STUDY QUESTIONS For CHSE Board Examinations

GROUP A One mark each

(a) Multiple Choice Type Questions

1. If E_n and L_n represent respectively the total energy and angular momentum of the electron in the nth orbit of hydrogen atom, then
   (a) $E_n \propto Ln$ (b) $E_n \propto L_n^2$
   (c) $E_n \propto \frac{1}{L_n}$ (d) $E_n \propto \frac{1}{L_n^2}$ (2015)

2. The radius of the third Bohr orbit for hydrogen is 4.5Å.
   (a) 7.2Å (b) 8.0Å
   (c) 9.6Å (d) 11.3Å (2014)

3. The orbital angular momentum of an electron in the third Bohr orbit is
   (a) $\frac{9h}{2\pi}$ (b) $\frac{7h}{4\pi}$
   (c) $\frac{3h}{2\pi}$ (d) $\frac{h}{4\pi}$ (2013)

4. The ground state energy of hydrogen atom is –13.6eV. Hence the energy of the electron of a doubly ionised lithium atom in its 1st orbit will be
   (a) –4.5 eV (b) –13.6 eV
   (c) –40.8 eV (d) –122.4 eV (2012)

5. The spectral lines in the brackett series arise due to transition of electrons in hydrogen atom from higher orbits to the orbit with
   (a) $n = 1$ (b) $n = 2$
   (c) $n = 3$ (d) $n = 4$ (2010)

6. The dimension of an atom is of the order of :
   (a) 10^{-6} m (b) 10^{-5} m
   (c) 10^{-10} m (d) 10^{-14} m

7. In which of the orbits will the electron of a hydrogen atom have maximum energy :
   (a) first (b) second
   (c) third (d) completely detached

8. Which is quantised in Bohr's atomic model
   (a) total energy of the electron
   (b) angular momentum of the electron
   (c) linear velocity of the electron
   (d) angular velocity of the electron

9. Accroding to classical theory the proposed circular path of an electron in Rutherford atom model will be
   (a) Circular (b) Straight line
   (c) Parabolic (d) Spiral

10. For a given value of n, the number of electrons in an orbit is
    (a) n (b) n^2
    (c) $2n^2$ (d) $2n$

11. The hydrogegn atom can give spectral lines in the series, Lyman, balmer and Paschen. Which of the following statements is correct.
    (a) Lyman series is in the infrared region
    (b) Balmer series is in the visible region (Partly)
    (c) Balmer series is (solely) in the ultraviolet region
    (d) Paschen series is in the visible region.

12. Fraunhoffer lines are observed in the spectrum of
    (a) hydrogen discharge tube
    (b) carbon arc
    (c) the sum
    (d) sodium vapour lamp

13. The potential energy of the electron in hydrogen atom is $-ke^2/r$. Its kinetic energy is
    (a) $-\frac{ke^2}{2r}$ (b) $+\frac{ke^2}{2r}$
    (c) $-\frac{ke^2}{r}$ (d) $\frac{ke^2}{r}$

14. According to Bohr's atomic model
    (a) the electron radiates energy only when it jumps to inner orbit.
    (b) an atom has heavy, positively charged nucleus
    (c) the electron can move only in particular orbits
    (d) all the above statements are true

15. In a black and white television, pictures on the screen are produced due to bombardment of
    (a) X-Ray photons on a white-screen
    (b) X-Ray photons on a white fluorescent screen
    (c) electrons on a white screen
    (d) electrons on a fluorescent white screen

16. If the series limit wavelength of the Lyman series for hydrogen atom is 912Å, then the series limit wavelength of the Balmer series of hydrogen atom is
    (a) 912 Å (b) 912 × 2 Å
    (c) 912 × 4 Å (d)

17. The first spectral line of sodium atom is 5890Å. The first excitation potential of sodium is
    (a) 3.7 V (b) 2.1 V
    (c) 10.2 V (d) 4.1 V

18. Infrared spectrum lies between
(a) Radiowave and micro wave regions
(b) Microwave and visible regions
(c) Visible and ultraviolet regions
(d) Ultraviolet and X-Ray regions

