

(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 — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. The vibrational stretching frequency of diatomic molecule depends on
 - (a) Force constant
 - (b) Masses of two atoms
 - (c) Both (a) and (b)
 - (d) None
2. The wave number difference between successive rotational levels of a rigid diatomic molecule is
 - (a) $2BJ$
 - (b) $BJ(J+1)$
 - (c) $2BJ(J+1)$
 - (d) $2BJ(J-1)$
3. Which of the following absorb IR radiation?
 - (a) Homonuclear diatomic molecule
 - (b) Heteronuclear diatomic molecule
 - (c) Both (a) and (b)
 - (d) Diatomic molecules will not absorb IR
4. Over tones are mainly observed in
 - (a) near IR
 - (b) mid IR
 - (c) far IR
 - (d) Not in IR region
5. Which of the following cannot be conserved during Raman scattering?
 - (a) Total Energy
 - (b) Momentum
 - (c) Kinetic Energy
 - (d) Electronic Energy
6. The Raman spectrum is said to consist of Stokes lines when _____
 - (a) $\Delta\nu > 0$
 - (b) $\Delta\nu < 0$
 - (c) $\Delta\nu = 0$
 - (d) Does not depend on $\Delta\nu$

Page 2 Code No. : 20300 E



7. Beer Lambert's law gives the relation between which of the following?
- (a) Reflected radiation and concentration
 - (b) Scattered radiation and concentration
 - (c) Energy absorption and concentration
 - (d) Energy absorption and reflected radiation
8. In which of the following ways, absorption is related to transmittance?
- (a) Absorption is the logarithm of transmittance
 - (b) Absorption is the reciprocal of transmittance
 - (c) Absorption is the negative logarithm of transmittance
 - (d) Absorption is a multiple of transmittance
9. NMR spectrometer provides _____ and _____ method of determining structure in soluble chemical compounds.
- (a) Accurate, destructive
 - (b) Accurate, non-destructive
 - (c) Inaccurate, destructive
 - (d) Inaccurate, non-destructive

Page 3 Code No. : 20300 E

10. What does "MRI" stand for?
- (a) Magneto-Ray Idometry
 - (b) Medical Radiometry Instrument
 - (c) Magnetic Resonance Imaging
 - (d) 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.

Page 4 Code No. : 20300 E
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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 — ($5 \times 8 = 40$ 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 unharmonical oscillator.

Or

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

Page 5 Code No. : 20300 E

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).

Page 6 Code No. : 20300 E

