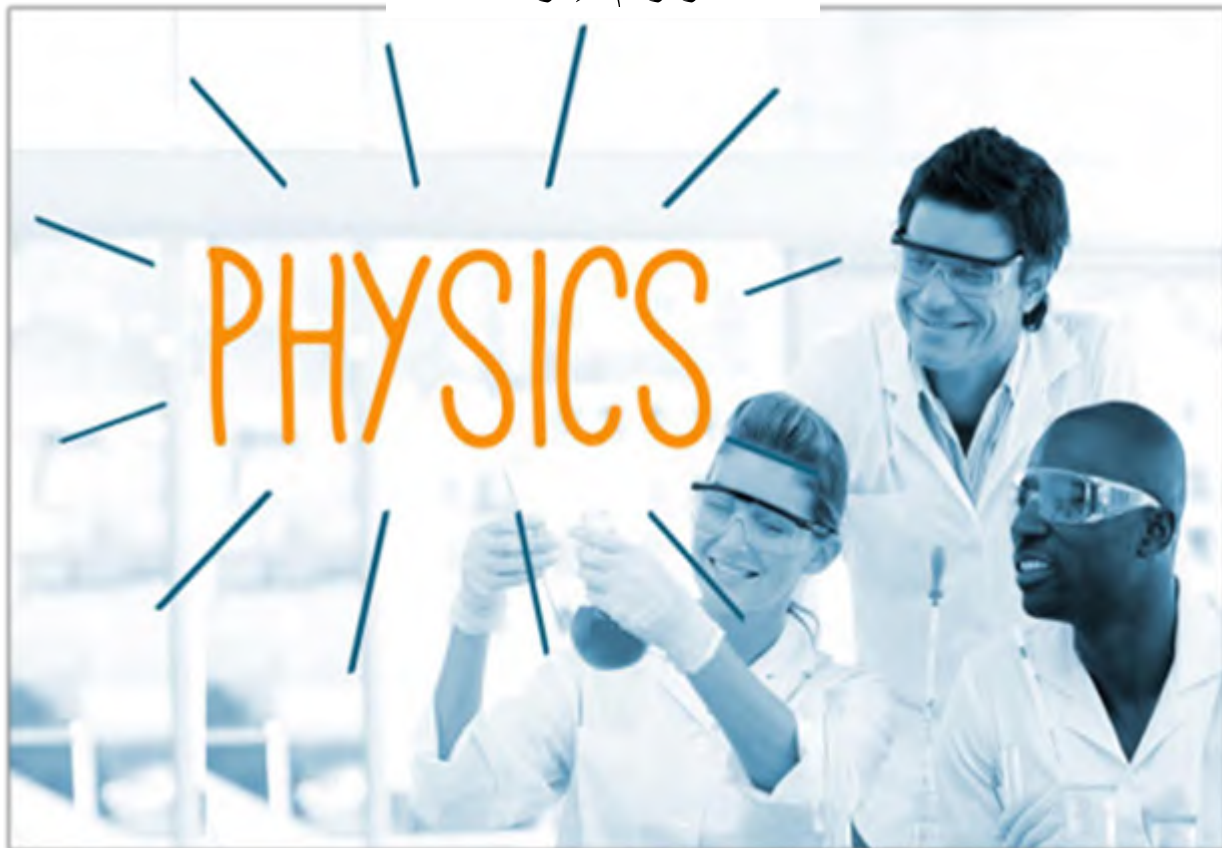


مركز أم الإمارات



Grade 12 General / physics
Trimester 2 / Academic Year 2019-2020
Prepared by Mohammed Sami

