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Reg. No. :

Code No. : 30050 E Sub. Code : GMPH 62

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Physics – Main

SPECTROSCOPY

(For those who joined in July 2012 – 2015)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL the questions.

Choose the correct answer :

1. The source used in UV spectrometer is
 - (a) Hydrogen lamp
 - (b) Xenon discharge lamp
 - (c) Mercury arc lamp
 - (d) All the above

2. Isotope shift is rotational spectra
- (a) Increases with J
 - (b) Decreases with J
 - (c) Zero
 - (d) Does not happen
3. Which one of the following does not have permanent dipole moment?
- (a) HCl
 - (b) CO
 - (c) CO₂
 - (d) H₂O
4. The vibration–rotation spectrum has
- (a) P–branch
 - (b) R-branch
 - (c) Both P and R branch
 - (d) Neither P nor R branch
5. The lines having wavelengths greater than that of the incident wavelength are called
- (a) Anti stokes lines
 - (b) Stokes lines
 - (c) Raman lines
 - (d) Rayleigh lines
6. In Raman effect stokes line is given by
- (a) $\gamma = \gamma_0$
 - (b) $\gamma = \gamma_0 - \gamma_m$
 - (c) $\gamma = \gamma_0 + \gamma_m$
 - (d) $\gamma = 0$

7. ΔJ value corresponding to R-branch in electronic vibration transition is
(a) -1 (b) $+1$
(c) 2 (d) -2
8. Pure rotational spectrum takes place between
(a) UV and IR (b) IR and visible
(c) Microwave and IR (d) None
9. The sources of IR spectroscopy are
(a) Globar (b) Nickel
(c) Cobalt (d) None
10. Which is difficult to examine in IR spectrometer?
(a) liquid sample (b) solid sample
(c) gas sample (d) none

PART B — ($5 \times 5 = 25$ marks)

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

Each answer should not exceed 250 words.

11. (a) Outline the instrumentation technique by microwave spectroscopy.

Or

- (b) Explain the symmetric top molecules.

12. (a) Outline the applications of IR spectroscopy.

Or

- (b) State and explain the principle of IR spectroscopy.

13. (a) Explain the quantum theory of Raman effect.

Or

- (b) Discuss the pure rotational Raman spectra of linear molecules.

14. (a) Explain Fortrat parabolas.

Or

- (b) Explain Frank – Condon principle.

15. (a) Discuss the preparation of different samples used in IR spectrometer.

Or

- (b) Outline the advantages of beam spectrometer.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Describe the rigid diatomic molecules.

Or

- (b) How does the microwave spectrum of a non rigid rotator differ from that of a rigid rotator?

17. (a) Explain the vibrations of Polyatomic molecules with examples.

Or

- (b) Explain the energy of diatomic molecule of harmonic and an harmonic oscillator.

18. (a) Explain the structure determination from Raman and Infrared spectroscopy.

Or

- (b) Outline the applications of Raman Spectroscopy.

19. (a) Explain the rotational fine structure of electronic vibration spectra.

Or

- (b) Explain Born Oppenheimer approximation.

20. (a) Discuss briefly the IR instrumentation.

Or

- (b) Explain the different parts of a IR spectrometer.
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