UNIT 26 ATOMIC PHYSICS

MULTIPLE CHOICE QUESTIONS

1. Atomic spectra are also known as:
   (a) Discrete spectra **(b) Line spectra**
   (c) Emission spectrum (d) Continuous spectra

2. The ratio of kinetic energy to total energy for an electron in a Bohr orbit is:
   (a) 1: -1 (b) 2:3
   (c) 1:2 (d) 2:1

3. The Bohr radius increases as the principal quantum number:
   (a) increases (b) decreases
   (c) remains constant (d) oscillates

4. Laser beams consist of:
   (a) Highly coherent electrons **(b) Highly coherent photons**
   (c) Highly coherent phonons (d) Highly coherent neutrons

5. The ruby laser is an example of:
   (a) Optical pumping (b) Electrical pumping
   (c) Chemical pumping (d) Thermal pumping

6. Laser action requires a medium with at least:
   (a) Three energy levels (b) Four energy levels
   (c) Two energy levels (d) Five energy levels

7. Population inversion occurs in:
   (a) Active medium (b) Passive medium
   (c) Gaseous medium (d) Vapour medium

8. X-rays transfer ……to metals.
   (a) Energy (b) Force
   (c) Pressure (d) Momentum

9. X-rays are deflected by:
   (a) Magnetic fields (b) Electric fields
   (c) Gravitational fields **(d) No fields**

10. Doubling the voltage of an X-ray tube:
    (a) Halves the intensity
    (b) Keeps the intensity unchanged
    (c) Doubles the intensity
    (d) Quadruples the intensity

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EXAM PRACTICE MCQs

1 Find the shortest wavelength present in the radiation from an x-ray machine whose accelerating potential is 50000 V.

(a) 0.0248 Å **(b) 0.248 Å**
(c) 2.48 Å (d) 24. 8 Å

2 Which of the following spectral lines of X-rays is more intense?

(a) K_α (b) K_β
(c) K_γ (d) $none\ of\ these$

3. The food industry uses X-ray for _____

a) Checking Purity of food **b) Sterilizing food**
c) Break it into smaller pieces d) Does not uses

4 X-rays can't penetrate through a sheet of:

(a) Wood (b) Paper
(c) Aluminum **(d) Lead**

5 The wavelength of characteristic X-rays depends upon—

(a) Size of target (b) Mass of target
(c) Temperature of target **(d) Atomic number of target**

6 The potential difference applied to an X-ray tube is 5 kV, and its current is 3.2 mA. The number of electrons striking the target per second is:

(a) $5 \times 10^{16}\ electrons$ (b) $3 \times 10^{14}\ electrons$
(c) $\mathbf{2 \times 10^{16}\ electrons}$ (d) $5 \times 10^{16}\ electrons$

7. Select the scientist connected with the discovery of X-rays.

(a) Einstein **(b) Rontgen**
(c) Faraday (d) Archimedes

8 Which of the following properties is/are possible in the case of X-rays?

(a) Polarization (b) Diffraction
(c) Interference **(d) All of the above**

9 If the potential difference applied to an X-ray tube is doubled while keeping the separation between the filaments and the target the same, what will happen to the cutoff wavelength?

(a) Will remains same
(b) Will be doubled
(c) Will be halved
(d) Will be four times the original wavelength

10 Which of the following wavelengths of x-rays have the largest penetrating power?

(a) 2 Å (b) 4 Å
(c) 8 Å (d) 16 Å

$Hint,\ \lambda\ \alpha\ \frac{1}{\text{penetrating power}}$

11 Which of the following is a unique property of laser?

(a) Directional (b) Speed
(c) Coherence (d) Wavelength

12 Which of the following is an example of optical pumping?
(a) Ruby laser (b) Helium-Neon laser
(c) Semiconductor laser (d) Dye laser

13 The lifetime of an electron in a metastable state is of the order of
(a) 10^{-9} S. **(b) 10^{-3} S.**
(c) 10^{-8} S. (d) 10^{-7} S.

14 Which one of the following lasers has the highest efficiency?
(a) Ruby (b) diode laser
(c) He-Ne (d) Carbon dioxide

15 In He-Ne laser, the lasing action is produced by
(a) He-Ne both **(b) Ne only**
(c) Electrons of He (d) none of above

16 The velocity of laser light is,
(a) Less than ordinary (b) more than ordinary light
(c) equal to ordinary light (d) Different for different colours

17 In Ruby LASER, the host crystal is
(a) Al_2O_3 (b) MnO_2
(c) $CaCO_3$ (d) Nacl

18 The image produced by holography is
(a) 1-dimensional (b) 2-dimensional
(c) 3-dimension (d) 4-dimension

19 The first laser was invented in May, 1960 by
(a) Theodore Maiman (b) Maxwell
(c) Einstein (d) C. V. Raman

20 The state of population inversion is also known as
(a) Positive temperature state (b) Negative temperature state
(c) temperature Equilibrium state (d) None of the above

21 According to Bohr's model of a hydrogen atom, the relation between the principal quantum number n and the radius of stable orbit:
(a) $r \ \alpha \ \frac{1}{n}$ (b) $r \ \alpha \ \frac{1}{n^2}$
(c) $r \ \alpha \ n$ **(d) $r \ \alpha \ n^2$**

22 The Bohr radius is equal to:
(a) $r = 5.3 \times 10^{-11}$ (b) $r = 0.53 \times 10^{-11}$
(c) $r = 5.3 \times 10^{-12}$ (d) $r = 0.53 \times 10^{10}$

23 If the radius of the 1st orbit of hydrogen is 'r', then the radius of the 3rd orbit of hydrogen is
(a) $3\,r$ (b) $6\,r$ (c) $9\,r$ (d) $\frac{r}{3}$

24 An electron projected perpendicular to a uniform magnetic field B moves in a circle. If Bohr's quantization is applicable, then the radius of the electronic orbit in the first excited state is :
(a) $\sqrt{\frac{2\,h}{\pi\,e\,B}}$ (b) $\sqrt{\frac{4\,h}{\pi\,e\,B}}$
(c) $\sqrt{\frac{h}{\pi\,e\,B}}$ (d) $\sqrt{\frac{h}{2\,\pi\,e\,B}}$

25 The energy of an electron in the second shell of the hydrogen atom is
(a) +3.4 eV ` **(b) -3.4 eV**
(c) -13.6 eV (d) + 13.6 eV