CBSE

STRUCTURE OF ATOM WS 1

Class 11 - Chemistry

Section A

1. Cathode rays are discharged under one of the following conditions **[1]**

   a) when a certain type of gas is used
   b) when a certain type of electrode is used
   c) at very low pressure and high voltage
   d) only when the rays become negatively charged

2. Millikan performs oil drop experiment to determine _____. **[1]**

   a) mass of the electron
   b) density of the proton
   c) charge on the electron
   d) $\frac{e}{m}$ of the neutron

3. Match List-I with List-II and select the correct answer using the code given below the lists: **[1]**

List-I	**List-II**
Sub-atomic particles	Persons responsible
(A) Electron	(p) Jamesh Chadwick
(B) Proton	(q) J.J. Thomson
(C) Neutron	(r) Rutherford
(D) Nucleus	(s) Goldstein

   a) (A)-(p), (B)-(p), (C)-(q), (D)-(s)
   b) (A)-(q), (B)-(s), (C)-(r), (D)-(p)
   c) (A)-(r), (B)-(s), (C)-(p), (D)-(q)
   d) (A)-(q), (B)-(s), (C)-(p), (D)-(r)

4. Purpose of a mass spectrometer is to **[1]**

   a) determine the mass of an atom
   b) determine the charge of a particle
   c) provide data for data loggers
   d) determine the particles

5. Oil drop experiment is for determining the: **[1]**

   a) deviation of the electron.
   b) mass of the electron
   c) number of electrons
   d) charge on the electrons

6. Television pictures result due to **[1]**

   a) fluorescence of canal rays on the television screen
   b) fluorescence of cathode rays on the television screen
   c) phosphorescence of protons on the television screen
   d) fluorescence of protons on the television screen

7. Values of $\frac{e}{m}\left[\frac{\text{charge}}{\text{mass}}\right]$ in the categories alpha particle(α), electron (e) and protons (p) increase in the order: **[1]**

a) $p < e < \alpha$ b) $\alpha < p < e$

c) $e < \alpha < p$ d) $\alpha < e < p$

8. If travelling at same speeds, which of the following matter waves have the shortest wavelength? **[1]**

a) Alpha particle (He^{2+}) b) Proton

c) Neutron d) Electron

9. Charge on the electron was determined by **[1]**

a) Electrical discharge carried out in the modified cathode ray tube b) x-ray tube experiments

c) R.A. Millikan's oil drop experiment d) cathode ray discharge tube experiments

10. Cathode rays are discharged under one of the following conditions: **[1]**

a) when a certain type of gas is used b) at very low pressure and high voltage

c) when a certain type of electrode is used d) only when the rays become negatively charged

11. Cathode rays are deflected by: **[1]**

a) electric and magnetic fields b) magnetic field only

c) thin metal foils only d) electric field only

12. Cathode rays or cathode ray particles are: **[1]**

a) neutrons b) protons

c) electrons d) muons

13. An electron has a **[1]**

a) negligible mass b) relative charge of -1

c) all of these d) the charge is opposite and equal to a proton

14. Mass of a proton is equal to that of mass of **[1]**

a) a positron b) a proton

c) a neutron d) an electron

15. **Assertion (A):** Cathode rays get deflected towards the positive plate of the electric field. **[1]**
Reason (R): Cathode rays consist of negatively charged particles known as electrons.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

16. **Assertion (A):** Cathode rays consist of negatively charged particles, called electrons. **[1]**
Reason (R): In the pesence of electrical/magnetic field, the behaviour of cathode rays is similar to the negatively charged particles

a) Both A and R are true and R is the correct b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

17. **Assertion (A):** For a given principal quantum number, s, p, d, f ....., subshells, all have different energies. **[1]**
Reason (R): Mutual repulsion exists among the electrons in a multielectron atoms.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

18. Experiments on electrical discharge through gases ultimately lead to the discovery of _____. **[1]**

a) electrons

b) protons

c) nucleus

d) neutrons

19. Values of e/m (charge/mass) in the categories alpha particle (α), electron (e) and protons (p) increase in the order: **[1]**

a) α < e < p

b) p < e < α

c) α < p < e

d) e < α < p

20. Which of the following statements about the electron is incorrect? **[1]**

a) It is a negatively charged particle.

b) The mass of electron is equal to the mass of neutron.

c) It is a constituent of cathode rays.

d) It is a basic constituent of all atoms.