19. Of the following transitions in the hydrogen atom, the one which gives an emission line of highest frequency is
(a) $n = 1$ to $n = 2$ (b) $n = 3$ to $n = 10$
(c) $n = 10$ to $n = 3$ (d) $n = 2$ to n = 1

20. For light of wavelength 5000Å, photon energy is nearly 2.5 eV. For X-Ray of wavelength 1Å, the photon energy will be closed to
(a) [2.5] 500] eV (b) [2.5 ÷ (5000)²] eV
(c) [2.5 × 5000] eV (d) [2.5 × (5000)²] eV

21. The kinetic energy of the electron in an orbit of radius r in hydrogen atom is (e = electronic charge)
(a) $\frac{e^2}{r^2}$ (b) $\frac{e^2}{2r}$
(c) $\frac{e}{r}$ (d) $\frac{e^2}{2r^2}$

22. Band spectrum is produced by
(a) H (b) H_2
(c) He (d) Na

23. Ionisation potential of hydrogen atom is 13.6 eV. Hydrogegn atoms in the ground state are excited by monochromatic radiation of photon energy 12.1 eV. The spectral lines emitted by the hydrogen atoms according to Bohr's theory will be
(a) one (b) two
(c) three (d) four

24. When the electron in the hydrogen atom jumps from the 2nd orbit to the 1st orbit, the wavelength of the radiation emitted is λ. When the electron jumps from the 3rd orbit to the 1st orbit, the wavelength of the emitted radiation would be
(a) $\frac{27}{32}\lambda$ (b) $\frac{32}{27}\lambda$
(c) $\frac{2}{3}\lambda$ (d) $\frac{3}{2}\lambda$

25. The energy of an electron in the n^{th} orbit of the singly ionised helium atom is
(a) $\frac{-13.6}{n^2}eV$ (b) $\frac{-13.6 \times 2}{n^2}eV$
(c) $\frac{13.6 \times 4}{n^2}eV$ (d) $\frac{-13.6}{2n^2}eV$

26. What is deduced from the fact that when α-particles are fired at a fine gold leaf it is found that most of them pass through with little or no deflection
(a) α-particles have a high penetrating power
(b) α-particles are +vely charged
(c) Gold atoms are nearly all empty space
(d) α-particles cause gold atoms to disintegrate

27. According to Bohr's postulates which of the following quantities takes discrete values
(a) kinetic energy (b) potential energy
(c) Angular momentum (d) momentum

28. According to Bohr's model of the hydrogen atom
(a) Total energy of electron is quantised
(b) Angular momentum of the electron is quantised
(c) Linear velocity of the electron is quantised
(d) Angular velocity of the electron is quantised

29. According to classical theory, Rutherford atom was
(a) stable (b) unstable
(c) semi-stable (d) meta-stable

30. The radius of the atom is of the order of
(a) 10^{-6} m (b) 10^{-8} m
(c) 10^{-10} m (d) 10^{-12} m

31. The speed of an electron in the orbit of the hydrogen atom in the ground state is
(a) c (b) $c/2$
(c) $c/10$ (d) $c/137$

32. In Rutherford's expt, the number of α-particles scattered through an angle of 60° by a silver foil is 200 per minute. When the silver foil is replaced by a copper foil of the same thickness, the number of α-particles scattered through an angle of 60° per minute is
(a) $\frac{200 \times Z_{Cu}}{A_{Ag}}$ (b) $200\left(\frac{Z_{Cu}}{Z_{Ag}}\right)^2$
(c) $200 \times \frac{Z_{Ag}}{Z_{Cu}}$ (d) $200 \times \left(\frac{Z_{Ag}}{Z_{Cu}}\right)$

33. Which of the following sources give discrete emission spectrum
(a) Incandescent electric bulb
(b) sun
(c) Mercury vapour lamp
(d) candle

34. While electron in hydrogen atom revolves in a stationary orbit is
(a) radiates light but its velocity is unchanged
(b) does not radiate light and velocity remains unchanged
(c) Does not radiate though its velocity changes
(d) Radiates light with the change of energy

35. Generally the approximate limits of visible spectrum are
(a) 1,000 to 4,000 Å (b) 4,000 to 7,000 Å
(c) 7,000 to 10,000 Å (d) 10,000 to 13,000 Å

