



B.Sc. (Semester – V) Examination, October/November 2018
CHEMISTRY (Paper – I) (Six Units)
Physical Chemistry

Duration : 2 Hours

Total Marks : 80

- Instructions :**
- 1) Answer to the **two** Sections should be written in **separate** answer books.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) **Use** of non-programmable **calculator** is allowed.
 - 4) Log tables will be **supplied** on request.
 - 5) **All** questions are compulsory, however **internal** choice is available.

Physical constants :

$N = 6.023 \times 10^{23}$ molecules/mole, $h = 6.626 \times 10^{-34}$ Js,

1 a.m.u. = 931.5 MeV, $F = 96500$

Coulombs, $m = 9.109 \times 10^{-31}$ Kg.

SECTION – I
(Physical Chemistry)

1. Answer **any four** questions from the following : **(4×4)**
 - a) How Nucleus can be explained using liquid drop model ?
 - b) With the help of neat diagram, explain Daniel cell.
 - c) What is sine wave ? What is sinusoidal wave equation ?
 - d) Explain orientation polarisation for polar molecules.
 - e) Explain Born's interpretation of wave function.
 - f) Explain "To every observable there corresponds an operator".
2. A) i) What does Azimuthal quantum number signifies ? **2**
ii) Write a short note on composition of nucleus. **4**

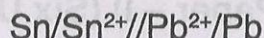
OR

- iii) What do you understand by zero point energy ? **2**
iv) Define half life of a radioelement. Derive an expression for decay constant. **4**

P.T.O.



- B) i) Write different conventions for representation of an electrochemical cell. 4
 ii) Calculate the e.m.f of the following cell at 25°C



Given : SOP of $\text{Sn}/\text{Sn}^{2+} = +0.140\text{V}$

SOP of $\text{Pb}/\text{Pb}^{2+} = -0.126\text{V}$

Also calculate the standard free energy change.

2

3. A) i) Using dipole moment, explain molecular structure of NH_3 and CH_4 . 4
 ii) What are magic numbers ? 2

OR

- iii) Explain the determination of dipole moment by refractivity method. 4
 iv) Explain binding energy per nucleon. 2

- B) i) Derive the expression for energy for the particle in a one dimensional box. 4

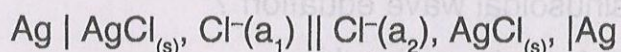
- ii) What is an operator ? Explain Hamiltonian operator. 2

SECTION - II

4. Answer **any four** of the following :

(4×4=16)

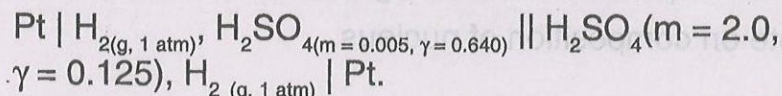
- a) What are concentrations cells ? Derive an expression for emf of the following concentration cell.



- b) Show that the frequency between 2 consecutive spectral lines in rotational spectrum is always constant.

- c) With a neat diagram explain the ionisation chamber.

- d) Find the emf of the following cell at 298K,



The transport number of H^+ ions in the given range of temperature is 0.83.

- e) The pure rotational spectrum of carbon monoxide CO has lines at 3.84×10^2 , 7.68×10^2 and $11.52 \times 10^2 \text{ m}^{-1}$. Calculate the equilibrium internuclear distance in the molecule. (C = 12, O = 16).

- f) Write a short note on proportional counters (Diagram not expected).



5. a) What is decomposition potential ? Describe with a labelled diagram the measurement of decomposition potential.

6

OR

5. a) What is overvoltage ? Describe with a labelled diagram the measurement of overvoltage.

6

- b) i) Explain the working of a scintillation counter with a diagram.

4

- ii) What is its selection rule for microwave spectroscopy ?

2

6. a) i) Describe isotope effect in rotational spectra with an example.

3

- ii) Write any 3 characteristics of an ideal GM counter.

3

OR

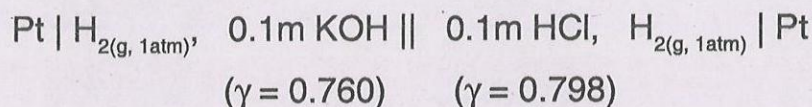
6. a) i) Write a short note on intensity of spectral lines using Boltzmann distribution.

3

- ii) What is multiplicative ion collection ?

3

- b) i) The emf of the cell,



is 0.6975 volt. Calculate the ionic product of water.

3

- ii) What is Liquid junction potential ? How does the salt bridge minimise the liquid junction potential ?

3