C 25126   (Pages : 2)   Name   ....

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SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Chemistry—Complementary Course

CH 2C 03—INORGANIC AND PHYSICAL CHEMISTRY

Time : Three Hours   Maximum : 30 Weightage

I. Answer *all* questions. Each question has a weightage of $1/4$. Questions in this section will be multiple choice, fill in the blanks or one word answer type :

1 Which of the following radiations has highest energy per photon ?

    (a) Blue.   (b) Green.

    (c) Yellow.   (d) Red.

2 Which of the following molecules will be microwave active ?

    (a) CO_2.   (b) BF_3.

    (c) NH_3.   (d) H_2.

3 UV visible spectrum is due to :

    (a) Rotational transitions.   (b) Vibrational transitions.

    (c) Electronic transitions.   (d) Spin transitions.

4 The unit cell dimensions a $b \neq c$ and $\alpha = y = 90$ β relate to the crystal type ————

5 KCl has a :

    (a) FCC structure.   (b) BCC structure.

    (c) Simple cubic structure.   (d) Tetragonal structure.

6 Which of the following is a stoichiometric crystal defect ?

    (a) Metal excess defect.   (b) Metal deficiency defect.

    (c) Both (a) and (b).   (d) Frenkel defect.

    Which isotope of cobalt is used in-radiotherapy ?

8 The pair, $^{14}_{7}N$ and $^{14}_{6}C$ is an example of ————

9 Which of the following factors does not affect the rate constant ?

    (a) Temperature.   (b) Concentration.

    (c) Catalyst.   (d) Nature of reactant.

10 Name the theory applicable to heterogeneous catalysis.

Turn over

11 In the integrated form of the Beer-Lambert law equation, $\log \frac{I_o}{I}$ is called :

12 The ratio of the rate constants differing by 10° is called ————

(12 x   = 3 weightage)

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

13 Sketch the concentration time graph for a zero-order reaction.

14 Starting with the integrated rate equation for a first order reaction, derive an expression for the time taken to complete 3/4 of the reaction.

15 Give two examples for homogeneous catalysis.

16 What is chemiluminescence ?

17 Explain with examples the term isobars.

18 Calculate the number of particles present in a unit cell of the face centred cube.

19 What are liquid crystals ? Give an example of a liquid crystal.

20 Calculate the energy in joule of a radiation having a frequency of $3 \times 10^{14} \text{ s}^{-1}$.

21 What do you mean by the width of a spectral line ?

(9 ^{x} 1 = 9 weightage)

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

22 The rotational spectrum of HCl contains a number of lines at a spacing of 2000 m^{-1}. Calculate the moment of inertia of HCl.

23 Outline the principle of infra-red spectrum.

24 Explain the single crystal method to study crystal structure.

25 The edge length of $NaCl$ crystal is 560 pm. If the radius of sodium ion is 95 pm, calculate radius of the chloride ion.

26 Describe the use of the Aston's mass spectrograph to detect isotopes.

27 Derive the integrated rate equation for a second order reaction and obtain the expression for the half-life of a second order reaction.

28 What is quantum yield ? Account for the high quantum yield of H_2—Cl_2 reaction.

(5 x 2 = 10 weightage)

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

29 Discuss the collision theory of reaction rates. Mention its limitations.

30 (a) Explain the diffusion method for the separation of isotopes.

(b) Calculate the efficiency of packing in a body centred cubic lattice.

31 Give a brief account of the theory and application of nuclear magnetic resonance spectrum.

(2 x 4 = 8 weightage)