

Section 6: Magnetism and electromagnetism

- a) Units
- b) Magnetism
- c) Electromagnetism
- e) Electromagnetic induction

a) Units

Students will be assessed on their ability to:

- 6.1 use the following units: ampere (A), volt (V), watt (W).

b) Magnetism

Students will be assessed on their ability to:

- 6.2 understand that magnets repel and attract other magnets and attract magnetic substances**
- 6.3 describe the properties of magnetically hard and soft materials**
- 6.4 understand the term 'magnetic field line'
- 6.5 understand that magnetism is induced in some materials when they are placed in a magnetic field**
- 6.6 describe experiments to investigate the magnetic field pattern for a permanent bar magnet and that between two bar magnets
- 6.7 describe how to use two permanent magnets to produce a uniform magnetic field pattern.

c) Electromagnetism

Students will be assessed on their ability to:

- 6.8 understand that an electric current in a conductor produces a magnetic field round it
- 6.9 describe the construction of electromagnets**
- 6.10 sketch and recognise magnetic field patterns for a straight wire, a flat circular coil and a solenoid when each is carrying a current**
- 6.11 understand that there is a force on a charged particle when it moves in a magnetic field as long as its motion is not parallel to the field**
- 6.12 understand that a force is exerted on a current-carrying wire in a magnetic field, and how this effect is applied in simple d.c. electric motors and loudspeakers
- 6.13 use the left hand rule to predict the direction of the resulting force when a wire carries a current perpendicular to a magnetic field
- 6.14 describe how the force on a current-carrying conductor in a magnetic field increases with the strength of the field and with the current.

d) Electromagnetic induction

Students will be assessed on their ability to:

6.15 understand that a voltage is induced in a conductor or a coil when it moves through a magnetic field or when a magnetic field changes through it and describe the factors which affect the size of the induced voltage

6.16 describe the generation of electricity by the rotation of a magnet within a coil of wire and of a coil of wire within a magnetic field and describe the factors which affect the size of the induced voltage

6.17 describe the structure of a transformer, and understand that a transformer changes the size of an alternating voltage by having different numbers of turns on the input and output sides

6.18 explain the use of step-up and step-down transformers in the large-scale generation and transmission of electrical energy

6.19 know and use the relationship between input (primary) and output (secondary) voltages and the turns ratio for a transformer:

$$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$$

$$\frac{V_P}{V_S} = \frac{n_P}{n_S}$$

6.20 know and use the relationship:

input power = output power

$$V_P I_P = V_S I_S$$

for 100% efficiency