

(6 pages)

Reg. No. : .....

Code No. : 20300 E Sub. Code : AMPH 52

B.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2022.

Fifth Semester

Physics — Core

SPECTROSCOPY

(For those who joined in July 2020 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The vibrational stretching frequency of diatomic molecule depends on
- Force constant
  - Masses of two atoms
  - Both (a) and (b)
  - None

7. Beer Lambert's law gives the relation between which of the following?

- Reflected radiation and concentration
- Scattered radiation and concentration
- Energy absorption and concentration
- Energy absorption and reflected radiation

8. In which of the following ways, absorption is related to transmittance?

- Absorption is the logarithm of transmittance
- Absorption is the reciprocal of transmittance
- Absorption is the negative logarithm of transmittance
- Absorption is a multiple of transmittance

9. NMR spectrometer provides \_\_\_\_\_ and \_\_\_\_\_ method of determining structure in soluble chemical compounds.

- Accurate, destructive
- Accurate, non-destructive
- Inaccurate, destructive
- Inaccurate, non-destructive

2. The wave number difference between successive rotational levels of a rigid diatomic molecule is
- $2BJ$
  - $BJ(J+1)$
  - $2BJ(J+1)$
  - $2BJ(J-1)$
3. Which of the following absorb IR radiation?
- Homonuclear diatomic molecule
  - Heteronuclear diatomic molecule
  - Both (a) and (b)
  - Diatomic molecules will not absorb IR
4. Over tones are mainly observed in
- near IR
  - mid IR
  - far IR
  - Not in IR region
5. Which of the following cannot be conserved during Raman scattering?
- Total Energy
  - Momentum
  - Kinetic Energy
  - Electronic Energy
6. The Raman spectrum is said to consist of Stokes lines when \_\_\_\_\_
- $\Delta\nu > 0$
  - $\Delta\nu < 0$
  - $\Delta\nu = 0$
  - Does not depend on  $\Delta\nu$

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10. What does "MRI" stand for?
- Magneto-Ray Idometry
  - Medical Radiometry Instrument
  - Magnetic Resonance Imaging
  - Maximal Radiology Imaging

PART B — (5 × 5 = 25 marks)

Answer ALL questions, by choosing (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the intensities of spectral lines of diatomic molecule.

Or

- (b) Describe about the techniques of linear polyatomic molecules.

12. (a) Write a note on interaction of rotations and vibrations.

Or

- (b) Analyse the IR techniques of polyatomic molecule.

13. (a) Write an essay on Raman effect.

Or

- (b) Discuss about the structure determination from IR and Raman spectroscopy.

14. (a) Describe about the Transmittance and absorbance of UV spectroscopy.

Or

- (b) List out the applications of UV spectrophotometer.

15. (a) Discuss about the instrumentation for NMR spectroscopy.

Or

- (b) Explain the principle of NMR spectroscopy.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, by choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the theory of pure rotational spectra of diatomic molecule.

Or

- (b) Give an account on non-rigid rotator.

17. (a) Obtain an expression for zero point energy for an anharmonic oscillator.

Or

- (b) Describe about the vibration of polyatomic molecules.

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18. (a) Explain classical theory of Raman effect.

Or

- (b) Describe the Raman spectrum of symmetric top molecules.

19. (a) Explain the principle of ultraviolet spectroscopy.

Or

- (b) Write an essay on UV spectrophotometer.

20. (a) Describe the theory of NMR spectroscopy.

Or

- (b) Narrate an essay on Magnetic resonance imaging (MRI).

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