

SARDAR PATEL UNIVERSITY
Semester IV, S. Y. B.Sc. Examination,
Tuesday, April 09th- 2019, Time: 10.00 am to 01.00 pm
Subject: Applied Physics, Course Code- US04CAPH01
Course title-Spectroscopy

Maximum Marks: 70

Q-1 Write answers to the following multiple choice questions in your answer book by selecting the proper option. [10]

- (1) ----- are employed for the separation of components of light by diffraction phenomenon.
(a) Thermopiles (b) prism (c) Glass (d) grating
- (2) The line spectra is produced when the emitting element is in the ----- state.
(a) Molecular (b) Atomic (c) both a, and b (d) depends on the condition.
- (3) The splitting of the spectral lines in the presence of electric field, this effect is known as-
(a) Zeeman effect (b) Stark effect (c) Anomalous effect (d) all of these
- (4) In the molecular spectra the width of spectral line depends on
(a) The natural width (b) Doppler broadening (c) Pressure broadening (d) all of these
- (5) The shape of energy curve in the molecular spectra is-
(a) Parabola (b) hyperbola (c) circle (d) ellipse
- (6) The mass spectroscopy works on the principle of
(a) e/m ratio (c) time of flight
(b) magnetic deflection (d) all of the these
- (7) Mass spectroscopy is used to determine
(a) Mass of the molecule (c) mass of the atom
(b) e/m ratio of the specimen (d) All of the above
- (8) Beer's law states that the intensity of light decreases with respect to _____
(a) Concentration (b) Distance (c) Composition (d) Volume
- (9) To detect the complete spectrum of electromagnetic radiation mainly used detector is
(a) Silicon diode detector (b) Gas filled photo-emissive cell
(c) Photodiode arrays (d) High vacuum photo-emissive cell
- (10) The photosensitive detector is used to-
(a) To convert the light energy into the electrical energy
(b) To convert the electrical energy into light energy
(c) To observe the monochromatic light
(d) Only to observe the reflected light from the specimen

Q-2 Answer the following questions in brief. (Answer any ten questions)

[20]

- (1) Give a brief note on stark effect.
- (2) Enlist the essential elements associated with vector atom model.
- (3) Explain the J-J coupling with example.
- (4) What are the different modes of molecular transition?
- (5) How is the nature of molecular spectra?
- (6) By which equation the energy of diatomic molecule is given in parabolic shape with respect to the inter-nuclear distance?
- (7) What is mass spectrometry and what a mass spectrometer do?
- (8) A basic mass spectrometer consists of which three parts?
- (9) Sketch the circuit diagram for magnetic deflection mass spectrometer.
- (10) Draw the appropriate figure for the absorption instrumental setup.
- (11) Sketch the diagram of prism monochromator.
- (12) What is optical filter? Write the short note on optical filter.

(P.T.O.)

- Q-3 (a) Explain the quantum numbers and their physical interpretation in detail. [6]
(b) Explain the L-S coupling with example. [4]
- OR
- Q-3 What is Zeeman effect? Explain the experimental study and classical interpretation of Zeeman effect. [10]
- Q-4 (a) Explain the rotation of diatomic linear molecule in detail. [6]
(b) How the energy level scheme is classified by the Born Oppenheimer Approximation? [4]
- OR
- Q-4 (a) Explain in detail the vibrating diatomic molecule as a harmonic oscillator. [6]
(b) What are the causes responsible for the width of molecular spectral lines? Explain. [4]
- Q-5 (a) What is time of flight mass spectrometer? Explain that how to find the mass of a specimen with it. [6]
(b) Explain that how to interface the liquid chromatograph with mass spectrometer? [4]
- OR
- Q-5 What are the components of mass spectrometer? Explain in detail. [10]
- Q-6 (a) What are the different radiation sources used for absorption instrument? Explain in brief. [6]
(b) What is interference filter? How does it work explain in detail. [4]
- OR
- Q-6 (a) What is Beer Lambert's law? Explain in detail. Why the deviation in Beer Lambert's law occurs? [6]
(b) Give a brief note on photomultiplier tube. [4]

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