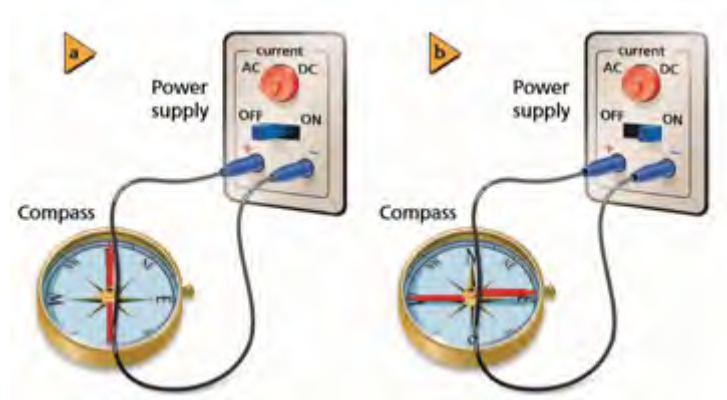


Section 1: Understanding magnetism

Electromagnetism

- 1- Explain the reason for the change in the direction of the compass needle when placed near a wire through which an electric current flow?**

Because the electric current creates a magnetic field around the wire, that effects on the compass needle.



- 2- What are the characteristics of the magnetic field lines from current-Carrying wire?**

- The field lines form closed loops around the current-carrying wire.
- The loops are perpendicular to the current-carrying wire.



Chapter 5 – Magnetic fields

3- What are the factors that effect on the magnetic field of the current-carrying wire?

- The strength of the magnetic field directly proportional to the current in the wire.
- The strength of the magnetic field inversely proportional to the distance from the wire.

4- How to determine the direction of the magnetic field around a current-carrying wire?

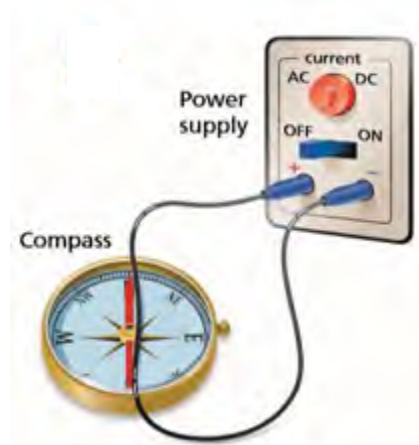
By using the right-hand rule:

- Thumb points in the direction of the current.
- The fingers of the hand encircling the wire points in the direction of the magnetic field.



