C 62708 (Pages : 3) Name.....

Reg. No.....57

SECOND SEMESTER B.Sc. DEGREE EXAMINATION
MAY 2014

(UG–CCSS)

Complementary Course – Chemistry

CH 2C 03 – PHYSICAL CHEMISTRY – I

Time : Three Hours Maximum : 30 Weightage

I. Answer all the *twelve* questions. Each question carries a weightage of ¼. This section contains multiple choice, fill in the blanks and one word answer type questions :

1. Which of the following molecules is IR inactive ?

   (a) HCl. (b) NO.

   (c) N_2. (d) CO.

2. An isotropic solid among the following is :

   (a) Diamond. (b) Graphite.

   (c) Glass. (d) NaCl.

3. The unit cell of a crystal resembled a match box in its shape. The crystal belongs to :

   (a) Tetragonal system. (b) Monoclinic system.

   (c) Rhombohedral system. (d) Orthorhombic system.

4. When the N/P ratio is high, a radioactive isotope undergoes :

   (a) β emission. (b) Positron emission.

   (c) K-electron capture. (d) Proton emission.

5. The unit of rate constant for a reaction is found to be the same as the unit of rate. The order of the reaction is :

   (a) Zero. (b) One.

   (c) Two. (d) Three.

6. The rate of a reaction is dependent on :

   (a) Concentration of reactants. (b) Temperature.

   (c) Nature of the reactants. (d) All these.

7. The essential requirement for a molecule to give rotational spectrum is that, the molecule should possess _____.

Turn over

8. In a body centered cube, the radius of the particle '*r*' and edge length of the unit cel related as _____.

9. The very high temperature of the sun is due to _____.

10. The minimum amount of energy that must be possessed by the reactant molecules, t undergo an effective collision is called _____.

11. A catalytic process in which the catalyst and reactants are in the same phase is know _____.

12. 'Only that radiation which is absorbed by the reactants can bring about a photochemi change'. This statement is in accordance with _____ law.

(12 × ¼ = 3 weig

II. Answer all *nine* questions. Each question carries a weightage of 1 :

13. How is the unit of energy joule related to that in erg and electron volt?

14. State the Franck-Condon principle.

15. Name the different energy levels present in a molecule.

16. Which are the different types of symmetry elements present in crystals?

17. Crystalline solids are anisotropic. Why?

18. Find the Miller indices of a plane whose intercepts are 2a, 3b and c?

19. What are isotones? Give one example.

20. Define binding energy.

21. What is meant by quantum yield of a photochemical reaction?

(9 × 1 = 9 weigh

III. Answer any *five* questions. Each question carries a weightage of 2 :

22. Write briefly on the principle of microwave spectra.

23. Discuss the structure of NaCl crystal.

24. Explain the detection of isotopes by Aston's mass spectrograph.

25. What is carbon dating? Explain.

26. Derive the integrated rate equation for a second order reaction of the type $2A \rightarrow$ produc

27. Explain the adsorption theory of catalysis.

28. The half life period of a first order reaction is 120 minutes. Calculate the time require 90% completion of the reaction.

(5 × 2 = 10 weight

IV. Answer any *two* questions. Each question carries a weightage of 4 :

29. Discuss the principle of NMR spectroscopy. What all information about a proton can be obtained from the NMR spectrum? Explain.

30. (i) Derive the Bragg's equation.

(ii) What are extrinsic and intrinsic imperfections? Give examples.

31. (i) Explain the effect of temperature on the rate of a reaction.

(ii) Write the Arrhenius equation and explain how the Arrhenius parameters are calculated.

(2 × 4 = 8 weightage)