

SECOND SEMESTER B.Sc. DEGREE (SUPPLEMENTARY)
EXAMINATION, DECEMBER 2012

(CCSS)

Chemistry

CH2 C03—PHYSICAL CHEMISTRY—1

Three Hours

Maximum : 30 Weightage

Answer all the *twelve* questions. Each question carries a weightage of $\frac{1}{4}$. This section contains multiple choice, fill in the blanks and one word answer type questions.

1 The unit of energy is :

- (a) S^{-1} . (b) cm^{-1} .
(c) MeV. (d) Å.

2 Which among the following is NMR active ?

- (a) $^{13}_6C$. (b) $^{12}_6C$.
(c) $^{18}_8O$. (d) $^{16}_8O$.

3 The radio waves are utilized in _____ spectroscopy.

- (a) Vibrational. (b) Electronic.
(c) Rotational. (d) NMR.

4 There are _____ types of primitive unit cells among crystals.

5 The number of atoms in a unit cell of a simple cubic lattice is _____.

6 There are _____ types of space lattices in cubic crystals.

7 The radioactive nucleus used in the treatment of thyroid cancer is _____:

- (a) ^{60}Co . (b) ^{127}I .
(c) ^{131}I . (d) ^{59}Co .

8 The most penetrating ray is :

- (a) α . (b) β .
(c) γ . (d) None of the above.

Turn over

- 9 Which among the following is true ?
 (a) Order cannot be zero. (b) Order can be zero.
 (c) Order is a theoretical concept. (d) Order cannot have fractional value.
- 10 The unit of rate constant of zero order reaction is :
 (a) $\text{mol L}^{-1} \text{S}^{-1}$. (b) mol L^{-1} .
 (c) $\text{L}^2 \text{mol}^{-2} \text{S}^{-1}$. (d) L mol^{-1} .
- 11 The catalyst used in the Haber process of manufacture of ammonia is _____.
- 12 The intensity of monochromatic radiation _____ with increase in concentration absorbing medium.

(12 × ¼ = 3 weight)

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

- 13 What are the two factors that determine the intensity of spectral lines ?
- 14 Why amorphous substances are said to be isotropic ?
- 15 What are liquid crystals ? How are they classified ?
- 16 What are point defects ? Give *two* examples.
- 17 What is meant by mass defect ?
- 18 What is nuclear fission ? Give an example.
- 19 What is meant by heterogenous catalysis ? Give one example.
- 20 The rate constant of a reaction is $5.7 \times 10^{-5} \text{ L mol}^{-1} \text{S}^{-1}$ at 25°C and $1.64 \times 10^{-4} \text{ L mol}^{-1} \text{S}^{-1}$ at 40°C . Calculate the activation energy.
- 21 Distinguish between order and molecularity.

(9 × 1 = 9 weight)

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

- 22 Give a brief account of the width of spectral line.
- 23 Explain chemical shift.
- 24 Determine the Miller indices of crystal planes which cut through the crystal axes at :
 (a) $(-2a, -3b, -3c)$.
 (b) (a, b, c) .
- 25 Briefly explain the structure of NaCl crystal.

- 26 Calculate the binding energy per nucleon of oxygen atom $^{16}_8\text{O}$ which has a mass of 15.994910 a.m.u. Mass of neutron = 1.008665 a.m.u. Mass of proton = 1.007277 a.m.u. and mass of electron = 0.0005486 a.m.u.
- 27 Write notes on the influence of temperature on reaction rates.
- 28 Derive an expression for the rate constant of a second order reaction.

(5 × 2 = 10 weightage)

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

- 29 Describe the principle and applications of IR spectroscopy.
- 30 Give a detailed account on the powder-X-ray diffraction method to study the structure of crystals.
- 31 Discuss the Collision theory of reaction rates.

(2 × 4 = 8 weightage)