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Reg. No. :

Code No. : 41101 E Sub. Code : JMCH 41/
SMCH 41

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2019.

Fourth Semester

Chemistry — Main

PHYSICAL CHEMISTRY — II

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Thermodynamics is applicable to
- (a) Microscopic systems only
 - (b) Macroscopic systems only
 - (c) Homogeneous systems only
 - (d) Heterogeneous systems only

2. A closed system is one which cannot transfer matter but transfer ~~to~~ and from its surroundings.

- (a) heat (b) work
- (c) radiation (d) all of the above

3. A process which proceeds of its own without any outside assistance is called

- (a) Non-spontaneous process
- (b) Spontaneous process
- (c) Reversible process
- (d) Irreversible process

4. Entropy is a measure of _____ of the molecule of the system.

- (a) concentration (b) velocity
- (c) zig-zag motion (d) randomness

5. Equilibrium reactions are characterised by

- (a) going to completion
- (b) being non-spontaneous
- (c) the presence of both reactants and products
- (d) both (a) and (b)



6. What is the expression for K_{eq} for the reaction
 $2N_2O_{(g)} + O_{2(g)} \rightleftharpoons 4NO_{(g)}$?

(a) $\frac{[N_2][O_2]}{[NO]}$ (b) $\frac{[NO]^4}{[N_2O]^2}$
 (c) $\frac{[N_2O]^2 [O_2]}{[NO]^4}$ (d) $\frac{[NO]^4}{[N_2O]^2 [O_2]}$

7. The completely miscible solution can be separated by

- (a) a separating funnel
 (b) evaporation
 (c) fractional distillation
 (d) none of these

8. In one mole solution which contains 0.5 mole of solute, then the mass of the solvent is

- (a) 1000 g (b) 1000 ml
 (c) 500 ml (d) 500 g

9. One which decreases with dilution is

- (a) conductance
 (b) specific conductance
 (c) equivalent conductance
 (d) none of the above

10. Which relationship is used for the determination of degree of dissociation of weak electrolytes?

(a) $\alpha = \frac{\Lambda_m^0}{\Lambda_m}$ (b) $\alpha = \frac{\Lambda_m}{\Lambda_m^0}$
 (c) $\frac{\Lambda_0}{\Lambda_m^0}$ (d) $\frac{\Lambda_m^0}{\Lambda_0}$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) State and explain the zeroth law of thermodynamics.

Or

- (b) Explain the following : $(2\frac{1}{2} + 2\frac{1}{2})$

- (i) Enthalpy
 (ii) Internal energy.

12. (a) Discuss the conditions of equilibrium and spontaneity.

Or

- (b) Define entropy. Explain the physical significance of entropy.



13. (a) Derive the expression of temperature dependent equilibrium constant.

Or

- (b) What will be the effect of addition of inert gas on the equilibrium constant?
14. (a) Explain the following : $(2\frac{1}{2} + 2\frac{1}{2})$
- (i) Raoult's law
- (ii) CST.

Or

- (b) What is the molarity of a solution prepared by dissolving 75.5 g of pure KOH in 540 ml of solution?
15. (a) Explain the following : $(1 + 2 + 2)$
- (i) Equivalent conductance
- (ii) Molar conductance
- (iii) Ionic product of water.

Or

- (b) Explain any one method to determine the transport number.

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PART C — $(5 \times 8 = 40 \text{ marks})$

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) What do you understand by C_p and C_v of gases? Why is the value of C_p always greater than that of C_v ? How are they related?

Or

- (b) What is Joule-Thomson coefficient? Derive the expression for Joule-Thomson coefficient.

17. (a) What is meant by Clausius inequality? Explain it with suitable example.

Or

- (b) (i) Define Gibbs free energy and explain briefly. (4)
- (ii) Give an account of any one applications of Gibbs-Helmholtz equation. (4)

18. (a) Derive an expression to show how the equilibrium constant of a reaction varies with the change of pressure.

Or

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- (b) (i) Write a short note on Le-Chatelier's principle. (4)
(ii) Derive the relationship between K_p and K_c . (4)
19. (a) (i) Define and explain mole fraction. (3)
(ii) Calculate the molality of a solution prepared by dissolving 5.0 g of toluene in 225 g of benzene. (5)

Or

- (b) What are liquid crystals? What are their types? Explain briefly any four applications of the liquid crystals.
20. (a) (i) Define Cell constant. How is it determined? (4)
(ii) Explain any two applications of conductance measurements. (4)

Or

- (b) What are conductometric titrations? What are their types? Explain them in detail.