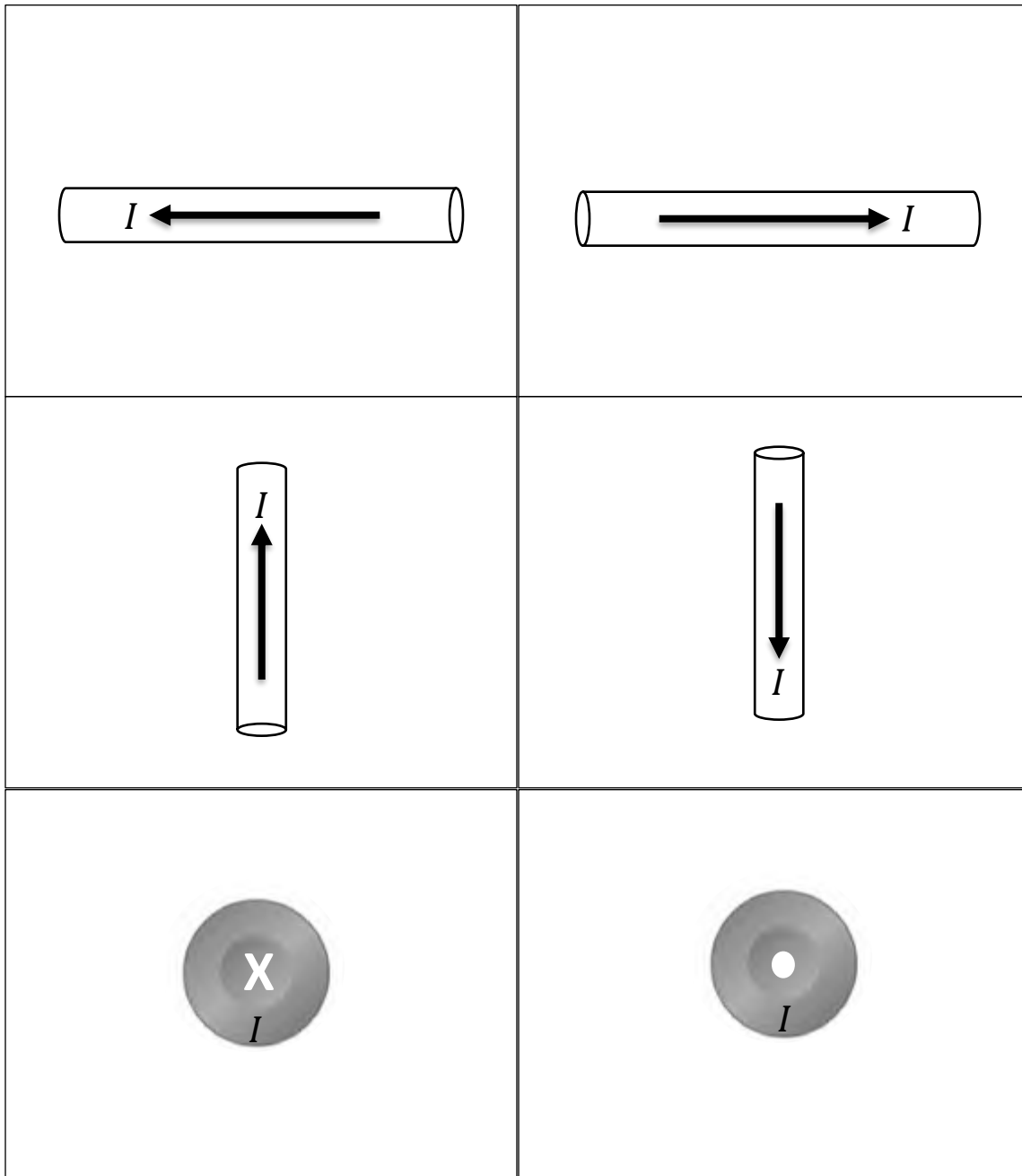
5- According to the right-hand rule and the figure below, to which direction the compass needle will point if the current start flowing through the wire, in the following cases?

Case 1	Case 2
The compass under the wire	The compass over the wire



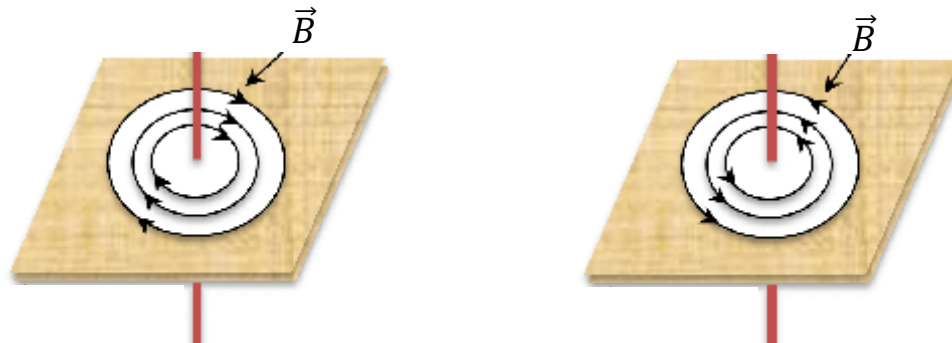
Chapter 5 – Magnetic fields

6- Determine (draw) the direction of the magnetic field around the current-carrying wire in the following cases?



Chapter 5 – Magnetic fields

7- Determine (draw) the direction of the current that is flowing through the wire in the following cases?



