

B.Tech 1st Year 1st Semester
First Unit Test, September 2017
CHEMISTRY 1 [CH 101]

Set-1

(Students are requested to write down the SET No. in the Answer sheet)

Time allotted: 60 minutes

Full marks: 30

Group A

Answer any **six** of the following **eight** questions

- 1 (a) Three moles of an ideal gas expand spontaneously into vacuum. The Work done is
(i) 3J (ii) 6J (iii) Zero (iv) None
- (b) For an ideal gas, the change in internal energy in a reversible isothermal process is
(i) positive (ii) negative (iii) zero (iv) none
- (c) The time required for 100% completion of a zero order reaction is
(i) ak (ii) $a/2k$ (iii) a/k (iii) $2k/a$
- (d) In the hydrolysis of an organic chloride in presence of large excess of water
 $RCl + H_2O \rightarrow ROH + HCl$
(i) molecularity is 1 but order is 2 (ii) molecularity and order both are 2
(iii) molecularity is 2 but order is 1 (iv) molecularity and order both are 1
- (e) Which of the following relation is true?
(i) $W_{rev} = W_{irrev}$ (ii) $W_{rev} < W_{irrev}$ (iii) $W_{rev} > W_{irrev}$ (iv) none of these
- (f) All living systems are
(i) Open system (ii) closed system (iii) isolated system (iv) adiabatic system
- (g) The Unit of molar conductance is
(i) $ohm\ cm\ mol^{-1}$ (ii) $ohm^{-1}\ cm^2\ mol^{-1}$ (iii) $ohm^{-1}\ cm^{-1}\ mol^{-1}$ (iv) None of these
- (h) Cell Constant is
(i) a/l (ii) l/a (iii) al (iv) None of these
(Where a = area of cross section and l = length)

Group B

Answer all of the following questions

2. (a) Define Internal energy & Enthalpy.
(b) Prove that, For an adiabatic process $TV^{\gamma-1} = \text{Constant}$
(c) One mole of an ideal monoatomic gas undergoes an isothermal reversible expansion at 25°C to twice its original volume. Calculate ΔU and W . 1 + 3 + 2 = 6
3. (a) Define activation energy. Draw the energy profile diagram of an endothermic reaction and label the activation energy in that diagram.
(b) In the Arrhenius equation for a certain reaction, the value of A and E are $4.0 \times 10^{13} \text{ s}^{-1}$ and 98.6 kJ mol^{-1} respectively. The reaction is of 1st order. At what temperature will its half life period be 10 minutes? 1+1+4 = 6
4. (a) What is pseudo-unimolecular reaction? Give one example.
(b) Deduce the expression for the rate constant of a first order reaction. Hence show that the half life period of a first order reaction independent of the initial concentration of the reactant.
(c) The half life period of decomposition of compound is 50 minutes. If the initial concentration is halved the half life period is reduced to 25 minutes. What is the order? 1+2½+1½ = 6
5. (a) Define Transport Number and Hydration of ions. Write the effect of hydration of ions on the conductance of electrolytic solution.
(b) Draw the graph of Conductometric Titration of a Precipitation Reaction (KCl versus AgNO_3) and explain the nature of the curve with proper reasoning. 3 + 3 = 6

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Set-2

(Students are requested to write down the SET No. in the Answer sheet)

Time allotted: 60 minutes

Full marks: 30

Group A

Answer any **six** of the following **eight** questions

1. (a) The process in which the temperature of the system remains constant is known as
(i) Adiabatic (ii) Isothermal (iii) Isobaric (iv) Isochoric
- (b) Change in enthalpy for an endothermic reaction is
(i) more than zero (ii) less than zero (iii) equal to zero (iv) none
- (c) The rate law of the overall reaction $A + B \rightarrow C$ is $\text{rate} = k[A]^2$. Which of the following will not increase the rate of reaction?
(i) increasing the concentration of A (ii) adding a catalyst
(iii) increasing the concentration of B (iv) increasing temperature of reaction
- (d) 75% of a first order reaction is complete in 32 minutes. Its half life is
(i) 48 min (ii) 16 min (iii) 64 min (iv) 8 min
- (e) Which one is a state function?
(i) Enthalpy (ii) work (iii) heat (iv) none of these
- (f) The human body is an example of
(i) Closed system (ii) open system (iii) isolated system (iv) none of these
- (g) Normal Hydrogen Electrode has been assigned a potential of
(i) 100 V (ii) 0 V (iii) 1 V (iv) none of these
- (h) Prevention of Corrosion of Fe by Metal Coating is called
(i) Electrolysis (ii) Photoelectrolysis (iii) Galvanization (iv) None of these

Group B

Answer all of the following questions

2. (a) Define Extensive & Intensive Properties.
(b) Prove that Isothermal Reversible work done is more than irreversible work done.
(c) A sample of ideal gas initially at 27°C is compressed from 40 litre to 4 litre adiabatically and reversibly. Calculate the final temp. ($\gamma = 1.4$) $1 + 3 + 2 = 6$
3. (a) Explain Arrhenius equation stating the terms involved. Show the nature of the graph for $\log k$ versus $1/T$ explaining the significance of the slope.
(b) At 380°C , the half life period of first order decomposition of H_2O_2 is 360 minutes. The energy of activation is 200 kJ mol^{-1} . Calculate the time required for 75% decomposition at 450°C . $1 + 1 + 4 = 6$
4. (a) Derive rate law for 2^{nd} order reaction for the following reaction
$$2\text{A} \rightarrow \text{P}$$

Show that $t_{1/2}$ depends on the initial concentration of reactant..
(b) Distinguish between Schottky defect and Frenkel defect.
(c) Define Homogeneous catalysis with an example. $2\frac{1}{2} + 2 + 1\frac{1}{2} = 6$
5. (a) Define Equivalent Conductance of an Electrolyte and write its Unit. What are the effects of dilution and temperature on Equivalent conductance?
(b) Resistance of a 0.2N Electrolyte is found 90 ohms when the electrodes are of 2.0cm x 2.0 cm cross sectional area and separated by 3.0cm. Find out (i) specific conductance and (ii) equivalent conductance of the electrolyte. $3 + 3 = 6$