5 **(a)** Explain what is meant by the *resistance* of a resistor.

.....

..... [1]

(b) A student is given a resistor of resistance *R* in the range of kilo-ohms and wishes to determine its value accurately. To do so, he sets up the circuit as shown in Fig. 5.1.

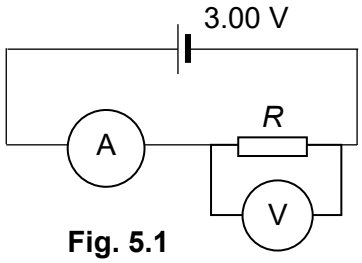

Fig. 5.1

The voltmeter has a resistance of 6000 Ω and the ammeter has negligible resistance. The voltmeter reading *V* is 3.00 V and the ammeter reading I is 1.50 mA.

(i) The student calculates the value of *R* using

$$R = \frac{V}{I}$$

Explain why this value of *R* is inaccurate.

.....

..... [1]

(ii) Calculate the actual value of *R*.

R = ... Ω [3]

(iii) Using the circuit components in Fig. 5.1, draw a circuit that will allow the student to calculate *R* accurately with the equation in **(b)(i)**.

[1]

(c) The student then decides to use a second method to determine *R*. He sets up the potentiometer circuit as shown in Fig. 5.2.

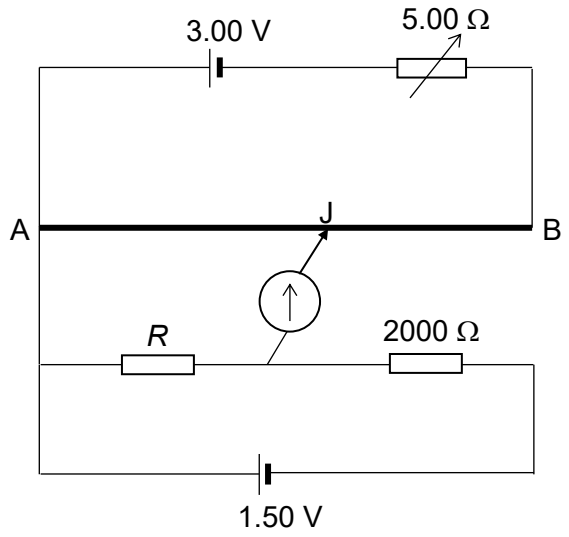

Fig. 5.2

In the potentiometer circuit, a variable resistor connected to the 3.00 V e.m.f. source is set to 5.00 Ω. The potentiometer wire AB has a length of 100 cm and a resistance of 10.0 Ω. No current flows through the galvanometer when the sliding contact is at point J.

(i) Calculate the potential difference across the wire AB.

potential difference = ... V [2]

(ii) Using your answer for *R* in **(b)(ii)**, determine the balance length AJ.

balance length = ... cm [2]