تم تحميل هذا الملف من موقع المناهج الإماراتية

الملف أوراق عمل Electromanetism 7 Chapter

روابط مواقع التواصل الاجتماعي بحسب الصف الثاني عشر العام



روابط مواد الصف الثاني عشر العام على تلغرام

التربية الاسلامية	اللغة العربية	اللغة الانجليزية	الرياضيات

المزيد من الملفات بحسب الصف الثاني عشر العام والمادة فيزياء في الفصل الثاني

1	العام، الفصل الثاني، ، ، اختبار الوحدة الاولى
2	أسئلة التقويم الثاني في مدرسة امنة بنت وهب
3	امتحان الفصل الثاني
4	الوحدة6 الحث الكهرومغاطيسي
5	الوحدة4 دوائر التوالي والتوازي

Grade 12 General / physics
Trimester 2 / Academic Year 2019-2020

I ♥ Physics

Electromagnetism part 1

Thomson's Experiment

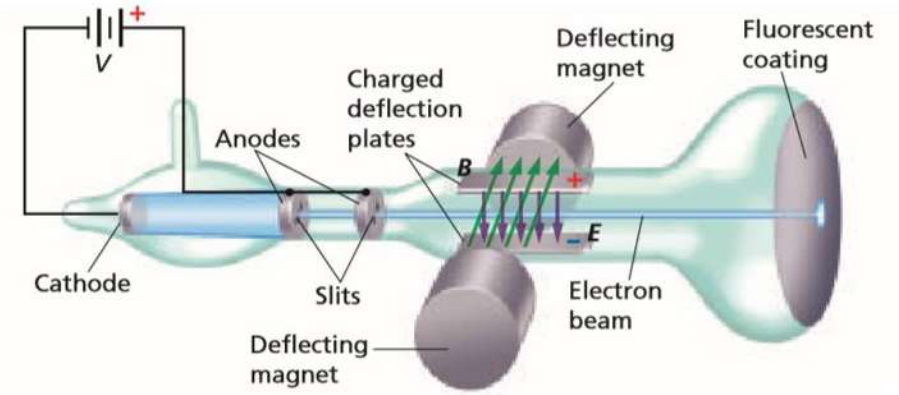
In 1897 while doing experiments with a cathode-ray-tube. Thomson was able to extract the negatively charged particles from atoms of various materials.

1- **How did Thomson extract the negatively charged particles from atoms?**

- Evacuated nearly all the air from a cathode-ray tube.
- Connected a battery to the tube to produce a large potential difference between the cathode and the anodes.

Note1: Thomson realized that the ray consisted of negatively charged particles from the gases in the tiny amount of air remaining in the tube.

Note2: He discovered that they were negatively charged particles because they deflect to a positive charged plate.



2- What did Thomson conclude from his experiment?

The charge-to-mass ratio of electron q/m.

3- What is the useful of the magnetic and the electric fields in Thomson's experiment?

To change the path of the electron beam by changing one of them.

Note: Thomson adjust the magnetic and the electric fields until the beam of electrons followed a straight, or undeflected. When this occurred, the forces due to the two fields were equal in magnitude and opposite in direction.

4- What is the speed of the electron when it passes in a straight path through the two fields?

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

Note: if the electric field stop of working, the electron will deflect under the affection of the magnetic force, then Thomson was able to determine the mass-to-charge ratio of the electron mathematically.

5- What is the equation of the charge-to-mass ratio of electron?

$$\frac{q}{m} = \frac{v}{Br}$$

q	The charge of the electron
m	The mass of the electron
v	The speed of the electron
B	The magnitude of the magnetic field
r	The radius of the deflected electron path

Note: Thomson determined that $q/m = -1.759 \times 10^{11}\ C/Kg$, Using this value for q/m and the known value of q, the mass of the electron (m) was calculated $m = 9.107 \times 10^{-31} Kg$

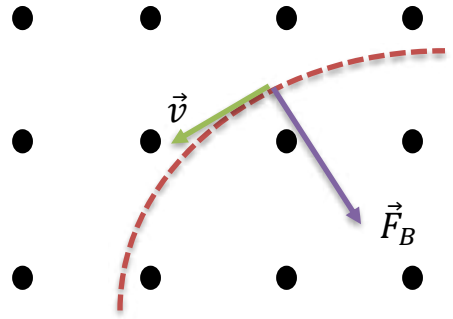
6- How did Thomson use his experiment to determine the charge-to-mass ratio of the positively hydrogen ion?

- Thomson reversed the direction of the electric field between the cathode and anodes.
- He also added a small amount of hydrogen gas to the tube.

