2017/12

B.SC. CHEMISTRY
SEMESTER- 1ST
PHYSICAL CHEMISTRY I
BSC-103

Duration: 3 Hrs. **Marks: 70**

Part : A (Objective) = 20
Part : B (Descriptive) = 50

[PART-B : Descriptive]

Duration: 2 Hrs. 40 Mins. **Marks: 50**

[Answer question no. One (1) & any four (4) from the rest]

1. i. Discuss the statement: 'Classification of electrolytes into 'strong' and 'weak' is obsolete. It would be more appropriate to classify them as 'true' and 'potential' electrolytes.' 4+1+3+2=10

ii. Define the ionic product of water

iii. Write the postulates of kinetic theory of gases.

iv. Determine Miller indices of the crystal which cut the crystal axes at distance (3a, -4b, -2c)

2. i. Explain the Ostwald dilution law. 3+3+4=10

ii. Draw the representative plot of titration of: a strong acid with a strong base and a weak base with a strong acid. Identify the suitable indicator for these titrations.

iii. What is meant by the vapour pressure of a liquid? What is the effect of temperature on it?

3. Show that the exact concentration of H_3O^+ in an aqueous solution of an acid HA can be computed from the expression 5+2.5+2.5=10

$$K_a = \frac{[H_3O^+]^3 - [H_3O^+]K_w}{[H_3O^+][HA]_o - [H_3O^+]^2 + K_w}$$

Under what conditions can the following expressions be used:

i. $K_a = \frac{[H_3O^+]^2}{[HA]_o - [H_3O^+]}$

ii. $K_a = \frac{[H_3O^+]^2}{[HA]_o}$

4. i. Explain the phenomenon of hydrolysis. Show that $K_h = \frac{K_w}{K_a}$, the symbols have their usual significance. 1+4=5

ii. Explain why the pH of an aqueous solution of NaCl is 7 ? 3+2=5

iii. Calculate the pH of a solution for which the hydrogen ion concentration is 0.005 g/litre.

5. i. What is an acid-base indicator? Give an example.How does its color change with H^+ ion concentration of the solution? 5+5=10

ii. How can you relate critical constants with van Der Waal's constant

6. From Maxwell distribution law derive the Most probable velocity and Average velocity. 10

7. Determine total number of symmetry in a cubic system 10

8. Derive van Der Wall's equation for real gas. Illustrate the behavior of this equation at low temperature and high temperature. 6+4=10

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