



## Avinashilingam Institute for Home Science and Higher Education for Women

(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956)

Re-accredited with 'A+' Grade by NAAC. Recognised by UGC Under Section 12B

Coimbatore - 641 043, Tamil Nadu, India

### Bachelor's Degree Examination – July 2020

#### IV Semester

Class : II B.Sc.

Major : Physics

Time : 3 Hours

Max. Marks : 100

#### 18BPHC10 Atomic Physics and Spectroscopy

##### PART - A

10 x 1 = 10

##### Choose the Correct Answer

- Photomultiplier is based on the principle of \_\_\_\_\_ emission.
  - Primary
  - Secondary
  - Both a and b
  - continuous
- The energy which is sufficient to liberate electrons from metal surface with zero velocity is called
  - Stopping potential
  - Work function
  - Threshold frequency
  - Retarding potential
- According to Bohr's postulate when an electron jumps from an orbit of higher to lower energy, the frequency of emitted photon will be
  - $\nu = E_i - E_f$
  - $\nu = (E_i - E_f) / h$
  - $\nu = E_f - E_i$
  - $\nu = (E_f - E_i) / h$
- The energy required to remove an electron from an orbit is \_\_\_\_\_ potential.
  - Critical
  - Excitation
  - Ionization
  - Chemical
- In L-S coupling J can have \_\_\_\_\_ values.
  - (2S+1)
  - (S+1)
  - (2L+1)
  - (L+1)
- If the threshold wavelength of sodium is  $6800\text{\AA}$  and  $h=6.626 \times 10^{-34}$  Js, then the work function of sodium ( $\phi$ ) is
  - 0.817eV
  - 1.827eV
  - 1.717eV
  - 1.727eV
- The infra-red region of the spectrum extends beyond the red end of the visible spectrum up to
  - 100 microns
  - 200microns
  - 300 microns
  - 400 microns
- The intensity of the Raman line depends on the magnitude of change in
  - polarizability
  - dipole moment
  - both (a) and (b)
  - applied field
- In He-Ne laser the mixture of Helium and Neon are in the ratio of
  - 1 : 5
  - 10 : 1
  - 2 : 3
  - 3 : 2
- The method of producing population inversion is called
  - absorption
  - Spontaneous emission
  - Stimulated emission
  - pumping

**Part B**

**5 x 6 = 30**

**Answer ALL questions**

**Each answer should not exceed 400 words or two pages**

11. a. What is photoelectric effect? Write about Einstein's explanation on photoelectric effect.

(Or)

11. b. Explain in detail about photovoltaic cell.

12. a. Discuss about the spectral series of hydrogen atom.

(Or)

12. b. Describe Frank Hertz experiment.

13. a. Write a short notes on L-S and J-J coupling.

(Or)

13. b. Give a brief description on Stern and Gerlach experiment and its outcome .

14. a. Explain about the working of IR Spectrometer in a detail.

(Or)

14. b. Explain the classical theory of Raman Effect.

15. a. Define the following terms

i. Absorption

ii. Spontaneous and induced emission

iii. Population inversion

iv. Optical Pumping

(Or)

15. b. Explain the working principle of a Dye Laser.

**Part C**

**5 x 12 = 60**

**Answer ALL questions**

**Each answer should not exceed 800 words or four pages**

16. a. Verify the Einstein's photoelectric equation by Millikan's experiment.

(Or)

16. b. Explain photo emissive and photo conductive cell with neat diagram. Mention any five applications of photoelectric cells.

17.a. Describe Bohr's atom model in detail. List out the postulates and derive an expression for energy of an electron.

(Or)

17. b. i. Explain the effect of nuclear motion on atomic spectrum.

ii. Explain Ritz combination principle and Bohr's correspondence principle.

18. a. Give detailed account on Sommerfeld's relativistic atom model.

(Or)

18. b. Explain about magnetic dipole moment due to orbital motion of the electron and due to spin.

19. a. Define Raman effect? Explain the Quantum theory of Raman Effect.

(Or)

19. b. Describe Raman Spectrometer with neat diagram and briefly discuss about its applications.

20. a. Explain the characteristics of He-Ne Laser.

(Or)

20. b. Describe the construction and working of Ruby Laser.

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