Note: The mass of the proton (m) was calculated $m = 1.67 \times 10^{-27} Kg$

Applications

1- An electron with a mass of 9.11×10^{-31} kg moves through a cathode-ray tube at 2.0×10^{5} m/s perpendicular to a magnetic field of 3.5×10^{-3} T. The electric field is turned off. What is the radius of the circular path that is followed by the electron?



For the following questions, assume all charged particles move perpendicular to a uniform magnetic field.

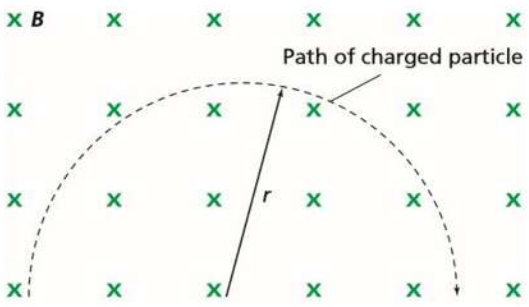
2- A proton moves at a speed of 7.5×10^{3} m/s as it passes through a magnetic field of 0.80 T. Find the radius of the circular path.

3- Electrons move through a magnetic field of 3.0×10^{-3} T balanced by an electric field of 2.4×10^{4} N/C.

A. What is the speed of the electrons?
B. If the electric field were produced by a pair of plates 0.50 cm apart. What is the potential difference between the two plates?
C. If the electric field were removed. What would be the radius of the circular path that the electrons followed?

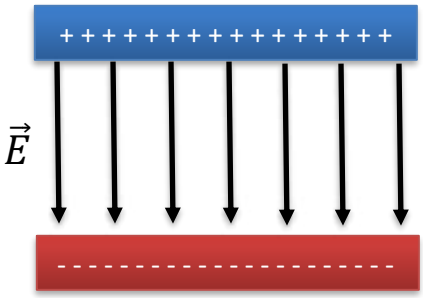
4- Protons passing without deflection through a magnetic field of 0.06 T are balanced by an electric field of 9.0×10^{3} N/C. What is the speed of the moving protons?

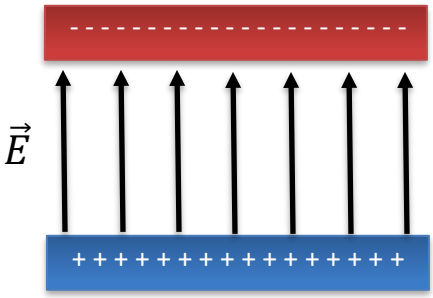
5- A proton moves across a 0.36 T magnetic field, as shown in the Figure. If the proton moves in a circular path with a radius of 0.20 m, what is the speed of the proton?

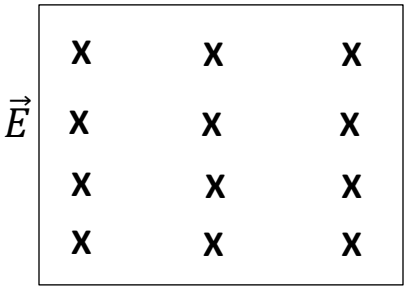


Extra exercises:

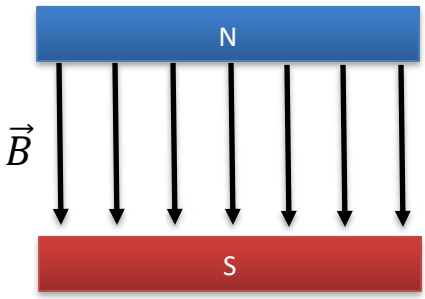
1- Determine the direction of the magnetic field that cancel the deflection of an electron moving to right when it passes through the following electric fields.

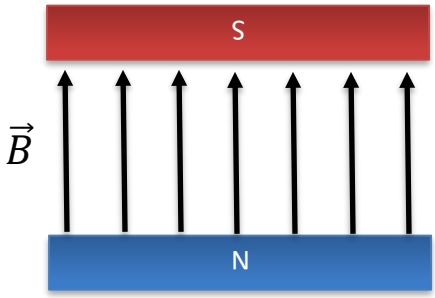


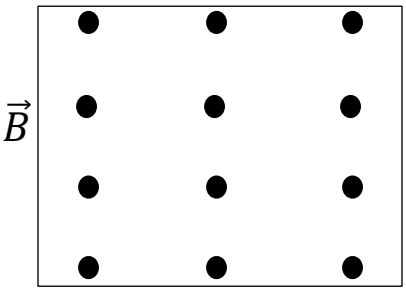




2- Determine the direction of the electric field that cancel the deflection of an electron moving to right when it passes through the following magnetic fields.







