle have same value of kinetic energy, then what is the correct order of wavelength according to De-Broglie

(1) $\lambda_p = \lambda_n = \lambda_e = \lambda_\alpha$

(2) $\lambda_\alpha < \lambda_n < \lambda_p < \lambda_e$

(3) $\lambda_p < \lambda_e < \lambda_\alpha < \lambda_n$

(4) $\lambda_\alpha < \lambda_p < \lambda_e < \lambda_n$

Sol. Answer (2)

Since, $\lambda \propto \frac{1}{\sqrt{mE}}$

Kinetic energy is same for all the particle

$(mass)_\alpha > (mass)_n > (mass)_p > (mass)_e$

Hence order of de-Broglie wavelength is

$\lambda_\alpha < \lambda_n < \lambda_p < \lambda_e$

10. Which of the following is/are correct

S-I : BOD of polluted water may be 17 ppm

S-II: BOD represent the amount of oxygen to decompose biodegradable and non-biodegradable substances

(1) S-1 is correct (2) S-1 is correct

S-2 is correct (2) S-2 is not correct

(3) S-1 is not correct (4) S-1 is not correct

S-2 is correct (4) S-2 is not correct

Sol. Answer (2)

BOD is the amount of oxygen required by bacteria to breakdown organic matter present in a certain volume of a sample of water.

BOD of highly polluted water may be 17 ppm or more than it.

∴ S-1 is correct and S-2 is incorrect

11. Match the following correctly

(i) Zymase (A) Stomach

(ii) Urease (B) Yeast

(iii) Diastage (C) Malt

(iv) Pepsin (D) Soyabean

(1) (i) - B (i) - B

(ii) - D (2) (ii) - A

(iii) - C (iii) - C

(iv) - A (iv) - D

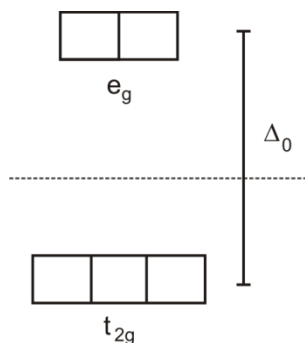
(i) - A (i) - D

(ii) - B (2) (ii) - C

(iii) - C (iii) - B

(iv) - D (iv) - A

Sol. Answer (1)



⇒ Higher is the CFSE (crystal field splitting energy) value lower is the wavelength of the light absorbed .

Higher CFSE ⇒ strong field ligands

∴ option (1) is the correct answer.

17. Statement 1: In Electrolytic refining of copper blister, copper gives precious metal.

Statement 2: In electrolysis of copper blister, anode is made of copper.

- (1) Statement 1 and 2 both are correct
- (2) Statement is correct but statement 2 is incorrect
- (3) Statement 1 is incorrect but statement 2 is correct
- (4) Statement 1 and 2 both are incorrect

Sol. Answer (1)

In electrolytic refining of blister Cu, precious metals like Au, Ag & Pt are deposited as anode mud.

So, statement 1 is true.

In electrolytic refining of Cu, anode is made of impure Cu and cathode is made of pure Cu

So, statement 2 is correct

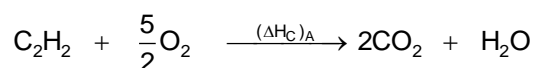
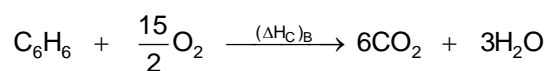
∴ Option (1) is correct answer

18. Heat of combustion for benzene and acetylene are -3900 and -642 joule. Then calculate heat of reaction (per mole) for following reaction



- (1) -658 J Mol^{-1} (2) $+658 \text{ J Mol}^{-1}$
- (3) -3000 J Mol^{-1} (4) -3400 J Mol^{-1}

Sol. Answer (2)

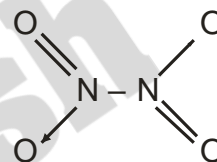
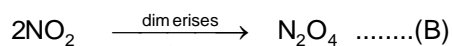
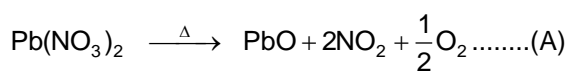


$$\begin{aligned} \Delta H_R &= 3(\Delta H_C)_{\text{Acetylene}} - (\Delta H_C)_{\text{Benzene}} \\ &= 3(-642) - (-3900) \\ &= -1926 + 3900 \\ &= 1974 \text{ J for 3 mole} \\ \therefore \Delta H_R \text{ for 1 mole} &= 658 \text{ J / mole} \end{aligned}$$

19. $Pb(NO_3)_2$ on heating gives A + PbO + O_2 A-dimerizes to give B. How many bridged oxygen atoms are present in B ?

