St. Mary's School, Dwarka
Holiday Homework
Class XI
Subject: Chemistry

Worksheet 1

Q1. The density of 3 M solution of NaCl is 1.25 g mL-1, Calculate the molality of the solution. (At. Mass of Na = 23, Cl=35.5) 2

Q2. (a) Derive Bohr's postulate of angular momentum from de Broglie equation.
(b) What is the difference between accuracy and precision. 2

Q3. Write the electronic configuration of Cu^{2+} and Cr^{3+} . (Cu At. No. = 29, Cr At. No.=24) 2

Q4. Concentrated aqueous sulphuric acid is 98% H_2SO_4 by mass and has a density of 1.84 g cm^{-3}. What volume of concentrated acid is required to make 5.0L of 0.500M H_2SO_4 solution. 3

Q5. (a) What are the frequency and wavelength of a photon emitted during a transition from n=5 to n=2 state in hydrogen atom.
(b) In which region of electromagnetic spectrum will this radiation lie. 3

Q6. (a) What are CFC ?
(b) What is the harmful effect of CFC ?
(c) Give chemical reaction involving harmful effects of CFC ? 3

Q7. (a) Define primary pollutant of the air.
(b) Write the name of gas produced in Mathura refineries which can damage the great historical monument "Taj Mahal".
(c) What is green house effect ? How does it affect the global climate ? 3

Q8. (a) Calculate the ionization enthalpy of Helium atom in kJ/mol. Given En = $-13.6/n^2$ eV per atom hydrogen.
(b) One unpaired electron in an atom contributes a magnetic moment of 1.1 Bohr magneton. Calculate the magnetic moment for manganese (At. No. 25) and copper (At. No. 29) 3

Q9. When an electromagnetic radiation of wavelength 300 nm falls on the surface of sodium, electrons are emitted with a kinetic energy of 1.68×10^5 J/mol. What is the minimum energy needed to remove an electron from sodium. What is the maximum wavelength that will cause a photoelectron to be emitted ? 3

Q10. Answer the following
(a) What do you understand by stationary orbits ?

(b) Why is electronic energy negative ?

(c) Explain the appearance of large number of lines in hydrogen spectrum. 3

Q11. Explain the following terms :

(a) Acid rain (b) Green Chemistry (c) Ozone layer depletion 3

Q12. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g of carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g.

Calculate

(i) empirical formula

(ii) molar mass of the gas, and

(iii) molecular formula 5

Worksheet 2

Q1. List the ways in which global warming and its associated effects may be minimized. 2

Q2. (a) What is anoxia or asphyxiation ?

(b) What do you mean by biochemical oxygen demand (BOD) 2

Q3. What is eutrophication, and how does it affect the population of fish in the ecosystem ? 2

Q4. What is the impact of use of pesticides on soil pollution ? 2

Q5 Select the isotopes and isobars.

(i) $^{238}U_{92}$ (ii) $^{235}U_{92}$ (iii) $^{234}U_{92}$ (iv) $^{234}Pa_{91}$ 2

Q6 What are the harmful effects of smog and photochemical smog ? How can they may be minimized ? 3

Q7. Butyric acid contains only C, H and O. A 4.24 mg sample of butyric acid is completely burned. It gives 8.45 mg of CO_2 and 3.46 mg of CO_2 and 3.46 mg of H_2O. The molecular mass of butyric acid was determined by experiment to be 88u. What is molecular formula ? 3

Q8. If 4 g of NaOH dissolves in 36 g of H_2O, calculate the mole fraction of each component in the solution. Also, determine the molarity of solution (specific gravity of solution is 1 g/mL) [molar mass of Na = 23, O = 16, H = 1] 3

Q9. (a) What is the difference between in the origin of cathode rays and anode rays ?

(b) The electron energy in hydrogen atom is given by $E_n = (-2.18 \times 10^{-18}/)/n^2$ J. Calculate the energy required to remove the electron completely from n= 2 orbit. What is the longest wavelength of light in cm that can be used to cause this transition ? 3

Q10. Calculate the amount of carbon dioxide that could be produced when

(i) 1 mole of carbon is burnt in air.

(ii) 1 mole of carbon is burnt in 16 g of dioxygen.

