



Name of Program-PhD
Course - Physical Chemistry
Course Code - CH20P104

Max. Duration: 1.5 hrs.

Max. Marks: 30

SECTION - A

1. Objective Type Questions (ALL QUESTIONS ARE COMPULSORY) (5X1 = 05)

1. Mid-IR region mainly consists of

- (i) $4000 - 100 \text{ cm}^{-1}$ (ii) $14000 - 4000 \text{ cm}^{-1}$ (iii) $4000 - 400 \text{ cm}^{-1}$ (iv) $400 - 100 \text{ cm}^{-1}$

2. LASER is an acronym for

- (i) Light amplified by spontaneous emission for radiation
(ii) Light amplification by Stimulated Emission of Radiation
(iii) Length assisted survey of region
(iv) None of the above

3. What is the wavelength range of the UV spectrum?

- (i) 100 nm to 500 nm (ii) 200 nm to 800 nm
(iii) 300 nm to 1000 nm (iv) 400 nm to 1600 nm

4. The possible transitions for water molecule in UV-visible region are

- (i) $\sigma \rightarrow \sigma^*$ (ii) $n \rightarrow \pi^*$, $\pi \rightarrow \pi^*$
(iii) $\sigma \rightarrow \sigma^*$, $n \rightarrow \pi^*$ (iv) $n \rightarrow \sigma^*$

5. The correct order of different types of energies is

- (i) $E_{\text{ele}} > E_{\text{vib}} > E_{\text{rot}} > E_{\text{tra}}$ (ii) $E_{\text{ele}} > E_{\text{rot}} > E_{\text{vib}} > E_{\text{tra}}$
(iii) $E_{\text{ele}} > E_{\text{vib}} > E_{\text{tra}} > E_{\text{rot}}$ (iv) $E_{\text{tra}} > E_{\text{vib}} > E_{\text{rot}} > E_{\text{ele}}$

SECTION - B

2. Short Answer Type Questions (Attempt any THREE) (3X5 =15)

- a) Explain selection rules.
b) Explain Principles of laser action.
c) Explain Franck-Condon factor.
d) Explain Raman Effect.
e) Explain Fourier Transforms in spectroscopy.

SECTION - C

3. Long Answer Type Questions (Attempt any ONE) (1X10 =10)

- (a) Discuss Laser spectroscopy.
(b) What is the photoelectron spectroscopy (PES)? Explain it.