



Chemistry

- (a) Calculate the volume of water to be added to be a 100 ml of 5N solution to make it 0.01N.

(b) 10 ml of 0.02M KMnO_4 is required to oxidize 20 ml of oxalic acid of certain strength 25 ml of the same oxalic acid is required to neutralize 20 ml of NaOH of unknown strength. Calculate the amount of NaOH in a litre of solution. (Mol. Wt. of NaOH = 40)

(c) One litre of an aqueous solution contains 15 gram of a solute of mol. Wt. 150. If the density of the solution is 1.005 g cm^{-3} , calculate the mole fraction of solute. (Mol. Wt. of $\text{H}_2\text{O} = 18$).
- (a) Give the set of four quantum numbers for the last two electrons of Be atom (At No. 4) in its ground state.

(b) An alpha particle is emitted from the nucleus Z. How many neutrons and protons are present in the daughter nucleus formed.

(c) In the reaction between iodine and sodium thiosulphate which is the reducing agent? What is its oxidized product?

(d) 10 ml of a gas confined in a closed container at -10°C at a pressure of 2×10^{-5} mm of Hg. Calculate the number of molecules of the gas in the container ($R = 0.082 \text{ lit at m. deg}^{-1} \text{ mol}^{-1}$, $N = 6.023 \times 10^{23} \text{ mol}^{-1}$)
- (a) Give the electronic configuration of Cr atom (At. No. 24) in its ground state.

(b) Account for the following in one or two sentences:

(i) The first ionization potential value of N is maximum compared to those of C and O. (At. No. C=6, N = 7, O = 8)

(ii) The electrical conductivity behaviour of HCl is quite different in its gaseous phase and in aqueous solution.

(c) A current of 1 amp. is passed in series through solution of copper sulphate and another solution of a salt of metal M. After certain time, 1.223 g of Cu and 4.160 g of M are deposited. Calculate the equivalent weight of M. What is the time taken for the deposition?
- (a) Give the resonance structures of N_2O .

(b) Pick out the odd electron species among NO_2^- , ClO_2 , NO_3^- , ClO_3^- and NO.

(c) Calculate the ratio of the radius of 2nd orbit of H-atom to that of 3rd orbit.

(d) Give reaction conditions for the preparation of nitric oxide from whose pH is 4.5.
- (a) Give the reagent used in the conversion of

(i) dichromate into chromate and (ii) chromate into dichromate

(b) A gas liberated in the reaction of metallic salt with dil. HCl turns lime water milky. On prolonged passage of the gas, the milky-ness becomes a clear solution. Give the chemical species formed at the two stages of the reaction.

(c) The ionic size of Cl^- is greater than that of K^+ , though the two ions are isoelectronic. Give reason.



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- (d) Arrange the following in the increase order of bond length Cl_2 , Br_2 , O_2 , and I_2 .
- (e) Give the structural isomers of C_5H_{12} .
6. (a) Account for the following in one or two sentences:
- (i) The equilibrium constant value increases with temperature for endothermic reactions.
- (ii) Density of water is higher than that of ice.
- (b) Arrange the following in the increase, order of acid strength;
 HClO_3 , HClO_4 , HClO and HClO_2
- (c) Giving the products, balance the following reactions
- (i) $\text{KI} + \text{H}_2\text{O}_3 + \text{H}^+ \dots \rightarrow$
Heat
- (ii) $\text{NH}_4\text{Cl} + \text{NaNO}_2 \rightarrow \dots$
7. (a) The heat of combustion of the reaction
 $\text{CH}_3\text{COOH} (l) + 2\text{O}_2(g) \rightarrow 2\text{CO}_2 (g) + 2\text{H}_2\text{O} (l)$ is $-208 \text{ K Cal Mol}^{-1}$. If the heats of formation of $\text{H}_2\text{O} (l)$ and $\text{CO}_2 (g)$ are -68 and $-94 \text{ K Cal mol}^{-1}$ respectively. Calculate the heat of formation of acetic acid.
- (b) The dissociation energy of H_2 and O_2 are 104 and $118 \text{ K Cal per mol}$ respectively. The heat of formation of the reaction
 $\frac{1}{2}\text{H}_2 (g) + \frac{1}{2}\text{O}_2(g) \rightarrow \text{OH}(g)$ is 10 K Cal . Calculate O-H bond energy.
- (c) Pick out the metals which give amphoteric metal oxides among the following : Al, Ni, Cu, Zn and Hg.
- (d) Metallic Sodium is manufactured by the electrolytes of fused NaOH. Give the reactions occurring at the two electrodes.
- (c) Write the balanced chemical reaction giving the reaction condition for the preparation of plaster of paris from CaSO_4 , $2\text{H}_2\text{O}$
8. Fill in the blanks in the following sentence :
- (a) In blast furnace, pig iron is obtained by the ... of iron oxide by ...
- (b) The pH of the solution resulted by mixing equinormal and volumes of Na_2CO_3 and HCl is less than seven. Give reason.
- (c) Balance the reaction of the following :
Sulphur di-oxide in acid medium by dichromate to give sulphate and Cr^{3+} as the products.
- (d) Calculate the equilibrium constant for the reaction; $2\text{SO}_3 (g) = 2\text{SO}_2 (g) + \text{O}_2 (g)$. The partial pressures of SO_3 , SO_2 and O_2 are 0.5 , 0.3 and 0.1 atm respectively.
- (e) A first order reaction takes 130 min. for 75% completion. Calculate the specific reaction rate.



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9. Give the reaction conditions for the following conversions :
(a) Nitrobenzene from Benzene (b) Ethyl iodide from diethyl ether (c) Ethene from ethyl alcohol (d) Iodoform from acetone (e) Benzene from phenol.
10. (a) Arrange the following in the increase order of C-C bond length: C₂H₆, C₂H₄ and C₂H₂
(b) Balance the following reaction giving the products:
NaCOOCH₃ + NaOH
(c) Give the products of the reaction between ethyl iodide and metallic in ether.
(d) Fill in the blanks:
(i) Acetylene reacts with bromine water to give ... but with liquid bromine it gives ...
(ii) Carbon tetrachloride on reacting with steam of 500⁰C gives ... and ...