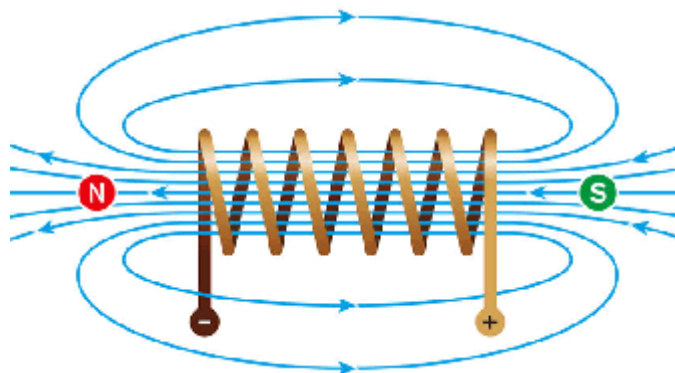
8- Determine (draw) the direction of the magnetic field inside and outside the current-carrying wire formed into a loop in the following cases?



9- Define solenoid.

A wire connected to a circuit and coiled into many spiral loops.

- **Note:** When there is an electric current in a solenoid, the solenoid has a field similar to the field of a permanent magnet. This kind of magnet is an electromagnet.



10- What are the factors that effect on the strength of the magnetic field in a solenoid?

- The current in the solenoid. (direct proportional)
- The number of the solenoid loops. (direct proportional)
- The spaces between the solenoid loops. (invers proportional)

11- What is the effect of placing an iron-containing rod inside the solenoid on the magnetic field strength?

The magnetic field strength of the solenoid will increase

12- How to determine the direction of the solenoid magnetic field?

By using the right-hand rule:

- Thumb points in the direction of the magnetic field direction.
- The fingers curling with the current direction.



Applications

1- A long, straight, current-carrying wire runs from north to south.

- A. A compass needle placed above the wire points with its north pole toward the east. In what direction is the current flowing?
- B. If a compass is put underneath the wire, in which direction will the compass needle point?

.....

.....

.....

.....

2- How does the strength of a magnetic field, 1 cm from a current-carrying wire, compare with each of the following?

- A. The strength of the field that is 2 cm from the wire
- B. The strength of the field that is 0.5 cm from the wire

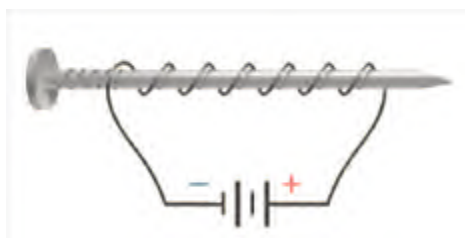
.....

.....

.....

.....

3- A student makes a magnet by winding wire around a nail and connecting it to a battery, as shown in the figure. Which end of the nail- the pointed end or the head- will be the north pole?



4- You have a spool of wire, a glass rod, an iron rod, and an aluminum rod. Which rod should you use to make an electromagnet to pick up steel objects? Explain.

.....

.....

.....

.....

5- The electromagnet in the previous problem works well, but you decide that you would like to make its strength adjustable by using a **potentiometer** as a variable resistor. Is this possible? Explain.

.....

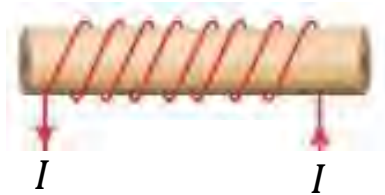
.....

.....

Chapter 5 – Magnetic fields

Extra exercises

- 1- Determine (draw) the direction of the magnetic field inside and outside the solenoid in the following cases.

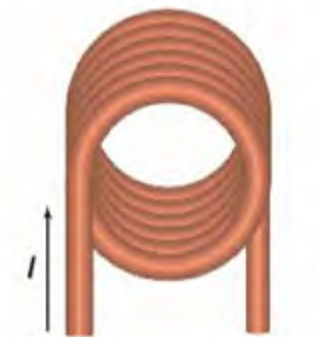


- 2- Determine (draw) the direction of the current in the solenoid according to the following figures.



- 3- The figure below shows the end view of an electromagnet with current flowing through it.

- A. What is the direction of the magnetic field inside the loops?
B. What is the direction of the magnetic field outside the loops?



The end of part 2