21. Which of the following statement is not correct about the characteristics of cathode rays? **[1]**

a) Characteristics of cathode rays do not depend upon the material of electrodes in cathode ray tube.

b) They travel in straight line in the absence of an external electrical or magnetic field.

c) They start from the cathode and move towards the anode.

d) Characteristics of cathode rays depend upon the nature of gas present in the cathode ray tube.

22. i. What is the mass of a neutron? **[1]**
ii. What is the charge of a neutron?

23. What is the charge (e) of an electron? **[1]**

24. What is the $\frac{e}{m}$ ratio of an electron? **[1]**

25. i. What is the mass of a proton? **[1]**
ii. What is the charge of a proton?

26. Neutrons can be found in all atomic nuclei except in one case. Which is this atomic nucleus and what does it consist of? **[1]**

27. What is the difference in the origin of cathode rays and anode rays? **[1]**

28. The magnitude of charge on the electron is 4.8×10^{-10} esu. What is the charge on the nucleus of a helium atom? **[1]**

29. Name the sub – atomic particles of an atom. **[1]**

Section B

30. **Fill in the blanks:** **[2]**

(a) The mass of a neutron is almost equal to the mass of a _____ atom. **[1]**

(b) Electron, proton and neutron are called _____ particles. **[1]**

31. Which of the following will not show deflection from the path on passing through an electric field? **[2]**
Proton, cathode rays, electron, neutron.

32. In Milikan's experiment, static electric charge on the oil drops has been obtained by shining X-rays. If the static electric charge on the oil drop is -1.282×10^{-18}C, calculate the number of electrons present on it. **[2]**

33. Why does the charge-to-mass ratio of positive rays depend on the residual gas in the discharge tube? Why is the charge-to-mass ratio of all cathode says the same? **[2]**

34. i. Calculate the number of electrons which will together weigh one gram. **[2]**
ii. Calculate the mass and charge of one mole of electrons.

35. Calculate the mass and charge of one mole of electrons. **[2]**

36. Calculate the approximate charge in coulomb and approximate mass in a kilogram of the nucleus of a lithium-7 isotope. **[2]**

37. What is the mass (m_e) of an electron? **[2]**

38. Calculate the number of electrons which will together weigh one gram. **[2]**

Section C

39. A certain particle carries 2.5×10^{-16} C of static electric charge. Calculate the number of electrons present in it. **[3]**

40. Which experiment led to the discovery of electrons and how? **[3]**

Section D

Question No. 41 to 44 are based on the given text. Read the text carefully and answer the questions: **[4]**

In 1830, Michael Faraday showed that if electricity is passed through a solution of an electrolyte, chemical reactions occurred at the electrodes, which resulted in the liberation and deposition of matter at the electrodes. In the mid-1850s Faraday began to study electrical discharge in partially evacuated tubes, known as cathode ray discharge tubes. When sufficiently high voltage is applied across the electrodes, current starts flowing through a stream of particles moving in the tube from the negative electrode to the positive electrode. These were called cathode rays or cathode ray particles. J.J. Thomson measured the ratio of electrical charge (e) to the mass of the electron (m_e) by using a cathode ray tube and applying electrical and magnetic fields perpendicular to each other as well as to the path of electrons. Positively charged particle was characterised in 1919. Later, a need was felt for the presence of electrically neutral particles as one of the constituents of the atom.

41. What is the value of charge to mass ratio (e/m) of electrons?

42. How is it concluded that electrons are a universal constituent of all matter?

43. Which fundamental property of an atom is not understood if we assume that an atom consists of a nucleus containing protons only and an extranuclear part containing an equal number of electrons?

