4 (a) A battery of electromotive force (e.m.f.) 9.0 V and internal resistance *r* is connected to two resistors S and T, as shown in Fig. 4.1.

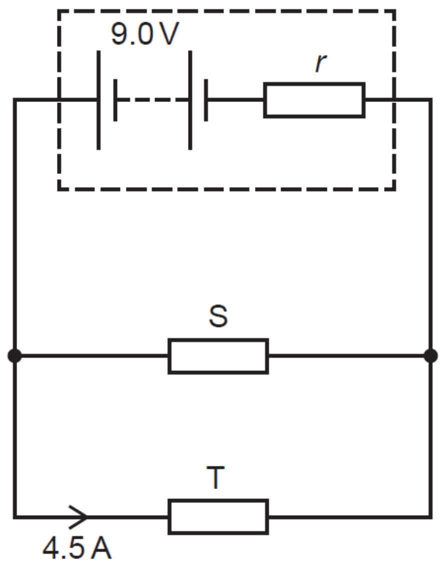

Fig 4.1

A total charge of 650 C moves through resistor S in a time interval of 540 s. During this time resistor S dissipates 4800 J of energy. The current in resistor T is 4.5 A. Assume that the e.m.f. of the battery remains constant.

Calculate:

(i) the current in resistor S

current = ...A [1]

(ii) the internal resistance *r* of the battery.

r = ... Ω [3]

[Turn over

(b) A sinusoidal alternating voltage has a root-mean-square (r.m.s.) potential difference (p.d.) of 4.2 V and a frequency of 50 Hz.

(i) By reference to heating effect, explain what is meant by the root-mean-square (r.m.s.) value of an alternating current.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………[1]

(ii) The alternating voltage is applied across a resistor of resistance 760 Ω.

Determine the maximum power dissipated by the resistor.

maximum power dissipated = …………………………… mW [2]

(iii) On Fig. 4.2, sketch the variation with time t of the power P transferred in the resistor. Include on your graph a time equal to two periods of the alternating potential difference.

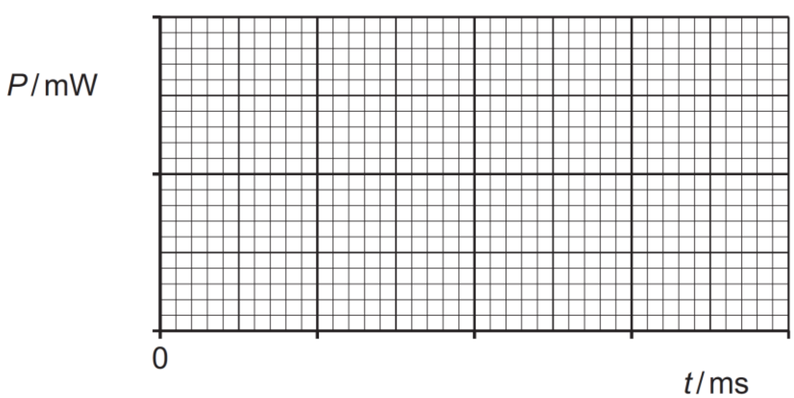

Fig. 4.2

[3]

[Total: 10]