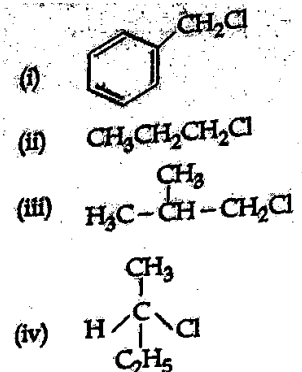


AIPMT 2014 Chemistry Solution (Set – Q)

1. Which of the following compounds will undergo racemisation when solution of KOH hydrolyses?



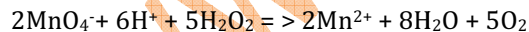
- (1) (ii) and (iv)
 (2) (iii) and (iv)
 (3) (i) and (iv)
 (4) (i) and (ii)

Solution) The racemization is experienced when bulky groups are attached to the central carbon, so (iii) and (iv) compounds would show racemization.

2. The reaction of aqueous KMnO_4 with H_2O_2 in acidic conditions gives:

- (1) Mn^{2+} and O_2
 (2) Mn^{2+} and O_3
 (3) Mn^{4+} and MnO_2
 (4) Mn^{4+} and O_2

Sol) The ionic reaction is given by:



3. Which one of the following is not a common component of Photochemical smog?

- (1) Acrolein
 (2) Peroxyacety nitrate
 (3) Chlorofluorocarbons
 (4) Ozone

Sol) Ozone in itself is not a component though it does exist in other forms in smog.

4. Which of the following will be most stable diazonium salt $RN_2^+ X^-$?

- (1) $C_6H_5N_2^+ X^-$
- (2) $CH_3CH_2N_2^+ X^-$
- (3) $C_6H_5CH_2N_2^+ X^-$
- (4) $CH_3N_2^+ X^-$

Sol) The diazo compound formed directly from benzene is the most stable.

5. Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings ?

- (1) Insulin
- (2) Adrenaline
- (3) Estradiol
- (4) Thyroxin

Sol) Adrenaline

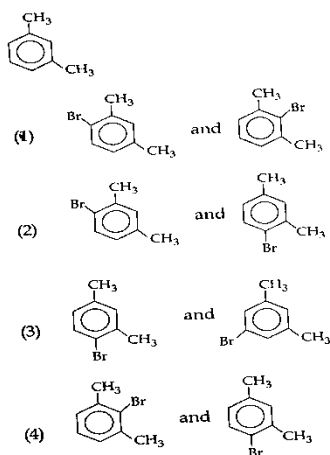
6. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much ?

(At. wt. Mg = 24; O = 16)

- (1) O_2 , 0.16 g
- (2) Mg, 0.44 g
- (3) O_2 , 0.28 g
- (4) Mg, 0.16 g

Sol) The oxygen is the limiting reagent and therefore Mg would be in excess.

7. What products are formed when the following compound is treated with Br_2 in the presence of $FeBr_3$?

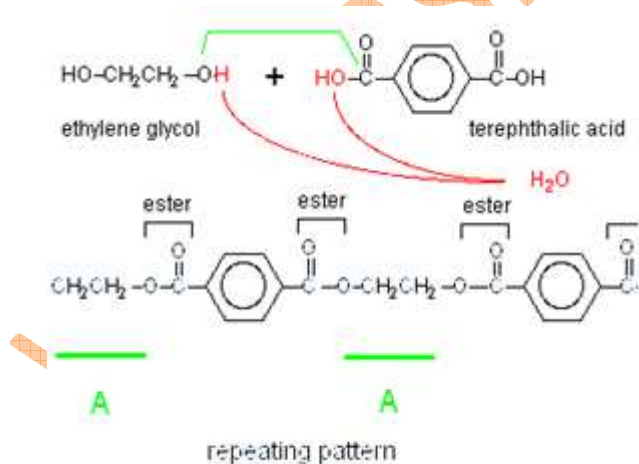


Sol) The ortho and para substituted compounds would be formed.

