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SARDAR PATEL UNIVERSITY

M.Sc. (Integrated) Biotechnology, Second Semester Examination

Thursday, 23rd April,

2015

10.30 a.m. to 1.30 p.m.

Biophysical Chemistry : PS02CIGB02

Total Marks : 70

Note : (i) All questions are to be attempted. (ii) Figures to the right indicate marks.

Q.1 Choose the correct option for the following: [8]

- (i) All cations that are short of an electron pair act as.....
(a) Arrhenius acid (b) Lewis acid (c) Lewis base (d) Bronsted base.
- (ii) Phenolphthalein is the best indicator for.....titration.
(a) acid base (b) complexometry (c) redox (d) potentiometry.
- (iii) A process which proceeds of its own accord, without any outside assistance is called.....
(a) reversible (b) irreversible (c) spontaneous (d) non spontaneous.
- (iv) A system that can transfer both energy and matter to and from its surrounding is called.....system.
(a) isolated (b) open (c) closed (d) heterogeneous.
- (v) Diffusion isflow of liquid.
(a) unilateral (b) bilateral (c) both "a" and "b" (d) none
- (vi) The surface tension of liquid is measured by.....
(a) viscometer (b) Hess viscometer (c) stalagmometer (d) osmometer
- (vii) Which is the correct symbol for a beta particle ?
(a) ${}^2_4\text{He}$ (b) ${}^0_1\text{n}$ (c) ${}^{-1}_0\text{e}$ (d) ${}^1_1\text{p}$
- (viii) Which is an example of radioactive element ?
(a) Cu (b) U (c) Li (d) all of these.

Q.2 Answer the following (Attempt any seven): [14]

- (i) Define : (a) pH (b) indicator,
(ii) Explain : Arrhenius concept of acid-base .
(iii) Distinguish between : Isothermal and adiabatic process.
(iv) Enlist the various factors affecting the viscosity of liquid.
(v) Explain Vont-Hoff equation of osmotic pressure.
(vi) State and explain second law of thermodynamics.
(vii) Define surface active agent with an example.
(viii) What do you mean by half life time of radioactive elements ? How it can be calculated ?
(ix) Give two main characteristics of gamma rays.

Q.3

[A] Answer the following: [6]

- (i) Derive Hinderson-Hassel back equation to calculate the pH of buffer

P.T.O.

solution.

(ii) Draw and explain strong acid-strong base neutralization curve.

[B] Explain the term Salt hydrolysis in detail with examples. [6]

OR

[B] Do as directed: [6]

(i) Derive relation $K_b = K_w / K_a \cdot K_b$

(ii) Calculate the pH of 0.02 M HCl solution.

Q.4

[A] Answer the following: [6]

(i) Derive Gibbs-Helmholtz equation and discuss about its applications.

(ii) Discuss various thermodynamic process.

[B] Explain the following: [6]

(i) Work is not a state function.

(ii) Internal energy of system.

OR

[B] Do as directed: [6]

(i) Define free energy. The free energy change (ΔG) accompanying a given process is 80 kJ at 25°C and 85 kJ at 25°C. Calculate the change in enthalpy (ΔH) for the process at 20°C.

(ii) Distinguish between : Reversible and irreversible process.

Q.5

[A] Answer the following: [6]

(i) Calculate the osmotic pressure of 5% solution of sodium chloride at room temperature (Given M.W. of NaCl : 58 gm/mole).

(ii) Define specific viscosity. How it is useful to calculate molecular weight of polymer ?

[B] Define surface tension of liquid. Enlist various method of its measurement. Discuss any one method in detail. [6]

OR

[B] What is meant by osmosis and osmotic pressure ? Discuss the process in detail. Also write importance of osmosis phenomenon. [6]

Q.6

[A] Answer the following: [6]

(i) Define isotopes. Enlist methods for the separation of isotopes from its isotopic solution.

(ii) Describe the principle involved in the working of Geiger-Muller counter.

[B] Define β -decay with suitable illustration. Calculate disintegration constant of cobalt-60, if its half life time to produce Nickle-60 is 5 year. [6]

OR

[B] Write a note on : Applications of radioisotope in biological science. [6]