The Mass Spectrometer

1- Define isotopes.

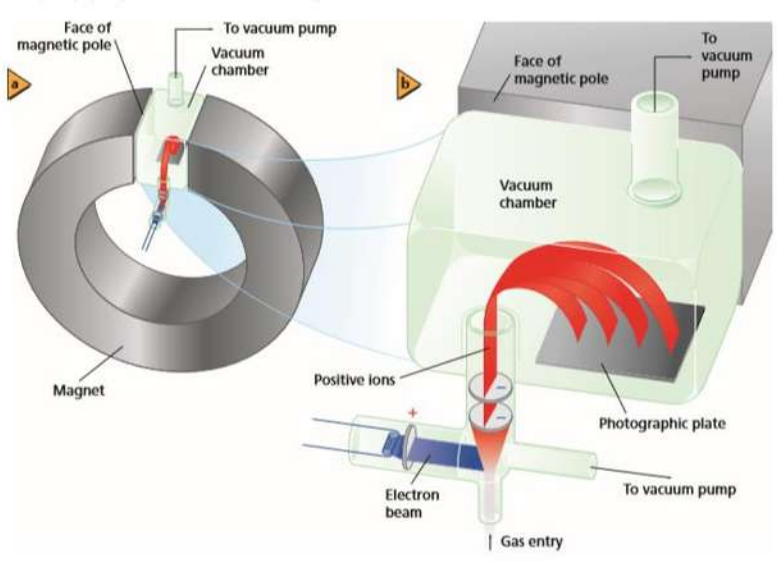
It is different atoms of the same element, with the same chemical properties but different masses.

2- Define mass spectrometer.

It is an instrument that measure the charge-to-mass ratios of positive ions within a material.

3- How does mass spectrometer work?

- Material introduced into a mass spectrometer must either be naturally a gas or be heated to the gaseous state.
- The gas inserted into a component called the ion source
- In the ion source an energetic beam of electrons collides with the gas's atoms and rips one or more electrons off producing positive ions.
- A potential difference between two electrodes produces an electric field that is used to accelerate the ions.
- The accelerated ions inter a magnetic field causes the ions to move in a circular path before they collide with an electronic detector.
- The number of glowing dots on the detector indicate the number of isotopes of that material.



4- What is the formula of the charge-to-mass ratio of the positive ion?

$$\frac{q}{m} = \frac{V}{B^2 r^2}$$

q	The charge of the positive ion
m	The mass of the positive ion
V	The accelerating potential difference
B	The magnitude of the magnetic field
r	The radius of the deflected ion path

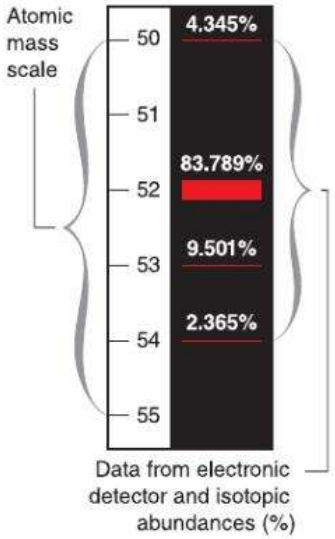
Important note: the radius of the deflected positive ion path directly proportional to the mass of the ion

5- Name some applications of the mass spectrometer.

- ✓ Used for isotopic analysis
- ✓ Used to analyze the atmospheres and soils of Mars and other objects in the solar system.
- ✓ Used in the geological, pharmaceutical, biological and forensic sciences

Isotopic analysis:

The approximate spacing between ion strikes on a detector for an ionized Chromium sample is shown in the figure. The four distinct marks indicate that a naturally occurring sample of chromium is composed of four isotopes. The abundance of each isotope corresponds to the width of the mark it makes on the detector.



Applications

1- **The operator of a mass spectrometer produces a beam of neon ions from which tow electrons have been removed, the ions are thus doubly ionized. They first are accelerated by a potential difference of 34 V. when they pass through a magnetic field of 0.050 T, the radius of their path is 53 mm. Determine the mass of the neon atom.**

2- **A beam of singly ionized (1+) oxygen atoms is sent through a mass spectrometer. The values are B = 7.2×10^{-2} T, r = 0.085 m, and V = 110 V. Find the mass of an oxygen atom.**

3- **A beam of single ionized lithium atom ($m = 7m_p$) accelerated by a potential difference of 320 V. the beam passes through a magnetic field of 1.5×10^{-2} T. what is the radius of curvature of the beam in the magnetic field**