8. Which of the following organic compounds polymerizes to form the polyester Dacron ?

- (1) Benzoic acid and ethanol
- (2) Terephthalic acid and ethylene glycol
- (3) Benzoic acid and para HO- (C₆H₄) – OH
- (4) Propylene and paraHO- (C₆H₄) – OH

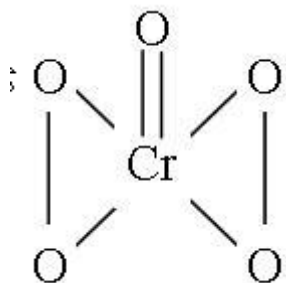
Sol) The reaction goes as follows:



9. In acidic medium, H_2O_2 changes $\text{Cr}_2\text{O}_7^{2-}$ to CrO_5 which has two (-O-O-) bonds. Oxidation state of Cr in CrO_5 is :

- (1) +3
- (2) +6
- (3) -10
- (4) +5

Sol) It is +6. The structure of CrO_5 is:



By looking at the above structure, you must have observed that 4 of the O atoms attached, are combined by the peroxide linkage. So, their oxidation states are taken as -1. The other one is normal. So, its oxidation state is taken as -2.

Now, let the oxidation state of Cr be x .
then, $x + 4 \times (-1) - 2 = 0$. Or, $x = 6$

10. Which of the following orders of ionic radii is correctly represented?

- (1) $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$
- (2) $\text{F}^- > \text{O}^{2-} > \text{Na}^+$
- (3) $\text{Al}^{3+} > \text{Mg}^{2+} > \text{N}^{3-}$
- (4) $\text{H}^- > \text{H}^+ > \text{H}$

Sol) Ionic radii increases with an increase of the number of electrons.

11. Which of the following salts will give highest in water?

- (1) NaCl
- (2) Na_2CO_3
- (3) CuSO_4

(4) KCl

Sol) The number of positive charges contributed by sodium carbonate is maximum.

12. Which of the following will not be soluble in sodium hydrogencarbonate ?

(1) Benzoic acid

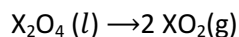
(2) o – Nitrophenol

(3) Benzenesulphonic acid

(4) 2, 4, 6 – trinitrophenol

Sol) Benzoic acid is not soluble in sodium hydrogen carbonate.

13. For the reaction :



$$\Delta U = 2.1 \text{ k cal}, \Delta S = 20 \text{ cal K}^{-1} \text{ at } 300 \text{ K}$$

Hence, ΔG is :

(1) - 2.7 k cal

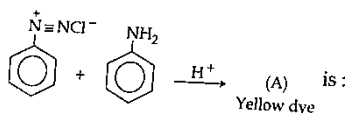
(2) 9.3 k cal

(3) -9.3 k cal

(4) 2.7 k cal

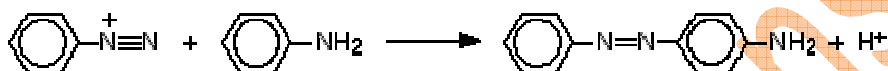
Sol) The equation: $\Delta G = \Delta U + P\Delta V - T\Delta S$ needs to be used.

14. In the following reaction, the product (A)

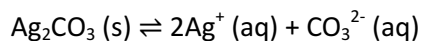


- (1)
- (2)
- (3)
- (4)

Sol) The reaction goes as follows:



15. Using the Gibbs energy change, $\Delta G^\circ = +63.3 \text{ KJ}$, for the following reaction



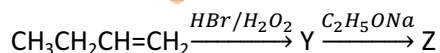
The K_{sp} of $\text{Ag}_2\text{CO}_3 (\text{s})$ in water at 25°C is :

($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

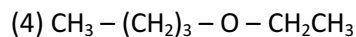
- (1) 8.0×10^{-12}
- (2) 2.9×10^{-3}
- (3) 7.9×10^{-2}
- (4) 3.2×10^{-26}

Sol) The equation: $\Delta G = -nRT \ln K_{sp}$ needs to be used.

16. Identity Z in the sequence of reactions:



- (1) $(\text{CH}_3)_2\text{CH}_2-\text{O}-\text{CH}_2\text{CH}_3$
- (2) $\text{CH}_3(\text{CH}_2)_4-\text{O}-\text{CH}_3$
- (3) $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{O}-\text{CH}_2\text{CH}_3$



Sol) The reaction would follow the anti markonikoff rule and therefore the ether is going to be formed.

