	ABES Engineering College, Ghaziabad Engineering Chemistry (BAS102) Tutorial sheet 1, (2023-24)

CO, KL	Questions
CO1, K2	1. Build MO diagram of HF molecule with the help of MOT.
CO1, K3	2. Calculate bond order of O_2, O_2^-, O_2^+, O_2^{++}, O_2^{--}. Arrange these species increasing order of bond length.
CO1, K2	3. Write down the molecular orbital of NO and NO^+. Arrange them in increasing order of stability.
CO1, K2	4. Illustrate MO diagram of CO molecule.
CO1, K2	5. Discuss the MO diagram of N_2 molecule.
CO1, K2	6. Interpret the stability of N_2, N_2^+, N_2^{++}, N_2^-, $N_2^{—}$on the basis of MOT.
CO1, K2	7. Arrange the given species according to increasing bond energy O_2, O_2^-, O_2^+, O_2^{++}, O_2^{--}.
CO1, K2	8. Arrange the given species according to decreasing bond length N_2, N_2^+, N_2^{++}, N_2^-, N_2^{--}
CO1, K2	9. Illustrate MO diagram of CO^+ molecule.
CO1, K2	10. Build MO diagram of HCl molecule with the help of MOT.

ABES	ABES Engineering College, Ghaziabad Engineering Chemistry (BAS102) Tutorial sheet 2, (2023-24)

CO, KL	Questions
CO4, K3	1. A sample of water is analyzed as given below $Ca(HCO_3)2$=5mg/l, $Mg(HCO_3)_2$ =8mg/l, $CaSO_4$=6 mg/l, $MgSO_4$=4mg/l. Find temporary & permanent hardness of water
CO4, K3	2. A zeolite softener was 90% exhausted by removing the hardness of 10,000 litres water completely when passed through zeolite. The exhausted zeolite then requires 200 litres of 3% sodium chloride for its complete regeneration. Calculate the hardness of the water solution.
CO4, K3	3. Calculate the amount of lime and soda required for treatment of 20,000 liters of water having following salts: $MgCl_2$=15 ppm, $CaCl_2$=5ppm, $MgCO_3$= 12 ppm, $Ca(HCO_3)_2$=15ppm, $Mg(HCO_3)_2$=7ppm, $CaSO_4$= 20 ppm, $MgSO_4$=18ppm, $Al_2(SO_4)_3$=8 ppm, NaCl=15ppm. (Both lime and soda is 90% pure). Also calculate the total hardness of water sample).
CO4, K3	4. The hardness of 1000 litres of sample was removed by passing it through zeolite. The softener then requires 30L of NaCl solution containing 1.5 gm/l of NaCl for regeneration. Calculate hardness of water.
CO4, K3	5. An exhausted zeolite is regenerated by passing 150 litres of NaCl having strength 150 gm/l of NaCl. How many litres of hard water sample having hardness 600ppm can be softened using this softener?
CO4, K3	6. Calculate the HCV and LCV of a 3.2 gm of fuel having following parameters: Weight of water in bomb calorimeter=2500gm Water equivalent of calorimeter=2000 gm Initial temperature=26.8°C Final temperature= 28°C Acid correction=10 cal Cotton thread correction= 15 cal Fuse wire correction= 10 cal Cooling Correction= 12°C Amount of Hydrogen=5%
CO4, K3	7. Discuss various parameters of proximate analysis of coal. Calculate the HCV and LCV of a fuel having C=81%, S=5%, N=3%, O=4%, H=6%.
CO4, K3	8. 5.25 gms of coal was kjeldhalized and ammonia thus evolved was absorbed in 50 ml of 0.1 N sulphuric acid. After absorption, the excess acid required 15.5 ml of 0.1 N sodium hydroxide solution for exact neutralization. Determine percentage of nitrogen content.
CO4, K3	9. 0.4 gm of coal sample was used in a bomb calorimeter for the determination of calorific value. The ash formed in the bomb calorimeter was extracted with acid and the acid extract was heated with $BaCl_2$ solution and ppt. of $BaSO_4$ was obtained. The ppt. was filtered, dried and weighed. The weight of ppt. was found to be 0.02 gm. Calculate the percentage of Sulphur in coal sample.
CO4, K3	10. A sample of 1 kg fuel contains 90% carbon, 2% hydrogen, 0.6% Sulphur, 0.3% nitrogen. Calculate the amount of air required for complete combustion.

ABES	ABES Engineering College, Ghaziabad Engineering Chemistry (BAS102) Tutorial sheet 3, (2023-24)

