Atomic Structure part-2

Multiple Choice Questions

Based on Millikan's Oil Drop Method

1. What was the primary purpose of Millikan's oil drop experiment?
   a) To measure the mass of an electron
   b) To measure the charge of an electron
   c) To determine the speed of light
   d) To study the photoelectric effect
2. In Millikan's experiment, the oil droplets were suspended in the electric field when:
   a) The electric force equaled the gravitational force
   b) The magnetic force equaled the gravitational force
   c) The electric force equaled the magnetic force
   d) The gravitational force was negligible
3. The force acting on the oil droplet due to the electric field is given by:
   a) $F = qE$
   b) $F = qB$
   c) $F = mg$
   d) $F = \frac{mv^2}{r}$
4. The formula for the terminal velocity of an oil droplet falling under gravity is given by:
   a) $v = \frac{mg}{6\pi\eta r}$
   b) $v = \frac{6\pi\eta r}{mg}$
   c) $v = \frac{mg}{r}$
   d) $v = \frac{r}{6\pi\eta mg}$
5. The elementary charge of an electron determined by Millikan is approximately:
   a) $1.602 \times 10^{-19}\,\text{C}$
   b) $9.11 \times 10^{-31}\,\text{kg}$
   c) $3.2 \times 10^{-19}\,\text{C}$
   d) $1.602 \times 10^{-29}\,\text{C}$
6. What role does the viscosity of air play in Millikan's experiment?
   a) It determines the terminal velocity of the droplets
   b) It affects the charge of the droplets
   c) It impacts the electric field strength
   d) It is negligible and not considered

Based on J.J. Thomson's $\frac{e}{m}$ Ratio Experiment

7. J.J. Thomson's experiment determined the charge-to-mass ratio ($\frac{e}{m}$) of:
   a) Protons

b) Neutrons

c) Electrons

d) Atoms

8. The apparatus used by J.J. Thomson to measure the $\frac{e}{m}$ ratio involved:

a) A gold foil

b) An oil drop

c) A cathode ray tube

d) A spectrometer

9. The magnetic force on an electron in Thomson's experiment is given by:

a) $F = qE$

b) $F = qvB$

c) $F = mg$

d) $F = \frac{mv^2}{r}$

10. In Thomson's experiment, the velocity of electrons is found using the relation:

a) $v = \frac{E}{B}$

b) $v = \frac{B}{E}$

c) $v = EB$

d) $v = \frac{m}{q}$

11. The value of the charge-to-mass ratio ($\frac{e}{m}$) determined by J.J. Thomson is approximately:

a) $1.76 \times 10^{11} \, \text{C/kg}$

b) $1.76 \times 10^{10} \, \text{C/kg}$

c) $1.76 \times 10^{12} \, \text{C/kg}$

d) $1.76 \times 10^9 \, \text{C/kg}$

12. In the absence of an electric field, the path of electrons in a magnetic field is:

a) Circular

b) Parabolic

c) Straight line

d) Elliptical

13. The equation $\frac{e}{m} = \frac{E}{B^2 r}$ is derived from balancing which two forces?

a) Gravitational and electric

b) Electric and magnetic

c) Magnetic and centripetal

d) Electric and gravitational

14. Which scientist is associated with the discovery of the electron using the cathode ray tube experiment?

a) Robert Millikan

b) J.J. Thomson

c) Ernest Rutherford

d) Niels Bohr

15. The main conclusion from J.J. Thomson's experiment was that:

a) Electrons are particles with a negative charge

b) Electrons have a positive charge

c) Electrons are neutral particles

d) Electrons are not fundamental particles

1. b
2. a
3. a
4. a
5. a
6. a
7. c
8. c
9. b
10. a
11. a
12. a
13. b
14. b
15. a