- (1) 0 (2) 1
- (3) 2 (4) 3

Sol. Answer (1)



∴ Bridged oxygen atoms is 0.

20. The threshold frequency for a metal is 1.3×10^{15} Hz. Then, minimum energy required to eject the electron from metal surface is

$$[h = 6.62 \times 10^{-34} \text{ JS}]$$

- (1) $8.6 \times 10^{-19} \text{ J}$ (2) $7.8 \times 10^{-16} \text{ J}$
- (3) $2.3 \times 10^{-19} \text{ J}$ (4) $6.4 \times 10^{-19} \text{ J}$

Sol. Answer (1)

∴ Minimum energy

Required to eject the electron

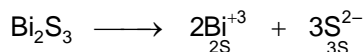
$$= 6.62 \times 10^{-34} \times 1.3 \times 10^{15}$$

$$= 8.606 \times 10^{-19}$$

∴ option (1) is correct answer

21. The solubility product (K_{SP}) of Bi_2S_3 is 1.08×10^{-73} at a certain temperature. The molar solubility of the salt at this temperature is 1×10^{-x} M. The value of x is ?

Sol. Answer (15)



Where s = solubility of Bi_2S_3

$$K_{SP} = [Bi^{+3}]^2 [S^{2-}]^3$$

$$K_{SP} = (2s)^2(3s)^3$$

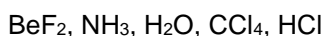
$$1.08 \times 10^{-73} = 4 \times 27s^5$$

$$s^5 = 1 \times 10^{-75}$$

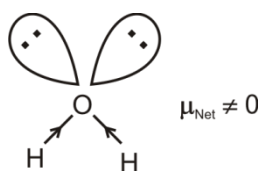
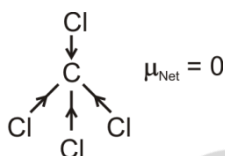
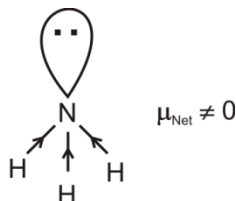
$$s = 1 \times 10^{-15}$$

∴ The value of x = 15

22. Which of the following has net dipole moment non-zero.



Sol. Answer (NH₃, H₂O, HCl)



23. T_{1/2} of the reaction is 340 sec. If the initial pressure of reactant is 55.8 kPa and t_{1/2} of the reaction is 170 sec. If the initial pressure of reactant is 27.8 kPa.

Determine the order of the reaction

Sol. Answer (0)

$$(P_0)_1 = 55.8 \text{ kPa} \quad t_{1/2} = 340 \text{ sec}$$

$$(P_0)_2 = 27.8 \text{ kPa} \quad t_{1/2} = 170 \text{ sec}$$

$$\therefore t_{1/2} \propto \text{initial pressure of reactant}$$

$$\text{i.e. } t_{1/2} \propto \text{initial concentration of reactant}$$

∴ Order of reaction is zero order.

24. During electrolysis process of FeSO₄, 0.374 g of Fe is deposited on cathode, when 1.5 A current is passed through the solution for 'x' minutes.

Then the value of x is

[Assume current efficiency as 100% and molar mass of Fe is 56 g/mol]

Sol. Answer (14.32)

No of equivalents of Fe deposited = No. of faradays of charge passed

$$\therefore \text{No. of faradays} = \frac{0.374}{(56/2)} = \frac{0.748}{56} f$$

$$\text{No. of faradays} = \frac{i \times t}{96500}$$

$$\frac{0.748}{56} = \frac{1.5 \times t}{96500}$$

$$\Rightarrow t = 859.31 \text{ sec} \quad \text{or} \quad 14.32 \text{ min}$$

Value of x = 14.32 min

25. In an organic compound containing protein, amount of protein is 0.3%. Then minimum molecular weight of organic compound (in g/ mole) is

[m.wt. of protein = 75]

Sol. Answer (25000)

For min. molecular weight of organic compound, 1 molecule of protein must be present

∴ Min molecular weight of organic compound

$$= \frac{75 \times 100}{0.3}$$

$$= 25000 \text{ g / mole}$$

26. Nitrogen gas is filled in a rigid container. At 6:00AM, the pressure is 30 atm at 27°C, and at 3:00 PM, pressure because 'p' atm at 45°C.

Find the value of 'p'

[Round off to the nearest integer]

Sol. Answer (32)

Since the container is rigid so, V and n remains constant

$$\therefore \frac{P_1}{P_2} = \frac{T_1}{T_2}$$

$$\Rightarrow \frac{30}{P_2} = \frac{300}{318}$$

$$\Rightarrow P_2 = 31.8 \text{ atm}$$

∴ Value of P = 31.8 atm

Rounded off to nearest integer = 32 atm