17. In the kjeldahl' method for estimation of nitrogen present in a soil sample, ammonia evolved from .75 g of sample neutralized 10 mL of 1M H_2SO_4 . The percentage of nitrogen in the soil is :

- (1) 45.33
- (2) 35.33
- (3) 43.33
- (4) 37.33

Sol) The answer is straightforward.

18. Which property of colloids is not dependent on the charge on colloidal particles ?

- (1) Electrophoresis
- (2) Electro – osmosis
- (3) Tyndall effect
- (4) Coagulation

Sol) The Tyndall effect doesn't depend on charges.

19. For a given exothermic reaction, K_p and K_p' are the equilibrium constants at temperatures T_1 and T_2 , respectively. Assuming that heat of reaction is constant in temperature range between T_1 and T_2 , it is readily observed that :

- (1) $K_p < K_p'$
- (2) $K_p = K_p'$
- (3) $K_p = \frac{1}{K_p'}$
- (4) $K_p > K_p'$

Sol) With an increase in temperature, the K_p value is going to increase.

20. When 22.4 litres of $\text{H}_2(\text{g})$ is mixed with 11.2 litres of $\text{Cl}_2(\text{g})$, each at S.T.P., the moles of $\text{HCl}(\text{g})$ formed is equal to:

- 1) 2 mol of HCl (g)
- 2) 0.5 mol of HCl (g)
- 3) 1.5 mol of HCl (g)
- 4) 1 mol of HCl (g)

Sol) The reaction goes as $H_2 + Cl_2 \rightarrow 2HCl$.

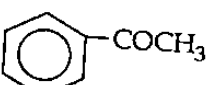
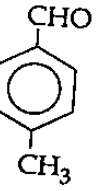
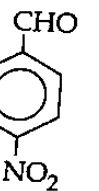
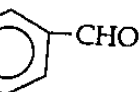
Here Cl_2 is the limiting reagent and therefore the number of moles of HCl formed are 1 in number.

21. Which one of the following is an example of a thermosetting polymer?

- (1) $\left[\text{CH}_2 - \underset{\text{Cl}}{\text{CH}} \right]_n$
- (2) $\left[\text{N} - \underset{\text{H}}{\text{H}} - (\text{CH}_2)_6 - \underset{\text{H}}{\text{N}} - \overset{\text{O}}{\parallel} \text{C} - (\text{CH}_2)_4 - \overset{\text{O}}{\parallel} \text{C} \right]_n$
- (3) $\left[\text{C}_6\text{H}_3(\text{OH})_2 - \text{CH}_2 - \text{C}_6\text{H}_3(\text{OH})_2 - \text{CH}_2 \right]_n$
- (4) $\left[\text{CH}_2 - \underset{\text{Cl}}{\text{C}} = \text{CH} - \text{CH}_2 \right]_n$

Sol) 4

22. Which one is most reactive towards Nucleophilic addition reaction?

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

Sol) Nucleophilic addition reactions are preferred by aldehydic groups over ketonic groups. Further bulky groups hinder the nucleophilic additions.

23. Calculate the energy in joule corresponding to light of wavelength 45 nm: (Planck's constant $h = 6.63 \times 10^{-34}$ Js ; speed of light $c = 3 \times 10^8$ ms⁻¹)

- 1) 6.67×10^{11}
- 2) 4.42×10^{-15}
- 3) 4.42×10^{-18}
- 4) 6.67×10^{15}

Sol) The energy is given by: $E = \frac{hc}{\lambda}$

24. Which of the following organic compounds has same hybridization as its combustion product-(CO₂)?

- 1) Ethyne
- 2) Ethene
- 3) Ethanol
- 4) Ethane

Sol) Ethene and CO₂ are Sp² hybridized.

25. Be^{2+} is isoelectronic with which of the following ions ?

- (1) Li^+
- (2) Na^+
- (3) Mg^{2+}
- (4) H^+

Sol) Be^{2+} has 2 electrons in its outermost shell and thus is isoelectronic with Li^+

26. Magnetic moment 2.83 BM is given by which of the following ions?

(At. nos. Ti = 22, Cr=24, Mn = 25, Ni = 28)

- (1) Ni^{2+}
- (2) Cr^{3+}
- (3) Mn^{2+}
- (4) Ti^{3+}

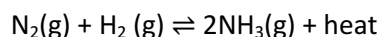
Sol) Magnetic moment is found by the formula $[\text{n}(\text{n}+2)]^{1/2}$. Ni^{2+} has 2 electrons in its outermost shell and that shows the required magnetic moment.

