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**F-6323**

**M.Sc. (II<sup>nd</sup> Semester) Examination, 2021**

**CHEMISTRY**

**( Physical Chemistry )**

*Time Allowed : Three Hours*

*Maximum Marks : 70*

*Minimum Passing Marks : 25*

**Note :** Question paper is divided into four sections. Attempt question of all four section as per direction. Distribution of marks is given in each section.

**SECTION-A**

**( Objective Type Questions )**

**Note :** Attempt **any ten** questions. Each question carries **one** mark.

1. Objective type : [1x10=10]

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**( 1 )**

**[P.T.O.]**

(i) Which of the following isotopes is not a radioisotopes ?

(a) Carbon-13

(b) Carbon-14

(c) Tritium

(d) Sulphur-35

(ii) The half life of a radioisotopes is :

(a) half the time taken for complete decay

(b) half the time taken for half the decay

(c) time taken for complete decay

(d) time taken for half the decay

(iii) The rate constant of zero order reaction has the unit :

(a)  $S^{-1}$

(b)  $Mol L^{-1} S^{-1}$

- (c)  $L^2 \text{ mol}^{-2} \text{ S}^{-1}$
- (d)  $L \text{ mol}^{-1} \text{ S}^{-1}$
- (iv) A catalyst alters, which of the following in a chemical reaction ?
- (a) Entropy
- (b) Enthalpy
- (c) Internal energy
- (d) Activation energy
- (v) Which of the following properties describe entropy ?
- (a) Point functions, Intensive property
- (b) Point function, Extensive property
- (c) Path function, Extensive property
- (d) Path function, Intensive property

- (vi) In Raman spectroscopy, the radiation liner in the :
- (a) Microwave region
  - (b) Visible region
  - (c) UV region
  - (d) X-ray region
- (vii) The IR region most widely used for qualitative analysis is :
- (a) Near-IR
  - (b) Mid-IR
  - (c) Far-IR
  - (d) All of the above
- (viii) The possible number of vibrational Bands for  $\text{CO}_2$  is\_\_\_\_\_.
- (ix) The Raman spectrum is said to consist of stokes lines when\_\_\_\_\_.

- (x) The electronic spectra in the visible range span is \_\_\_\_\_  $\text{cm}^{-1}$ .
- (xi) A Geiger miller tube is a \_\_\_\_\_.
- (xii) Liquid scintillation spectrometry is a method of detecting \_\_\_\_\_.

### SECTION-B

( Very Short Answer Type Questions )

(25-30 words)

**Note :** Attempt **any five** questions. Each question carries **2** marks.

2. Write short notes on the following : (25-30 words only)

[2x5=10]

- (i) What is Fugacity ?
- (ii) What is meant by Magic Number ?
- (iii) What is Raman Shift ?
- (iv) Give the concept of activity.

- (v) Give two radioisotopes of medicinal uses.
- (vi) What is fission energy ?
- (vii) Give the any two example of vibrational spectra of Diatomic molecules.

### **SECTION-C**

#### **( Short Answer Type Questions )**

**Note :** Attempt **any five** questions. Each question carries **4** marks. [5x4=20]

3. Short answer type (250 words) :

- (i) Describe the rigid rotor and non-rigid rotor.
- (ii) Write short notes on Nernst Heat theorem.
- (iii) Discuss the Born Oppenheimer approximation.
- (iv) Explain the photoelectron spectroscopy and application.
- (v) Describe the Harmonic and Unharmonic oscillator.

- (vi) Write the short notes on BET adsorption isotherm.
- (vii) Describe the application of radio isotopes as tracers and agriculture.

### **SECTION-D**

#### **( Long Answer Type Questions )**

**Note:** Attempt **any three** questions. Each question carries **10** marks. [10x3=30]

4. Essay type : (500 words)

- (i) (a) Discuss the basic principle of Raman spectroscopy.
- (b) Explain the Born oppenheimer approximetron and electronic spectra of diatomic molecules
- (ii) (a) Discuss the Decay kinetics and type of radioactive decay.
- (b) Write short notes on neutron activation analysis.

- (iii) Write short notes on the following :
- (a) Kinetic salt effect
  - (b) Adsorption isotherm
  - (c) Third law of thermodynamics
- (iv) (a) Explain the phase rule and its application.
- (b) Write notes on G.M. counter.

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