(iii) 2 moles of carbon are burnt in 16 g of dioxygen. 3

Q11. (a) What is meant by dual nature of light ? Calculate the wavelength (in angstroms) associated with an electron travelling at a speed of 2.19×10^6 m/s.

(b) Electromagnetic radiation of wavelength 242 nm is just sufficient to ionize the sodium atom. Calculate the ionisation energy of sodium in kJ/mol. 5

Q12. (a) What is the S.I. unit of mass ? How is it defined ?

(b) Round up the following upto three significant figures :

(i) 34.216 (ii) 10.4107 (iii) 0.04597 (iv) 2808

(c) Chlorine is prepared in the laboratory by treating manganese dioxide (MnO2) with aqueous hydrochloric acid according to the reaction

$4HCl(aq) + MnO_2(s) \longrightarrow 2H_2O(l) + MnCl_2(aq) + Cl_2(g)$

How many grams of HCl react with 5.0 g of manganese dioxide ?

5

Worksheet 3

Q1. Calculate the temperature at which the average speed of oxygen equals to that of hydrogen at 20 K. 2

Q2. (i) Why is energy of electron negative ?

(ii) Define Hund's rule of maximum multiplicity. 2

Q3. $Cu_{(s)} | Cu^{2+}_{(1M)} || Ag^{+}_{(1M)} | Ag_{(s)}$

$E^o_{Cu^{2+}/Cu} = 0.34$ V; $E^o_{Ag^+/Ag} = 0.80$V

(i) Write reaction at anode and cathode.

(ii) Write net cell reaction.

(iii) Calculate standard electrode potential of the cell. 3

Q4. Permanganate ion reacts with bromide ion in basic medium to give manganese dioxide and bromate ion. Balance the chemical equation in basic medium by half-cell reaction method.

$MnO_4^-{}_{(aq)} + Br^-{}_{(aq)} \longrightarrow MnO_{2(aq)} + BrO_3^-{}_{(aq)}$ 3

Q5. (i) Name two important sinks of CO_2.

(ii) What is marine pollution ?

(iii) What is humification ? 3

Q6. A compound on analysis found to contain following percentage composition:

Na = 43.4%, C = 11.4% and O = 45.3%. Determine the empirical and molecular formulae.

Given: the relative molecular mass of the compound is 106. 3

Q7. (a) Name the group of the elements in which electrons are progressively filled in 4f-orbital and 5-f orbitals.

(b) Which of the following is the correct order of size of the given species : I, I^+, I^- ?

(c) Which of the following elements can show covalency greater than 4 ?

Be, P, S, B 3

Q8. (i) Arrange Fe, Fe^{2+}, Fe^{3+} in increasing order of radii.

(ii) Explain why Be has higher ionisation enthalpy than B.

(iii) Predict the formula of compound which might be formed by silicon and bromine. 3

Q9. (i) List two main differences between orbit and orbital.

(ii) If an electron is moving with a velocity of 600 m/s which is accurate upto 0.005%, then calculate the uncertainty in its position.

(h = 6.626 x 10^{-34} Js and mas of electron = 9.1 x 10^{-31} kg) 3

Q10. (a) Commercially available concentrated hydrochloric acid contains 45% HCl by mass.

(i) What is the molarity of this solution ? The density is 1.19 g/mL.

(ii) What volume of conc. HCl is required to make 1.00L of 0.24 M HCl ?

(b) What does the following prefixes stand for:

(i) pico (ii) nano (iii) micro (iv) deci 5

Q11. (i) What are two conditions for the formation of hydrogen bond ?

(ii) In which of the following compounds 'S' does not obey octet rule ?

SF_2, SF_4, SF_6, SO_2

(iii) Explain the term hybridisation taking HC≡CH as an example. 5

Q12. (a) A discharge tube containing oxygen gas at 335oC is evacuated till the pressure is 5 x 10^{-2} mm. If the volume of discharge tube is 4.5 litres. Calculate the number of oxygen molecules still present in the tube. (R = 0.0821 L atm mol^{-1} K^{-1})

(b) Name the two processes that can be used to liquefy gases.

(c) What type of intermolecular forces are as follows:

(i) noble gases

(ii) water