27. The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :

- (1) 10.8 g
- (2) 54.0 g
- (3) 108.0 g
- (4) 5.4 g

Sol) There are 2 atoms of oxygen, so the charges exchanged are 2 moles for oxygen atom and 1 mole for silver atom.

28. For the reversible reaction :



The equilibrium shifts in forward direction :

- (1) By decreasing the pressure
- (2) By decreasing the concentration of $N_2(g)$ and $H_2(g)$
- (3) By increasing pressure and decreasing temperature
- (4) By increasing the concentration $NH_3(g)$

Sol) The equilibrium is going to shift in the forward direction when more reactants react and therefore by increasing pressure, more reactants are made to react.

29. The pair of compounds that can exist together is :

- (1) $HgCl_2$, $SnCl_2$
- (2) $FeCl_2$, $SnCl_2$
- (3) $FeCl_3$, KI
- (4) $FeCl_3$, $SnCl_2$

Sol) $FeCl_3$ and $SnCl_2$ exist together and react using the following equation:



30. Which of the following complexes is used to be as an anticancer agent ?

- (1) cis - $[PtCl_2(NH_3)_2]$
- (2) cis - $K_2[PtCl_2Br_2]$
- (3) Na_2CoCl_4
- (4) mer - $[Co(NH_3)_3Cl_3]$

Sol) This is used in Chemotherapy.

31. Among the following complexes the one which shows Zero crystal field stabilization energy (CFSE) is :

- (1) $[Fe(H_2O)_6]^{+3}$
- (2) $[Co(H_2O)_6]^{2+}$
- (3) $[Co(H_2O)_6]^{3+}$
- (4) $[Mn(H_2O)_6]^{3+}$

Sol) In $[Co(H_2O)_6]^{2+}$, there are 5 electrons in the d shell of Cobalt. Therefore, the CFSE would be given by:

$$\Delta E = 2 \times (-3/5 \Delta_{tet}) + 3 \times (2/5 \Delta_{tet}) = 0$$

32. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be :

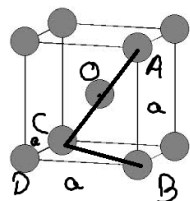
(1) $\frac{4}{\sqrt{3}}a$

(2) $\frac{\sqrt{3}}{4}a$

(3) $\frac{\sqrt{3}}{2}a$

(4) $\frac{2}{\sqrt{3}}a$

Sol) The figure goes as follows:

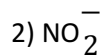
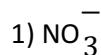


$$CB = a\sqrt{2}$$

$$AC = a\sqrt{3}$$

$$AC = OC = \frac{a\sqrt{3}}{2}$$

33. Which one of the following species has plane triangular shape?



Sol)

NO_3^- has a trigonal planar structure.

34. Which of the following molecules has the maximum dipole moment?



4) CO₂

Sol) NH₃ has the maximum value of dipole moment equal to 1.47 D.

35. Acidity of diprotic acids in aqueous solutions increases in the order :

1) H₂Se < H₂S < H₂Te

2) H₂Te < H₂S < H₂Se

3) H₂Se < H₂Te < H₂S

4) H₂S < H₂Se < H₂Te

Sol) The acidic nature increases from H₂O to H₂Te. H₂S is a weak diprotic acid.

36. Reason of lanthanoid contraction is

1) Increasing nuclear charge

2) Decreasing screening effect

4) Negligible screening effect of 'f' orbitals

Sol) Lanthanoid contraction exists because of negligible screening of the 5f orbitals.

37. Which of the following statements is correct for the spontaneous adsorption of a gas?

1) ΔS is negative and therefore, ΔH should be highly negative.

2) ΔS is positive and , therefore, ΔH should be negative.

3) ΔS is positive and, therefore, ΔH should also be highly positive.

4) ΔS is negative and, therefore, ΔH should be highly positive.

Sol) The two driving forces causing chemical reactions to occur are:

a. The formation of more stable (low-energy) products from less stable (high-energy) reactants in exothermic reactions ($\Delta H < 0$).

b. The formation of products that have more entropy than the reactants ($\Delta S > 0$).

