AS Level Physics A

H156/02 Depth in physics

Question Set 19

1 **(a)** Fig. 4 shows a circuit with five identical 60 Ω resistors. The battery has electromotive force (e.m.f.) 9.0 V and negligible internal resistance.

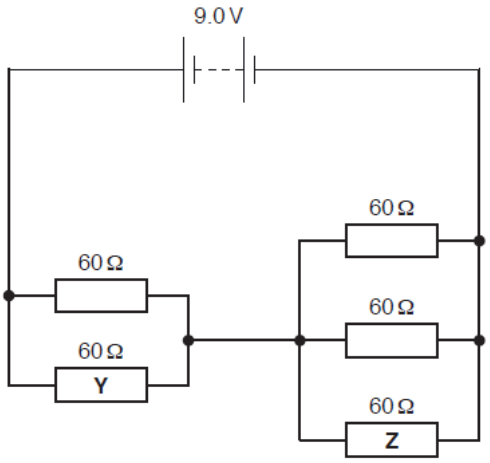

Fig. 4

(i) Show that the total resistance in the circuit is 50 Ω.
Make your reasoning clear.

[2]

(ii) Calculate the potential difference V across resistor **Y**.

V = V

[2]

(iii) Calculate the charge Q passing through resistor **Y** in two minutes (include an appropriate unit).

Q = unit **[3]**

(iv) Calculate the energy W dissipated in resistor **Y** in two minutes.

W = J

[1]

(b) Explain how the mean drift velocity of electrons in resistor **Y** compares with the mean drift velocity of electrons in resistor **Z**.

[3]

(c) Copper is a metal, carbon is a semiconductor and ceramic is an insulator.

Describe the difference between these three materials in terms of the number density n of free electrons. Include an explanation of the term **number density**.

[3]

Total Marks for Question Set 19: 14

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