

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2019
(Third Semester)

Branch - PHYSICS

ATOMIC. MOLECULAR AND LASER PHYSICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10x1 = 10)

- 1 When an electron jumps from outer orbits to the second orbit is called _____
(i) Lyman Series (ii) Balmer Series
(iii) Paschen Series (iv) Brackett Series
- 2 The frequency of two lines with a nicd prism, both the lines are found to be circularly polarized in opposite direction is called _____
(i) Transverse (ii) Plane
(iii) Longitudinal (iv) Symmetrical
- 3 The distinct feature of the vector atom model is _____
(i) Orbital motion (ii) Magnetic momenta
(iii) Spinning electron hypothesis (iv) Electronic Spectra
- 4 The velocity of photoelectron depends upon the of the incident photon only
(i) Frequency (ii) Volume
(iii) Mass (iv) Velocity
- 5 The minimum wavelength of continuous X-rays is given by
(i) $\lambda_{\min} \sim V$ (ii) $\lambda_{\min} = \frac{hc}{eV}$
(iii) $\lambda_{\min} = \frac{h}{ceV}$ (iv) $\lambda_{\min} = \frac{hc}{eV}$
- 6 Bragg's equation is
(i) $2d \sin \theta = n\lambda$ (ii) $2d \sin \theta = n\lambda$
(iii) $2d \sin \theta = n\lambda$ (iv) $2d \sin \theta = n\lambda$
- 7 Which of the following falls under electromagnetic radiation
(i) Photon (ii) UV- Rays
(iii) Electron (iv) Proton
- 8 In Raman Spectrum, the Raman shift is
(i) Function of wavelength of incident light
(ii) Dependent of the nature of Scattering substance
(iii) Independent of the nature of Scattering substance
(iv) Depends on temperature of the substance
- 9 In the term LASER, SE stands for
(i) Spontaneous emission (ii) Stimulated Emission
(iii) Stark emission (iv) Scattering Electron
- 10 Pumping process is used to _____
(i) Increase pressure (ii) Gives light
(iii) Achieve population Inversion (iv) None of the above .

SECTION - B (35 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 7 = 35)

- 11 a Bring out Bohr's postulates, derive an expression for the frequencies of radiation emitted in hydrogen atom.
OR
b Discuss the quantum mechanical explanation of the normal Zeeman effect.
- 12 a Explain the concept of L-S and j-j coupling.
OR
b Calculate the work function of sodium in electron volts given that the threshold wavelength is 6800 Å and $h = 6.625 \times 10^{-34}$ JS.
- 13 a Explain the continuous and characteristic spectra of X-Rays.
OR
b State and explain Mosley's Law. What is its importance?
- 14 a Describe the general explanation of electromagnetic radiation.
OR
b Describe the principle and instrumentation of UV-spectroscopy.
- 15 a Give the principle of Laser and derive the Einstein coefficients A and B.
OR
b Explain the function of LASER induced fusion process.

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Produce an expression for Lande's splitting factor and explain the anomalous Zeeman effect of Sodium Doublet Lines D_1 and D_2 with its help.
- 17 Discuss vector atom model and explain different quantum numbers associated with it.
- 18 Obtain an expression for the shift in wavelength of X-ray beam. Give its experimental verification.
- 19 Give the theory of Raman Effect and describe an experimental arrangement for studying it.
- 20 Explain the principle, construction and working of Ruby Laser.

Z-Z-Z

END