MULTIPLE CHOICE QUESTIONS

1. What did Rutherford's alpha particle experiment prove?
   a. Electrons b. Protons c. Neutrons d. Nucleus

Answer: (d) Nucleus

2. Why was Rutherford's atomic model unstable?
   a. Electrons do not remain in orbit. b. Nuclei will break down.
   c. The nucleus repels electrons. d. Orbiting electrons radiate energy.

Answer: (a) Electrons do not remain in orbit.

3. Balmer series lies in which spectrum?
   a. Ultraviolet b. Visible c. Infrared d. Partially Visible

Answer: (b) Visible

4. According to the classical theory, the path of the electrons is
   a. Circular b. Parabolic c. Spiral d. Straight line

Answer: (c) Spiral

5. Electrons in the atom are held to the nucleus by
   a. Nuclear Force b. Coulomb's Force
   c. Gravitational Force d. Van Der Waal's Force

Answer: (b) Columb's Force

6. The electrons of Rutherford's model would be expected to lose energy because
   a. They jump on the nucleus b. They move randomly
   c. Radiate electromagnetic waves d. Escape from the atom

Answer: (c) Radiate electromagnetic waves.

7. Who discovered the first spectral series?
   a. Lyman b. Balmer c. Paschen d. Pfund

Answer: (b) Balmer

8. Which of the following did Bohr use to explain his theory?
   a. Quantization of angular momentum b. Conservation of Quantum frequency
   c. Conservation of Mass d. Conservation of Linear Momentum

Answer: (a) Quantization of angular momentum

9. The significant result deduced from Rutherford's scattering experiment is that
   a. The whole of the positive charge is concentrated at the centre of an atom
   b. There are neutrons inside the nucleus
   c. α-particles are hydrogen nuclei
   d. Electrons are embedded in the atom

Answer: (a) the whole of the positive charge is concentrated at the centre of an atom.

10. The first model of the atom was proposed by
   a. Neils Bohr b. Albert Einstein c. J.J Thompson d. Ernest Rutherford

Answer: (c) J.J Thompson

11. The minimum energy required to free the electron from the ground state of hydrogen atom is
   (a) 0.85eV (b) 3.4eV (c) 13.6 eV (d) 1.51eV

12. The ionisation potential of hydrogen is 13.6 V. The energy of the atom in n = 2 state will be
   (a) -10.2 eV (b) -6.4eV **(c) – 3.4 eV** (d) – 4.4 eV

13. The electron in hydrogen atom jumps from the 3rd orbit to second orbit. The wavelength X of the emitted radiations is

(a) $\frac{36}{5R}$ (b) $\frac{5}{36}R$ (c) $\frac{5}{R}$ (d) $\frac{R}{6}$

14. To explain fine structure of spectrum of hydrogen atom, we must consider.

(a) a finite size of nucleus.

(b) the presence of neutrons in the nucleus.

(c) spin angular momentum.

(d) orbital angular momentum.

15. The ratio of the energy of the electron in first orbit to that in the second orbit is

(a) ¼ (b) 1/2R (c) 2 **(d) 4**

16. When an electron jumps from some outer orb it to the innermost orbit in the hydrogen atom, the spectral line belongs to

(a) Lyman series (b) Balmer series (c) Paschen series (d) Pfund series

17. How does the energy difference between two consecutive energy levels vary on the quantum number n increases?

(a) does not change **(b) decrases** (c) increases (d) may increase or decrease.

18. According to classical theory, Rutherford atom is

(a) stable **(b) unstable** (c) metastable (d) semistable

19. For an electron orbit to be non-radiating, it should be

(a) such that the angular momentum should be integral multiple of h.

(b) circular in nature

(c) elliptical in nature

(d) none of these

20. The significant result deduced from the Rutherford's scattering experiment is that

(a) whole of the positive charge is concentrated at the centre of atom

(b) there are neutrons inside the nucleus

(c) α-particles are helium nuclei

(d) electrons are embedded in the atom

21. Electrons in the atom are held to the nucleus by

(a) coulomb's force (b) nuclear force

(c) vander waal's force (d) gravitational force

22. As one considers orbits with higher values of n in a hydrogen atom, the electric potential energy of the atom

(a) decreases **(b) increases** (c) remains the same (d) does not increase

23. According to Bohr's model of hydrogen atom

(a) the linear velocity of the electron is quantised.

(b) the angular velocity of the electron is quantised.

(c) the linear momentum of the electron is quantised.

(d) the angular momentum of the electron is quantised.

24. According to the Bohr theory of H-atom, the speed of the electron, its energy and the radius of its orbit varies withthe principal quantum number n, respectively, as

(a) 1/n, n^2, $1/n^2$ (b) n, $1/n^2$, n^2 (c) n, $1/n^2$, $1/n^2$ **(d) 1/n, $1/n^2$, $1/n^2$**

25. The angular momentum of the electron in hydrogen atom in the ground state is

(a) 2h (b) h/2 **(c) h/2π** (d) h/4π

26. Which of the following series in the spectrum of hydrogen atom lies in the visible region of the electromagnetic spectrum?
(a) Paschen series **(b) Balmer series** (c) Lyman series (d) Brackett series

27. The shortest wavelength in Balmer's series for Hydrogen atom is …A… and this is obtained by substituting …B … in Balmer's formula. Here, A and B refer to
(a) 656.3 nm, n = 3 (b) 486.1 nm, n = 4 (c) 410.2 nm, n = 5 **(d) 364.6 nm, n = ∞**

28. As an electron makes a transition from an excited state to the ground state of a hydrogen – like atom/ion
(a) kinetic energy decreases, potential energy increases but total energy remains same
(b) kinetic energy and total energy decrease but potential energy increases
(c) its kinetic energy increases but potential energy and total energy decrease
(d) kinetic energy, potential energy and total energy decrease

29. In a hydrogen atom, which of the following electronic transitions would involve the maximum energy change
(a) n = 2 to n = 1 **(b) n = 3 to n = 1** (c) n = 4 to n = 2 (d) n = 3 to n = 2

3 MARKS QUSTIONS:

1. Write three postulates of Bohr's theory.
2. Derive an expression for radius of nth orbit of an electron revolving around the nucleus.
3. Draw energy level diagram for transition of electrons.
4. Give de Broglie's explanation of Bohr's second postulate of quantisation of angular momentum.
5. Derive expression for total energy of an electron in stationary state of hydrogen atom. Assume the expression for the radius.