44. Calculate the total no. of electrons present in one mole of methane.

45. **State True or False:** **[4]**

(a) e/m ratio of the electron was determined by J.J. Thomson. **[1]**

(b) Charge/mass ratio for positive rays is minimum when the gas in the discharge tube is hydrogen. **[1]**

(c) All atoms are composed of three fundamental particles. **[1]**

(d) The nuclear reaction ${}^{9}_{4}Be + {}^{4}_{2}He \rightarrow {}^{12}_{6}C + {}^{1}_{0}n$ was used by Curie to discover neutron. **[1]**

46. **Read the passage and answer the following question:** **[4]**
In 1830, Michael Faraday showed that if electricity is passed through a solution of an electrolyte, chemical

reactions occurred at the electrodes, which resulted in the liberation and deposition of matter at the electrodes. In mid-1850s Faraday began to study electrical discharge in partially evacuated tubes, known as cathode ray discharge tubes. When sufficiently high voltage is applied across the electrodes, current starts flowing through a stream of particles moving in the tube from the negative electrode to the positive electrode. These were called cathode rays or cathode ray particles. J.J. Thomson measured the ratio of electrical charge (e) to the mass of the electron (m_e) by using a cathode ray tube and applying electrical and magnetic fields perpendicular to each other as well as to the path of electrons. Positively charged particle was characterised in 1919. Later, a need was felt for the presence of an electrically neutral particles as one of the constituents of the atom.

In these question, a statement of assertion followed by the statement of reason is given. Choose the correct answer out of the following choices

a. Assertion and reason both are correct statements and reason is the correct explanation for assertion.
b. Assertion and reason both are correct statements and reason is not the correct explanation for assertion.
c. Assertion is the correct statement but reason is wrong statement.
d. Assertion is the wrong statement but reason is correct statement.

i. **Assertion:** The cathode rays start from cathode and move towards the anode.
Reason: In the absence of electrical or magnetic field, cathode rays travel in straight lines.

ii. **Assertion:** Thomas argued that the **l**ighter the particle, greater the deflection.
Reason: Deflection depends upon the mass of the particle.

iii. **Assertion:** Television picture tubes are anode ray tubes.
Reason: Electrons are the basic constituent of all the atoms.

iv. **Assertion:** The charge to mass ratio of the particles depends on the gas from which these originate.
Reason: The smallest and lightest positive ion was obtained from hydrogen and was called proton.

OR

Assertion: A cathode ray tube is made of glass containing two thin pieces of metal electrodes.

Reason: The value of e/m_e is $2.758820 \times 10^{11} C\ kg^{-11}$.

Section E

Question No. 47 to 51 are based on the given text. Read the text carefully and answer the questions: **[5]**

In 1830, Michael Faraday showed that if electricity is passed through a solution of an electrolyte, chemical reactions occurred at the electrodes, which resulted in the liberation and deposition of matter at the electrodes. In the mid-1850s Faraday began to study electrical discharge in partially evacuated tubes, known as cathode ray discharge tubes. When sufficiently high voltage is applied across the electrodes, current starts flowing through a stream of particles moving in the tube from the negative electrode to the positive electrode. These were called cathode rays or cathode ray particles. J.J. Thomson measured the ratio of electrical charge (e) to the mass of the electron (m_e) by using a cathode ray tube and applying electrical and magnetic fields perpendicular to each other as well as to the path of electrons. Positively charged particle was characterised in 1919. Later, a need was felt for the presence of electrically neutral particles as one of the constituents of the atom.

47. **Assertion (A):** The cathode rays start from cathode and move towards the anode.
Reason (R): In the absence of an electrical or magnetic field, cathode rays travel in straight lines.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

48. **Assertion (A):** Thomas argued that the lighter the particle, greater the deflection.

Reason (R): Deflection depends upon the mass of the particle.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

49. **Assertion (A):** Television picture tubes are anode ray tubes.

Reason (R): Electrons are the basic constituent of all atoms.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

50. **Assertion (A):** The charge to mass ratio of the particles depends on the gas from which these originate.

Reason (R): The smallest and lightest positive ion was obtained from hydrogen and was called a proton.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

51. **Assertion (A):** A cathode ray tube is made of glass containing two thin pieces of metal electrodes.

Reason (R): The value of e/m_e is $2.758820 \times 10^{11} C\ kg^{-11}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

52. i. Calculate the total number of electrons present in one mole of methane. **[5]**

ii. Find (a) the total number and (b) the total mass of neutrons in 7 mg of ^{14}C. (Assume that mass of a neutron = 1.675×10^{-27} kg).

iii. Find (a) the total number and (b) the total mass of protons in 34 mg of NH_3 at STP.

Will the answer change if the temperature and pressure are changed?