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Reg. No. : .....

Code No. : 7878 **Sub. Code : PCHM 23**

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2019.

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. For the hydrogen atom, which of the following orbitals has the lowest energy ————.

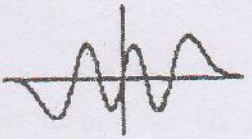
   (a) 4s

   (b) 4p

   (c) 4d

   (d) They all have the same energy

2. The illustrated wave function represents the state of the linear harmonic oscillator with n= ———



(a) 2 (b) 3

(c) 5 (d) 6

3. No two electrons in an atom will have all the four quantum numbers same. This statement is known as ———.

(a) Exclusion rule

(b) Uncertainty principle

(c) Aufbau principle

(d) Hund's rule

4. None of the four quantum numbers can have a value which is

(a) Negative

(b) Infinite

(c) Zero

(d) Fractional non-integral

5. The ———— is an equation in electrochemical kinetics relating the rate of an electrochemical reaction to the over potential.

(a) Butler-Volmer equation

(b) Onsager equation

(c) Debye equation

(d) Bronsted equation

6. ———— is defined as, the fraction of the total current carried either by the anion or the cation in electrolysis.

(a) Wien effect

(b) Transference number

(c) Falkenhagen effect

(d) Arhenius theory

7. ———— is a non-electrolytic finishing process that makes stainless steel more rust-resistant.

(a) Alloying (b) Tinning

(c) Galvanizing (d) Passivation

8. Micro electrode in polarography is generally ————.

(a) DME (b) Working electrode

(c) Indicator electrode (d) All of these

9. ———— is the production and emission of light by a living organism.

(a) Bioluminescence (b) Fluorescence

(c) Chemiluminescence (d) Phosphorescence

10. The process of determining the age of a fossil is known as ————.

(a) Irradiation (b) Radioactive dating

(c) Carbon dating (d) Smoke detecting

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Explain the one dimensional simple harmonic oscillator.

Or

(b) Write a note on the rigid rotator.

12. (a) Explain the rule of Mutual Exclusion principle for CO_2 molecule.

Or

(b) What does the MO of H_2^+ look like? What is its bond order? What is its magnetic property? Explain.

13. (a) Write Butler-Volmer and Tafel equations.

Or

(b) Explain the Helmholtz model.

14. (a) Explain the Ilkovic equation. Explain the terms involved.

Or

(b) What is an Evans diagram? Explain.

15. (a) Write brief notes on chemical actinometers.

Or

(b) Write brief note on Photosensitisation and Chemiluminescence.

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 *scrödinger* wave equation for Particle in 1 D box.

Or

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

17. (a) Brief in detail about Born-Oppenheimer approximation.

Or

(b) Explain the formation H_2 molecule on the basis of valence bond theory.

18. (a) Derive and explain Debye-Huckel theory of strong electrolyte with experimental verification.

Or

(b) Discuss the Activity and Activity Coefficients of non-electrolytes.

19. (a) What are fuel cells? How will you classify them? How do fuel cell works?

Or

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

20. (a) Draw and explain the each term of Jablonski diagram.

Or

(b) Illustrate the applications of radiation chemistry.
