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D-6323

M.Sc. (IInd Semester) Examination, 2020

CHEMISTRY

(Physical Chemistry)

Time Allowed : Three Hours

Maximum Marks : 70

Note : (i) Section-A : Objective type. Attempt any ten questions. Each question carries one mark.

Q. No. (1-5) Fill in the blanks type.

Q. No. (6-12) Multiple choice type.

(ii) Section-B : Very short answer type (25-30 words). Attempt any five questions. Each question carries 2 marks.

(iii) Section-C : Short answer type (250 words). Attempt any five questions. Each question carries 4 marks.

(iv) Section-D : Essay type (more than 500 words). Attempt any three questions. Each question carries 10 marks.

SECTION - A

Note : Attempt any ten questions. Each question carries 1 mark. **1×10=10**

Q. 1. Fill in the blanks type :

(i) The unit or rate constant of second order reaction is _____.

(ii) Selection rule for rotational spectra is _____.

(iii) The number of vibrational modes in a molecule is _____ for non-linear molecules where N is the number of atoms.

(iv) Radioactivity is first discovered by _____ in the year _____.

(v) Molecules which are not having dipole moment are called microwave _____.

Multiple choice type :

(vi) _____ spectroscopy explores the part of the electromagnetic spectrum which extending from 100 to 1 cm :

(a) IR

(b) Microwave

(c) Raman

(d) NMR

(vii) Which type of radioactive decay does not change the atomic number :

(a) Alpha

(b) Beta

(c) Gamma

(d) None of these

(viii) Example of magic number is :

(a) 20

(b) 38

(c) 54

(d) 84

(ix) How is nanometer related to angstrom ?

(a) 10 nm = 1 A°

(b) 1 nm = 10 A°

(c) 100 nm = 1 A°

(d) 1 nm = 100 A°

(x) Which molecule has zero dipole moment ?

(a) HCl

(b) CO_2

(c) CH_3Cl

(d) H_2O

(xi) Carbon dating method was developed by :

(a) Madam Curie

(b) Roentgen

(c) Willard Libby

(d) F. Soddy

(xii) When did C.V. Raman got nobel prize ?

(a) 1928

(b) 1930

(c) 1932

(d) 1934

SECTION - B

Note : Attempt any five questions. Each question carries 2 marks. **2×5=10**

Q. 2. Very short answer type (25-30 words) :

(i) Define the order of the reaction.

(ii) Give Planck's statement of third law of thermodynamics.

(iii) What is zero point energy ?

(iv) What is concept of entropy ?

(v) What is meant by nuclear cross section ?

(vi) What is Rayleigh scattering ?

(vii) Define Adsorption.

SECTION - C

Note : Attempt any five questions. Each question carries 4 marks. **4×5=20**

Q. 3. Short answer type (250 words) :

Discuss the following :

(i) Nernst heat theorem.

(ii) Structure elucidation from combined Raman and IR spectroscopy.

(iii) Detection and measurement of Radio activity by G.M. Counter.

(iv) Factors affecting adsorption.

(v) Applications of microwave spectroscopy.

(vi) Electronic spectra of diatomic molecules.

(vii) Neutron activation analysis.

SECTION - D

Note : Attempt any three questions. Each question carries 10 marks. **10×3=30**

Q. 4. Essay type (more than 500 words) :

(i) Discuss the theory of pure rotational spectra with reference to rigid rotator model and non-rigid rotator model. Give the effect of isotopic substitution on the transition frequencies.

(ii) What are radioisotopes ? Discuss their various applications in detail.

(iii) Discuss the classical and quantum theories of Raman effect. Give selection rule for Rotational Raman Spectra and Vibrational Raman Spectra.

(iv) Describe various methods of determining rate laws.