38. Artificial sweetener which is stable under cold conditions only is :

(1) Sucralose

(2) Aspartame

(3) Alitame

(4) Saccharine

Sol) Sacchrine is the only sweetener among the rest which exists/is stable at cold temperatures.

39. Equal masses of H_2 , O_2 and methane have been taken in a container of volume V at temperature $27^\circ C$ in identical conditions. The ratio of the volumes of gasses $H_2 : O_2 : \text{methane}$ would be :

(1) 16 : 8 : 1

(2) 16 : 1 : 2

(3) 8 : 1 : 2

(4) 8 : 16 : 1

Sol) Let the equal masses be x g.

Then we have the mole ratios given by:

$$\frac{x}{2} : \frac{x}{32} : \frac{x}{16}$$

Hence, the ratio of moles can be rewritten as:

$$16 : 1 : 2$$

This is also the ratio of the volumes.

40. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively:

(1) reducing in (a) and oxidizing in (b)

(2) reducing in (a) and (b)

(3) oxidizing in (a) and (b)

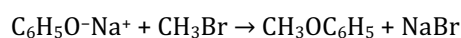
(4) oxidizing in (a) and reducing in (b)

Sol) In the first reaction ozone is reduced to oxygen and in the second reaction, silver oxide is reduced to silver metal.

41. Among the following sets of reactants which one produces anisole?

- (1) C_6H_5OH ; $NaOH$; CH_3I
- (2) C_6H_5OH ; neutral $FeCl_3$
- (3) $C_6H_5 - CH_3$; CH_3COCl ; $AlCl_3$
- (4) CH_3CHO ; $RMgX$

Sol) The reaction is given by:



42. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :

- (1) 2×96500 C
- (2) 9650 C
- (3) 96.50 C
- (4) 96500 C

Sol) The quantity of charge flow required is: $1 \times 0.1 \times 96500 = 9650$ C.

43. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression ?

- (1) $C_6H_{12}O_6$
- (2) $Al_2(SO_4)_3$
- (3) K_2SO_4
- (4) KCl

Sol) The largest freezing point depression would be expressed by the compound with the largest molar mass.

44. What is the maximum number of orbitals that can be identified with the following quantum numbers ?

$$n = 3, l = 1, m_l = 0$$

(1) 1

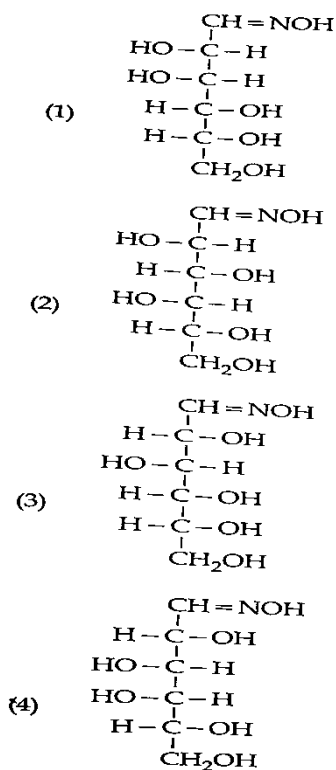
(2) 3

(3) 4

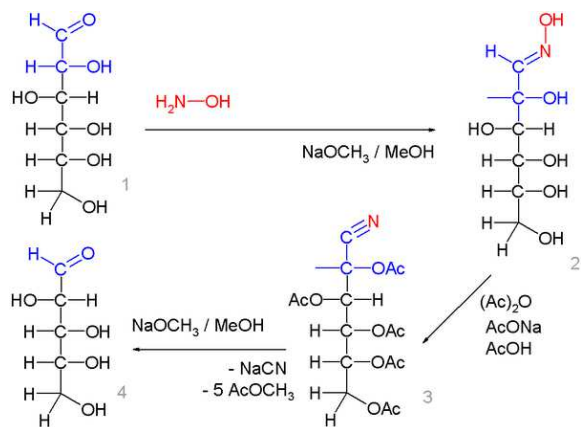
(4) 1

Sol) There are 2 spins possible for the given quantum mechanical configuration.

45. D (+) glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be :



Sol) The reaction goes as follows:



www.askiitians.com