

2013

PHARMACEUTICAL CHEMISTRY

(PHYSICAL CHEMISTRY)

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following :

10 × 1 = 10

i) A liquid boils when its vapour pressure becomes equal to

- a) atmospheric pressure b) zero
c) very high d) very low.

ii) If n = mole of solute, N = mole of solvent, then mole fraction of solvent is

- a) $n / (n + N)$ b) $N / (n + N)$
c) $(n + N) / n$ d) $(n + N) / N$.

iii) Viscosity of a liquid is a measure of

- a) repulsive forces between the liquid molecules
b) frictional resistance
c) intermolecular forces between the molecules
d) none of these.

iv) The units of R , the gas constant are

- a) $\text{erg K}^{-1} \text{mole}^{-1}$ b) $\text{cal K}^{-1} \text{mole}^{-1}$
c) $\text{joule K}^{-1} \text{mole}^{-1}$ d) all of these.

v) According to the first law of thermodynamics

- a) $W = Q - \Delta E$ b) $Q = \Delta E - W$
c) $\Delta E = W - Q$ d) $W = Q + \Delta E$.

vi) Parachor is a

- a) additive property b) constitutive property
c) both (a) and (b) d) none of these.

vii) Hydrolysis of an ester is an example of
reaction.

- a) pseudounimolecular b) zero order
c) second order d) first order.

viii) Equivalent weight of sodium oxalate as a reducing
agent is

- a) 112 gm b) 56 gm
c) 110 gm d) none of these.

ix) Particle size in colloidal system is in the range

- a) $10\mu - 20\mu$ b) $1\mu - 50\mu$
c) $50\mu - 100\mu$ d) none of these.

x) Specific optical rotation depends upon

- a) wavelength of the light
b) temperature
c) concentration of the sample solution
d) all of these.

xi) The decomposition of CaCO_3 in a closed vessel is given

by equation $\text{CaCO}_3 (s) \rightarrow \text{CaO} (s) + \text{CO}_2 (g)$. The
number of phases & components respectively are

- a) 2 & 3 b) 3 & 2
c) 2 & 2 d) 3 & 3.

xii) Sugar dissolves in water due to formation of

- a) covalent bonds b) ionic bonds

- c) coordination bond d) hydrogen bond.

GROUP – B

(Short Answer Type Questions)

Answer any three of the following. $3 \times 5 = 15$

2. Define surface tension. Explain the capillary rise method.
3. Define osmosis and osmotic pressure. Write down any one method for determination of osmotic pressure.
4. a) What is the molecular weight of gas A, 12.8 gm of which occupy 10 lit at a pressure of 750 mm and 27°C ?
($R = 0.0082 \text{ lit-atm degree}^{-1} \text{ mole}^{-1}$)
b) Describe Van der Waals equation. Discuss the volume correction & pressure correction. $1\frac{1}{2} + 3\frac{1}{2}$
5. Why a solution of NaCl does not act as a buffer ? Explain how a buffer solution works ? $2 + 3$
6. Show that :
Equivalent conductance = Specific conductance $\times (1000 / C)$
where C is the concentration in gmeqvt. / litre.
The resistance of an N/10 solution of a salt is found to be 32.5×10 ohms. Calculate the equivalent conductance of the solution. Cell constant = 1.15 cm^{-1} . $3 + 2$

GROUP – C

(Long Answer Type Questions)

Answer any three of the following. $3 \times 15 = 45$

7. a) Define adsorption and absorption with suitable examples.
b) What are adsorbate and adsorbent ? Give examples.
c) What is adsorption isotherm ?
d) Derive Langmuir adsorption isotherm, stating the assumption on which it is based.

e) From Langmuir adsorption isotherm, how can you establish Freundlich adsorption isotherm ?

f) Write down the various applications of adsorption.

$$2 + 1\frac{1}{2} + \frac{1}{2} + 5 + 2 + 4$$

8. a) State Henry's Law.

b) Explain the solubility of partially miscible liquids for

(i) Phenol-water, (ii) Trimethylamine-water system,

(iii) Nicotine-water system. $3 + (3 \times 4)$

9. a) A gas expands by 0.5 litre against a constant pressure of 0.5 atm at 25°C. What is the work in ergs & in joules done by the system ?

b) Discuss isothermal and adiabatic processes.

c) Describe heat of combustion with proper examples.

d) How the heat of reaction can be estimated from covalent bond energies ?

e) Describe the vant Hoff equation. $3 + 3 + 3 + 2 + 4$

10. Deduce the following equation from kinetic theory :

i) $C_v = 3/2R + X$

ii) $C_p = 5/2R + X$, C_v and C_p are the heat capacities.

Derive Boyle's law and Charles law from kinetic theory.

What are the deviations of ideal gas ? $8 + 4 + 3$

11. a) Define Catalysis. Discuss the general characteristics of catalytic reaction.

b) What do you mean by Inhibitor, Poison and Promoter ?

c) What are the types of catalytic reactions ? Define and give examples for each.

d) What is enzyme ? Write in brief on enzymatic catalysis.

$$5 + 3 + 3 + 4$$