CBSE

STRUCTURE OF ATOM WS 2

Class 09 - Science

Section A

1. In neutral atoms, number of electrons are equal to number of _____. **[1]**

   a) Mass number
   b) Protons
   c) Neutrons
   d) Nuclear charge

2. Which of the following statements does not belong to Bohr's model? **[1]**

   a) Electrons revolve around the nucleus in different orbits having fixed energies.
   b) The electrons radiate energy during revolution due to force of attraction between nucleus and electrons.
   c) The electron in the orbit nearest to the nucleus is in lowest energy state and farthest away from nucleus is in highest energy state.
   d) Energy of the electrons in the orbit is quantized, i.e., they have fixed energies.

3. Rutherford's scattering experiment fails for very small scattering angles because **[1]**

   a) whole nuclear charge of the target atom is not screened by its electrons at all.
   b) the gold foil is thin.
   c) the velocity of α-particles is large.
   d) the impact parameter between the α - particle source and the nucleus of the target is very large as compared to the size of the nucleus.

4. Out of electron, positron, alpha particle and proton, which particle is regarded as the universal particle? **[1]**

   a) Alpha particle
   b) Positron
   c) Proton
   d) Electron

5. Rutherford's alpha-particle scattering experiment was responsible for the discovery of**:** **[1]**

   a) Atomic nucleus
   b) Proton
   c) Electron
   d) Neutron

6. The conclusion of Rutherford's scattering experiment does not include **[1]**

   a) The radius of nucleus is less than 10^{-14} m.
   b) The positively charged particles of atom move with very high velocity.
   c) Scattering follows coulomb's law, i.e., same charges repel each other.
   d) α-particles can come within the distance of order of 10^{-14} m of the nucleus.

7. When a gold sheet is bombarded by a beam of α-particles, only a few of them got deflected whereas most go **[1]**

straight, undeflected. This is because

a) the volume of nucleus is smaller than that of atom.

b) the force of repulsion acting on fast moving α- particle is very small.

c) the force of attraction exerted on α- particles by electrons is insufficient.

d) the neutrons have no effect on α-particles.

8. Dalton's atomic theory successfully explained **[1]**

i. Law of conservation of mass
ii. Law of constant composition
iii. Law of radioactivity
iv. Law of multiple proportions

a) (ii), (iii) and (iv)

b) (i), (ii) and (iii)

c) (i), (iii) and (iv)

d) (i), (ii) and (iv)

9. A thin sheet of gold foil is bombarded with α-particles as in Rutherford's experiment. Which of the given descriptions most accurately represents the path of α-particles? **[1]**

	Undeflected	**No. of particles deflected through a small angle**	**No. of particles deflected through a large angle**
I	All	None	None
II	Most	A few	None
III	Most	A few	A few
IV	A few	Most	A few

a) IV

b) III

c) II

d) I

10. Rutherford's α- scattering experiment led to the conclusion that **[1]**

a) atoms are electrically neutral.

b) the mass and the positive charge of an atom are concentrated in the nucleus.

c) mass and energy are inter-related.

d) neutrons are present in the nucleus.

11. The first model of an atom was given by **[1]**

a) Rutherford

b) N. Bohr

c) E. Goldstein

d) J.J. Thomson

12. The $\frac{charge}{mass}$ ratio of electron **[1]**

a) depends upon nature of electrodes

b) depends upon nature of gas

c) remains constant

d) depends upon both nature of gas and nature of electrodes

13. The highest value of e/m of anode rays has been observed when the discharge tube is filled with **[1]**

a) N_2

b) O_2

c) He

d)

14. Which of the following reactions led to the discovery of the neutron? **[1]**

a) ${}^{11}_{5}B + {}^{2}_{1}H \rightarrow {}^{12}_{6}N + {}^{1}_{0}n$

b) ${}^{8}_{4}Be + {}^{4}_{2}He \rightarrow {}^{11}_{6}C + {}^{1}_{0}n$

c) ${}^{9}_{4}Be + {}^{4}_{2}He \rightarrow {}^{12}_{6}C + {}^{1}_{0}n$

d) ${}^{12}_{6}C + {}^{1}_{1}H \rightarrow {}^{14}_{7}N + {}^{1}_{0}n$

15. The fundamental particle not present in hydrogen is _____. **[1]**

a) Proton

b) Nucleus

c) Neutron

d) Electron

16. **Assertion (A):** Atom is electrically neutral. **[1]**

Reason (R): A neutral particle, neutron is present in the nucleus of atom.

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.

17. **Assertion (A):** In Rutherford's gold foil experiment, very few α-particles are deflected back. **[1]**

Reason (R): Nucleus present inside the atom is heavy.

