(6 pages) **Reg. No. :** .....

Code No. : 6878 **Sub. Code : PCHM 23**

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2021.

Second Semester

Chemistry - Core

PHYSICAL CHEMISTRY II

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Number of nodal planes for f-orbital are _____

(a) 3 (b) 2

(c) 1 (d) 0

2. The distance between 3rd and 2nd orbit of hydrogen atom is _____

(a) 1.058×10^{-8} cm (b) 2.116×10^{-8} cm

(c) 2.646×10^{-8} cm (d) 0.529×10^{-8} cm

3. An atom has four unpaired electrons. The total spin of this atom will be ————————

(a) 1 (b) 2

(c) 1.5 (d) 4

4. The lowest excited state of the helium atom has the term symbol

(a) $2s^2$ (b) $^3S_1$

(c) $^1S_0$ (d) He^+

5. The increase in the conductance of an electrolytic solution when the applied voltage has a very high frequency is called as

(a) Falkenhagen effect

(b) Wien effect

(c) Stark effect

(d) Raman effect

6. $\gamma_{\pm} = (\gamma_+ \gamma_-)^{1/2}$ this equation defines ————————

(a) Bronsted equation

(b) Tafel equation

(c) Mean activitity coefficient

(d) Onsager equation

7. In the electro deposition of Ag, the silver ions are _____

(a) Reduced at anode
(b) Reduced at cathode
(c) Oxidised at anode
(d) Oxidised at cathode

8. Which of the following is not an example of a fuel cell?

(a) Hydrogen-oxygen cell
(b) Methyl-oxygen-alcohol cell
(c) Propane-oxygen cell
(d) Hexanone-oxygen cell

9. _____ states that only the light which is absorbed by a substance can bring about a photochemical change.

(a) Grotthus-Draper law
(b) Stark- Einstein law
(c) Beer- Lambert's law
(d) Faraday's law

10. Which one of the following types of particles is the MOST highly penetrating to biological tissues?

(a) α particles
(b) β particles
(c) Neutrons
(d) Posotron

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Derive the schrodinger equation for a linear harmonic oscillator.

Or

(b) Write a note on space quantisation.

12. (a) Write the rules of mutual Exclusion principal for CO_2 molecule.

Or

(b) What is Slater determinant? Give the Slater determinant for the two electron wave function of helium.

13. (a) Describe the Debye-Huckle-Onsagar equation. Mention is validity for dilute solutions.

Or

(b) State the Debye-Falkenhagen and wein effects.

14. (a) Write a brief note on electrophoresis.

Or

(b) Give the principals and applications of polarography.

15. (a) Write a comprehensive note on radiolysis of water.

Or

(b) Describe the photo physical pathways of excited molecular systems.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Derive the schrodinger equation.

Or

(b) Give a brief account on quantum mechanical tunnelling.

17. (a) Give a brief account on Born Oppenheimer approximation.

Or

(b) Calculate the delocalization energy for butadiene using HMO theory.

18. (a) Describe the Activity and Activity coefficient of non-ectrolytes.

Or

(b) Write the Debye-Huckel theory. Derive and explain Debye-Huckel Theory of strong electrolyte with experimental verification.

19. (a) Define corrosion.Give the types of corrosion. What are the factors influencing corrosion? How will you prevent the corrosion?

Or

(b) What are fuel cells? How will you classify them? How do fuel cell works?

20. (a) Draw and discuss the Jablonski diagram.

Or

(b) (i) Give the difference between radiation chemistry and photochemistry.

(ii) Mention the application of radiation chemistry.

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