CO, KL	Questions
CO3, K3	1. For a cell, emf is 1.018V at 293K. Its temperature coefficient = -4.00×10^{-5} VK^{-1}. Calculate the ΔG, ΔS, ΔH for the cell reaction. (n=2)
CO3, K3	2. Calculate the standard emf of the cell: Zn / $ZnSO_4$//$CuSO_4$ /Cu The standard reduction potentials are $E^0 = Zn^{2+}/Zn = -0.763$ V and $E^0 = Cu^{2+}/Cu = +0.337$ V
CO3, K3	3. Calculate the emf of the cell: Zn (s)/Zn^{+2} (aq)//(0.2M) Ag^{+2}(0.002M)//Ag(s) at 25^0C. The E^0_{Cell}=0.54 V
CO3, K3	4. Calculate the cell potential at 298 K for this reaction: Al^{+3}+ Fe $\longrightarrow$ Al + Fe^{+3} E^0= -1.62 V. The concentration of Al^{+3}, Fe^{+3} is 2 M and 3.5 M.
CO3, K3	5. What is the potential of a lead electrode that is in contact with a solution of 0.015 M in Pb^{2+} ions. The standard electrode potential (E^0) for Pb= Pb^{2+} + 2 e^- is equal to 0.13 V.
CO3, K3	6. Calculate the emf of the following cell: = Zn/Zn^{2+}(0.1 M)//Cu^{2+} (0.5 M)/ Cu. The standard reduction potentials of Zn and Cu are -0.76 V and +0.34 V, respectively.
CO3, K3	7. Calculate the cell potential at 298 K for this reaction: Al^{+3}+ Fe $\longrightarrow$ Al + Fe^{+3}. E^0= -1.62 V. The concentration of Al^{+3}, Fe^{+3} is 1.2M and 2.5 M.
CO3, K3	8. A Zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95% dissociated at 298 K. Calculate the electrode potential. (E^0 =Zn^{2+}/ Zn = -0.76 V).
CO3, K3	9. The emf of the following cell is found to be 0.20 V at 298 K. Cd/ Cd^{2+}//Ni^{2+}/ Ni. If the molar concentration of Ni^{2+} is 2.0 M, what is the molar concentration of Cd^{2+} ions in the solution? [E^0=Cd^{2+}/ Cd = -0.40 V; E^0=Ni^{2+}/ Ni = -0.25 V
CO3, K3	10. Calculate the potential of the following electrochemical cell: Cu(s)/Cu^{+2}(aq)(0.50M)// H^+(0.001M)/H_2(0.95 atm); Pt . $E^0_{cathode}$= 0V, E^0_{Anode}= 0.34 V

	ABES Engineering College, Ghaziabad Engineering Chemistry (BAS102) Tutorial Sheet 4, (2023-24)
CO, KL	Questions
CO5, K3	1. Calculate the number of PP formed when 42 grams of propene undergo polymerization process and DP was found to be 1000.
CO5, K3	2. If average molecular weight of polystyrene is 10^5, Calculate the average degree of polymerization.
CO5, K3	3. Find weight average molecular weight of polymer if degree of polymerization as 10,000.
CO5, K3	4. Calculate the number of PP formed when 42 grams of propene undergo polymerization process and DP was found to be 5000.
CO5, K3	5. If average molecular weight of polyethene is 10^8, Calculate the average degree of polymerization.
CO5, K3	6. Calculate the number of PVC formed when 82 gram of vinyl chloride undergo polymerization process and DP was found to be 100000.
CO5, K3	7. Find number average molecular weight of polymer if degree of polymerization as 50,000. .
CO5, K3	8. Calculate the number of PVC formed when 200 gram of vinyl chloride undergo polymerization process and DP was found to be 10000.
CO5, K3	9. Find number average molecular weight of polymer if degree of polymerization as 20,000.
CO5, K3	10. If average molecular weight of polyethene is 10^5, Calculate the average degree of polymerization.

ABES	ABES Engineering College, Ghaziabad Engineering Chemistry (BAS102) Tutorial Sheet 5, (2023-24)

CO, KL	Questions
CO2, K3	1. A compound having molecular formula C_3H_6O gives the following bands in IR spectrum:1800cm^{-1}, 3000cm^{-1}. What are these bands corresponding in the spectrum and identify the formula of a compound if it gives positive Tollen's test.
CO2, K3	2. 3 Determine the structure of the compound C_3H_6O, which shows the following absorption bands in the IR spectrum; (i) 2950 cm^{-1}, (ii) 1720 cm^{-1}. The compound gives negative test with Tollens reagent.
CO2, K3	3. A compound having concentration 10^{-3} g/L has absorbance value 0.50 at λ_{max} 510 nm using cell of 1cm. Calculate its absorptivity and molar absorptivity values. (M. W.=500)
CO2, K3	4. An organic compound X with molecular formula C_3H_6O absorbs at 1710 cm^{-1} strongly. When it is reduced with hydrogen another compound Y (C_3H_8O) appears. In Y absorption at 1710 cm^{-1} was missing and a band at about 3600 cm^{-1} appeared. What are X and Y.
CO2, K3	5. Calculate the no. of vibrations for given molecules: CO_2, H_2O, C_3H_6.
CO2, K3	6. How many NMR signals are there in given compounds: CH_3COOCH_3, CH_3OCH_3, CH_3-CH_3, CH_3CH_2Br, Cyclobutane, CH_3CHO, CH_2Br-CH_2Br.
CO2, K3	7. Calculate the transmitted power of the UV light if the radiant power of a solution is reduced to 50%.
CO2, K3	8. Predict the NMR signals and splitting pattern in the given compounds: CH_2Cl-CH_2Cl, CH_2Cl-CH_3, $CHCl_2$-CH_2Cl, CH_3-CCl_3.
CO2, K3	9. Calculate the number of vibrations for given molecules: C_2H_2, C_6H_6, CH_4.
CO2, K3	10. Calculate the transmitted power of the UV light if the radiant power of a solution is reduced to 80%.