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. **Assertion (A):** An atom contains a positively charged center called the nucleus of the atom. **[1]**

Reason (R): The nucleus of an atom is 10,000 times bigger than the atom.

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.

19. **Assertion (A):** Cathode rays travel in straight lines. **[1]**

Reason (R): Cathode rays do not penetrate through thin sheets.

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.

20. **Assertion (A):** According to Bohr's model, electrons occupy certain stable orbits or shells. **[1]**

Reason (R): Each shell has a definite energy.

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.

21. **Assertion (A):** Thomson's model of an atom is popularly known as the plum pudding or Christmas pudding model of an atom. **[1]**

Reason (R): According to the Thomson's plum pudding model, an atom is a positively charged sphere in which the electrons are embedded.

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.

22. **Assertion (A):** The electrons are confined to the energy levels where they revolve. **[1]**

Reason (R): While revolving in the discrete orbits, the electrons radiate energy.

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.

23. **Assertion (A):** Rutherford's atomic model was that it could not explain the stability of atoms. **[1]**

Reason (R): Any charged particle during acceleration would radiate energy, and while revolving, it would lose its energy and eventually fall into the nucleus.

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.

24. **Assertion (A):** The size of the nucleus is very small as compared to the size of the atom. **[1]**

Reason (R): The electrons revolve around the nucleus of the atom.

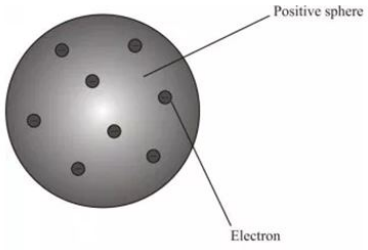
a) Both A and R are true and R is the correct explanation of A.

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.

25. The following figure shows the atomic model of _____. **[1]**



a) Rutherford

b) J.J. Thomson

c) Chandwick

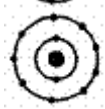
d) Bohr's

26. Which of the following in the figure do not represent Bohr's model of an atom correctly? **[1]**

i.

ii.

iii.

iv. 

a) (ii) and (iv)

b) (i) and (iv)

c) (ii) and (iii)

d) (i) and (ii)

27. Match the following with the correct response**:** **[1]**

(a) Electron	(i) E.Goldstein
(b) Proton	(ii) Rutherford
(c) Neutron	(iii) James Chadwick
(d) Atomic nucleus	(iv) J.J.Thomson

a) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

b) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

c) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

d) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

28. Fill in the gap using given analogy **[1]**

Radius of nucleus : 10^{-15} m :: Radius of atom _____.

a) 10^{-10} m

b) 10^{-9} m

c) 10^{-20} m

d) 10^{-8} m

29. Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order **[1]**

i. Rutherford’s atomic model

ii. Thomson’s atomic model

iii. Bohr’s atomic model

a) (ii), (iii) and (i)

b) (ii), (i) and (iii)

c) (iii), (ii) and (i)

d) (i), (ii) and (iii)

30. Which of the following statements is not true about neutrons? **[1]**

a) It is highly unstable in nature.

b) It contributes to the mass of the atom.

c) It is a neutral particle.

d) It is present in the nucleus of an atom.

31. Which of the following statements about Rutherford’s model of atom are correct? **[1]**

i. considered the nucleus as positively charged

ii. established that the α–particles are four times as heavy as a hydrogen atom

iii. can be compared to the solar system

iv. was in agreement with Thomson’s model

a) (i) and (iv)

b) only (i)

c) (ii) and (iii)

d) (i) and (iii)

32. Which of the following statement is correct about proton? **[1]**

A. It is an ionized hydrogen atom.

B. It is a nucleus of deuterium.

C. It is an ionized hydrogen molecule.

D. α-Particles consist of He^+ ions.

a) B

b) C

c) A

d) D

33. Name the three sub-atomic particles of an atom. **[1]**

34. Is it possible for the atom of an element to have one electron, one proton and no neutron. If so, name the element. **[1]**

35. Write any two observations which support the fact that atoms are divisible. **[1]**

36. How many times is radius of extra nuclear portion more than that of the nucleus of an atom? **[1]**

37. Name the three sub-atomic particles in an atom. **[1]**

38. On the basis of Rutherford's model of an atom, which sub-atomic particle is present in the nucleus of an atom? **[1]**

Section B

39. **State True or False:** **[2]**
    (a) An atom contains a positively charged centre called the nucleus of the atom. **[1]**
    (b) Fast-moving electrons form anode rays. **[1]**

40. **Fill in the blanks:** **[2]**
    (a) The _____ is a small positively charged part at the centre of an atom. **[1]**
    (b) Fast moving protons form the _____ rays. **[1]**

41. What do you think would be the observation if the α-particle scattering experiment is carried out using a foil of a metal other than gold? **[2]**

