

State Examination Commission – Physics Higher Level, 2006

Question 9

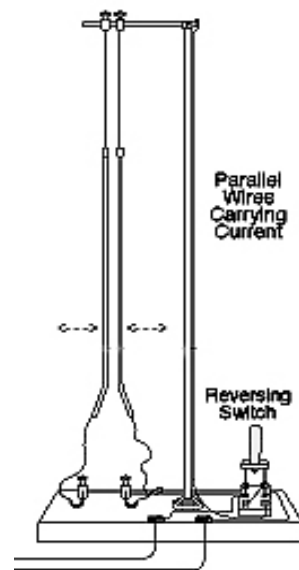
- What is an electric current? Define the ampere, the SI unit of current. (12)
 Describe an experiment to demonstrate the principle on which the definition of the ampere is based. (15)
 Sketch a graph to show the relationship between current and time for
 (i) alternating current; (9)
 (ii) direct current. (6)
 The peak voltage of the mains electricity is 325 V. Calculate the rms voltage of the mains? (9)
 What is the resistance of the filament of a light bulb, rated 40 W, when it is connected to the mains? (9)
 Explain why the resistance of the bulb is different when it is **not** connected to the mains. (5)

What is an electric current? Define the ampere, the SI unit of current. (12)

Standard term/definition

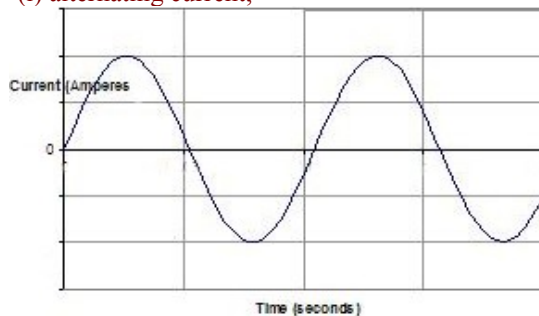
Describe an experiment to demonstrate the principle on which the definition of the ampere is based. (15)

Set up apparatus, as shown, with two parallel wires or strips of aluminium. Switch on d.c. power source and note repulsion/attraction between the two current carrying conductors.

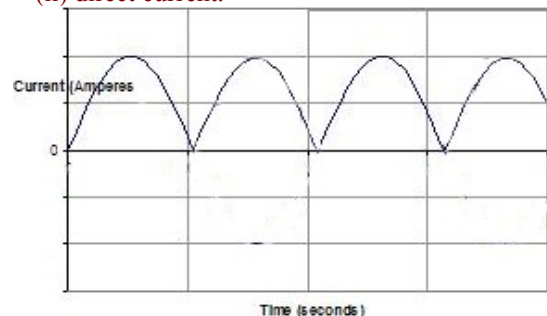


Sketch a graph to show the relationship between current and time for

(i) alternating current;



(ii) direct current.



The peak voltage of the mains electricity is 325 V. Calculate the rms voltage of the mains? (6)

$$V_{\max} = \sqrt{2} V_{\text{rms}}$$

$$V_{\text{rms}} = 325/\sqrt{2} = 230 \text{ V}$$

What is the resistance of the filament of a light bulb, rated 40 W, when it is connected to the mains? (9)

$$P = RI^2 = R(V/R)^2 = V^2/R$$

$$\Rightarrow 40 = (230)^2/R$$

$$\Rightarrow R = 1322 \Omega$$

Explain why the resistance of the bulb is different when it is **not** connected to the mains. (5)

Resistance of a metal is temperature dependant. When filament is cold it has a lower resistance.