36. If the mass of the electron is reduced to half, the Rydberg constant
(a) Remains unchanged
(b) Becomes half
(c) Becomes double
(d) Becomes one-fourth

37. According to Bohr's theory the radius of an electron-orbit, as described by n and, is proportional to
(a) Z^2n^2 (b) Z^2/n^2
(c) Z^2/n (d) n^2/Z

38. Give another name for the smallest particle of an element capable of taking part in a chemical reaction
(a) Electron (b) Proton
(c) Atom (d) Molecule

39. Given the electronic charge $c = 1.6 \times 10^{-19}$ *coulomb*
electronic mass $m = 9.1 \times 10^{-31}$ *kg*
$h = 6.6 \times 10^{-34}$ *Joule sec*
$c = 3 \times 10^8$ *m/sec*
The radius of the first orbit of electron in hydrogen atom is
(a) 5.3×10^1 *Å* (b) 5.3×10^0 *Å*
(c) 5.3×10^{-1} *Å* (d) 5.3×10^{-2} *Å*

40. In Q. no. 39, the velocity of the electron in the first orbit is
(a) 2.2×10^4 *m/sec* (b) 2.2×10^5 *m/sec*
(c) 2.2×10^6 *m/sec* (d) 2.2×10^7 *m/sec*

41. In Q. no. 39, the time period of revolution of the electron in the first Bohr orbit is
(a) 1.5×10^{-4} *sec* (b) 1.5×10^{-16} *sec*
(c) 1.5×10^{-18} *sec* (d) 1.5×10^{-20} *sec*

42. In Q. no. 39, the frequency of revolution of the electron in the first Bohr's orbit is
(a) 6.6×10^{15} (b) 6.6×10^{13}
(c) 6.6×10^{17} (d) 6.6×10^{19}

43. Electrons in the atom are held in the atom by
(a) Coulomb forces
(b) Nuclear forces
(c) Van der wall's forces
(d) Gravitational forces

44. A substance which emits light of certain colour at a given temperature can also absorb the same colur at that temperature. This is a statement of
(a) Snell's law (b) Fresnel's law
(c) Kirchoff's law (d) Newton's law

45. The ratio of areas within the electron orbits for the first excited state to the second excited state for the hydrogen atom is
(a) 2 : 1 (b) 4 : 1
(c) 8 : 1 (d) 16 : 81

46. In an atom, two electrons move round the nucleus in circular orbits of radii R and 4R. The ratio of the times taken by them to complete one revolution is
(a) 1/4 (b) 4/1
(c) 8/1 (d) 1/8

47. The binding energy of the hydrogen atom (the energy binding the electron to the nucleus) is
(a) 1 *eV* (b) infinite
(c) 13.6 *eV* (d) zero

48. In the Bohr model of the atom, electrons revolve round in orbits, known as
(a) stationary circular orbits
(b) stationary elliptical orbits
(c) Radiating circular orbits
(d) Radiating elliptical orbits

49. The frequency of revolution of an electron in the n^{th} circular Bohr orbit of hydrogen is
(a) Directly proportional to n^2
(b) Inversely proportional to n
(c) Inversely proportional to n^3
(d) Directly proportional to n^3

50. The hydrogen atoms in a sample are in excited state, described by n = 3. The number of spectral lines in emission spectrum will be
(a) 1 (b) 2
(c) 3 (d) 6

51. Whan α-particles are passed through thin foils
(a) They all pass straight through
(b) They are all deflected
(c) Most of them are deflected
(d) Most of them pass straight through

52. α-particles that come closer to nuclei
(a) Are deflected more
(b) Are deflected less
(c) Make more collision
(d) Are slowed down more

53. Consider an electron in the n^{th} orbit of a hydrogen atom in the Bohr model. The circumference of the orbit can be expressed in terms of the de Broglie wavelength λ of that electron as
(a) $(0.529)n\lambda$ (b) $\sqrt{n}\,\lambda$
(c) $(13.6)\lambda$ (d) $n\lambda$

54. A hydrogen atom remains in its ground state when electron
(a) Resides inside the nucleus
(b) Escapes from the atom
(c) Is in its first orbital
(d) Does not orbit round, but is stationary