42. What are the limitations of Rutherford's model of the atom? **[2]**

43. What are the limitations of J.J. Thomson's model of an atom? **[2]**

44. On the basis of Thomson's model of an atom, explain how the atom is neutral as a whole. **[2]**

45. What happens to the nucleus of an atom when it emits a γ-ray? **[2]**

46. Draw a sketch of Bohr's model of an atom with three shells. **[2]**

47. Stat the properties of cathode rays? **[2]**

48. Describe Bohr's model of the atom. **[2]**

49. List any three distinguishing features between the models of an atom proposed by J.J. Thomson and Ernest Rutherford. **[2]**

50. An electron is regarded as a universal particle. Explain. **[2]**

51. What do you think would be the observation if the α-particle scattering experiment is carried out using a foil of a metal other than gold? **[2]**

52. Under what conditions are the protons and electrons same in an atom? **[2]**

53. What are α, β and λ - rays composed of. **[2]**

54. Why did Rutherford select a gold foil in his α–ray scattering experiment? **[2]**

55. What are the limitations of J.J.Thomson's model of the atom? **[2]**

56. In the gold foil experiment of Geiger and Marsden, that paved the way for Rutherford’s model of an atom, $\sim$1.00% of the α-particles were found to deflect at angles > 50°. If one mole of α-particles were bombarded on the gold foil, compute the number of α-particles that would deflect at angles less than 50°. **[2]**

57. Do protons originate from the anode? **[2]**

58. Why is a proton not a universal particle like electron? **[2]**

59. In the gold-foil experiment **:** **[2]**
    i. Why did many α - particles pass through the gold foil undeflected?
    ii. Why did few α - particles deflect through small angles?
    iii. Why did few α - particles, after striking the gold foil, retrace their path?

Section C

60. Rutherford's atomic model was a reasonably good model of structure of atom based on the famous particle **[3]**

scattering experiment. However, it was subsequently modified by Neils Bohr and later on, by others. The resulting improvements in the understanding of atomic structure have greatly contributed to further scientific advancement. There are many other similar examples in scientific field when original contributors happily accept modifications in their ideas.

Answer the following questions based on the above information:

i. Name the scientific values associated with above anecdotes.

ii. Give any example from your life experiences so far which reflects display of such a value by you as an individual.

iii. In what way such a personal attribute is likely to help you?

61. An old man and a scientist were talking about a deserted house. The old man was sure that it was haunted by ghosts, but the scientist discarded the view saying no one had ever seen a ghost. The old man was annoyed and challenged the scientist about existence of atoms, sub-atomic particles which also could not be seen. **[3]**

i. Name the three sub-atomic particles and their discoverers.

ii. Whose viewpoint do you support and why?

62. Helium atom has an atomic mass of 4 u and two protons in its nucleus. How many neutrons does it have? **[3]**

63. Compare the properties of electrons, protons and neutrons. **[3]**

64. Justify the statement, 'Protons are constituents of all atoms'. **[3]**

Section D

65. The ratio of the radii of the hydrogen atom and its nucleus is $\sim 10^5$. Assuming the atom and the nucleus to be spherical, **[5]**

i. What will be the ratio of their sizes?

ii. If an atom is represented by planet Earth 'R_e'= 6.4×10^6 m. Estimate the size of the nucleus.

66. For the following statements, write T for True and F for False and give a reason: **[5]**

a. J.J Thomson's proposed that the nucleus of an atom contains only nucleons.

b. A neutron is formed by an electron and a proton combining together. Therefore it is neutral.

c. The mass of an electron is about $\frac{1}{2000}$ times that of a proton.

d. An isotope of iodine is used for making a tincture of iodine, which is used as a medicine.

67. In what way is Rutherford’s atomic model different from that of Thomson’s atomic model? **[5]**

68. i. From Rutherford's α-particle scattering experiment, give the experimental evidence for deriving the conclusion that **[5]**

a. most of the space inside the atom is empty.

b. the nucleus of an atom is positively charged.

ii. An element has mass number = 32 and atomic number = 16, find

a. the number of neutrons in the atom of the element.

b. the number of electrons in the outermost shell of the atom.

iii. On the basis of Rutherford's model of an atom, which subatomic particle is present in the nucleus of an atom?

69. What are the postulates of Bohr’s model of an atom? **[5]**

70. What is the gold foil experiment? Name the scientist who performed this experiment. Write the conclusions and shortcomings of Rutherford’s model of atom. **[5]**

71. Write an experiment to show that cathode rays travel in straight line? **[5]**

72. Enlist the conclusions drawn by Rutherford from his α-ray scattering experiment. **[5]**

73. What were the drawbacks of Rutherford's model of an atom? **[5]**