

Oil Drop Experiment Chemistry Questions with Solutions

Q-1: The purpose of Millikan's oil drop experiment was to determine the charge on _____.

- a) Electron
- b) Proton
- c) Neutron
- d) Positron

Answer: a) Electron

Explanation: The purpose of Millikan's oil drop experiment was to determine the charge on the electron.

Q-2: Which of the following factors will determine the extent of deflection of the electron in Millikan's experiment?

- a) Charge on the electron
- b) Mass of the electron
- c) Electric and Magnetic field strengths
- d) All of the above

Answer: d) All of the above

Explanation: Millikan's experiment is based on the principle that the amount of deflection of the electron depends on its charge, mass, and the strength of the electric and magnetic fields.

Q-3: Why was ordinary oil not recommended in Millikan's experiment?

Answer: Ordinary oil was not used in the experiment because it would evaporate due to the heat of the light, potentially resulting in an error in the Millikan's Oil Drop Experiment. As a result, the oil commonly used in vacuum apparatuses with low vapour pressure was used.

Q-4: What kind of rays were used to irradiate the air between the plates?

- a) Gamma Rays
- b) X-rays
- c) Infrared Rays
- d) Microwave Rays

Answer: b) X-rays

Q-5: Which device is used to measure the rate of fall of oil droplets due to gravitational force?

Answer: Telescopes are used to measure the rate at which oil droplets fall due to gravitational force.

Q-6: Which scientist, in addition to Millikan, devised the Oil drop experiment?

- a) Thomson

- b) Chadwick
- c) Harvey Fletcher
- d) Heisenberg

Answer: c) Harvey Fletcher

Explanation: The Millikan's Oil Drop Experiment was carried out in 1909 by Robert A. Millikan and Harvey Fletcher to determine the charge of an electron.

Q-7: Give an outline of the Millikan's Oil Drop Experiment apparatus.

Answer: Millikan and Fletcher built the apparatus for the experiment. It consisted of two metal plates held apart by an insulated rod. In the plate there were four holes, three of which allowed light to pass through and one of which allowed viewing through the microscope. The experiment did not use regular oil. As a result, the oil commonly used in vacuum apparatuses with low vapour pressure was used.

Q-8: What was the significance of Millikan's oil drop experiment?

Answer: Millikan's experiment is crucial because it determines the charge on an electron. Millikan balanced the actions of electric, gravitational, and air drag forces using a simple apparatus. Using the apparatus, he calculated the charge on an electron to be 1.60×10^{-19} C.

Q-9: Match Column I with Column II.

Column I	Column II
A) William Crookes	i) Water Melon Model
B) J.J Thomson	ii) Charge on the electron
C) Rutherford's Experiment	iii) Black Body Radiation
D) Max Planck	iv) Existence of nucleus
E) Millikan's oil drop experiment	v) Conduction of electricity through gases

Answer: A)-v), B)-i), C)-iv), D)-iii), E)-ii)

Q-10: The charge on an oil drop in a Millikan's oil drop experiment is calculated to be 11.2×10^{-19} C. Calculate the number of extra electrons on the drop.

Answer: As we know, $Q = ne$

Number of electrons, $n = Q/e$

Number of electrons, $n = 11.2 \times 10^{-19} \text{C} / 1.60 \times 10^{-19} \text{C}$.

Number of electrons, $n = 7$

Q-11: What was the charge on the electron measured in units of esu?

Answer: The charge on the electron was found by R.A Millikan with the help of his oil drop experiment. The value was found to be 4.8×10^{-10} esu.

Q-12: Explain the Millikan's Oil Drop Experiment procedure.

Answer:

- The atomizer emits a spray of oil droplets. These droplets are then allowed to enter an electrical condenser through a tiny hole in the upper plate (consisting of two charged plates).
- A telescope was used to observe the rate of fall of these droplets under the influence of gravity. The mass of the oil could be calculated from this.
- The air in the space between the plates was then irradiated by exposing it to X-rays. As a result, it ionises.
- The oil droplets capture one or more of the electrons that are thus knocked out. As a result, they become negatively charged. When a voltage is applied between the two plates, the oil droplet is attracted to the upper plate, which is positively charged.
- Again, by properly burying the voltage, a balance between gravitational and electrical forces can be obtained. As a result, the drop will come to a stop.
- The charge on the droplet was calculated using the mass of the oil droplet and the charge on the plates. It was discovered to be 1.60×10^{-19} C.

Q-13: How can you define an electron?

Answer: An electron is a fundamental particle with one unit negative charge and a mass nearly equal to (1/1837)th of a hydrogen atom.

Q-14: How did the gold foil experiment of Rutherford differ from Mullikan's oil drop experiment?

Answer: Rutherford's Gold foil experiment discovered the nucleus, while Mullikan's oil drop experiment determined the charge on the electron.

Q-15: What did Millikan's oil drop experiment reveal?

Answer: Millikan oil-drop test was first carried out in 1909 by American physicist Robert A. Millikan. He discovered that all of the drops had charges that were multiples of a single integer, the fundamental charge of an electron.

Practise Questions on Oil Drop Experiment

Q-1: The oil used in Millikan's oil drop experiment had to have

- a) High Vapour Pressure
- b) Low Vapour Pressure
- c) Intermediate Vapour Pressure
- d) High Viscosity

Answer: b) Low Vapour Pressure

Explanation: Ordinary oil was not used in the experiment because it would evaporate due to the heat of the light, potentially resulting in an error in the Millikan's Oil Drop Experiment. As a result, the oil commonly used in vacuum apparatuses with low vapour pressure was used.

Q-2: Which of the following was used to generate the oil droplet spray?

- a) Telescope
- b) Atomizer
- c) Electrical Condenser
- d) Electrical forces

Answer: b) Atomizer

Explanation: The atomizer produces a spray of oil droplets. These droplets are then allowed to enter an electrical condenser through a tiny hole in the upper plate.

Q-3: What was the result of Millikan's oil drop experiment?

Answer: As a result of Milliken's Oil Drop Experiment, the charge is said to be quantized, which means that the charge on any particle will always be an integral multiple of e (-1.6×10^{-19}).

Q-4: Calculate the electron mass using the values of e/m and e , which are 1.76×10^8 C/g and 1.6×10^{-19} C, respectively.

Answer: We know that,

$$\begin{aligned} m &= e/(e/m) \\ &= (1.6 \times 10^{-19} \text{ C})/(1.76 \times 10^8 \text{ C/g}) \\ &= 9.11 \times 10^{-28} \text{ g} \end{aligned}$$

Q-5: What is the use of X-rays in the Millikan's Oil drop Experiment?

Answer: The air in the space between the plates was irradiated by exposing it to X-rays. As a result, it gets ionised.