

5.2 Heating Effect of Electric Currents

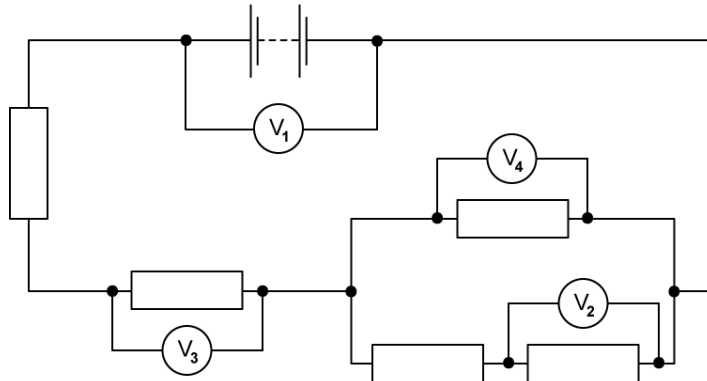
Question Paper

| | |
|------------|---|
| Course | DPIB Physics |
| Section | 5. Electricity & Magnetism |
| Topic | 5.2 Heating Effect of Electric Currents |
| Difficulty | Medium |

Time allowed: 20
Score: /10
Percentage: /100

Question 1

A circuit contains five identical resistors and four identical voltmeters. The reading on voltmeter V_1 is 8.0 V and the reading on voltmeter V_2 is 1.0 V. What are the readings on V_3 and V_4 ?



| | reading on voltmeter V_3 / V | reading on voltmeter V_4 / V |
|----|--------------------------------|--------------------------------|
| A. | 1.5 | 1.0 |
| B. | 3.0 | 2.0 |
| C. | 4.5 | 3.0 |
| D. | 6.0 | 4.0 |

[1 mark]

Question 2

A power cable **X** has resistance R and carries current I . A second cable **Y** has resistance $2R$ and carries current $\frac{1}{2}$.

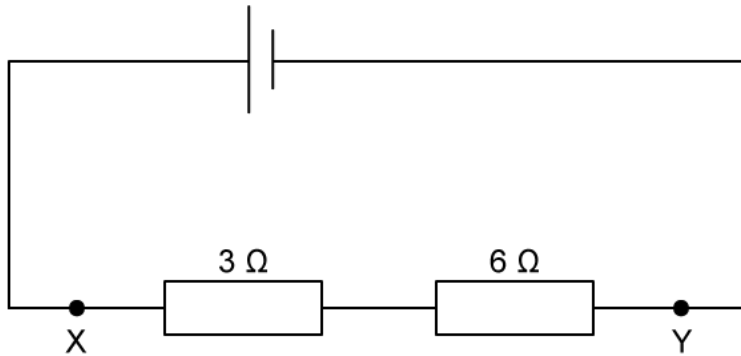
What is the ratio $\frac{\text{power dissipated in Y}}{\text{power dissipated in X}}$?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. 2
- D. 4

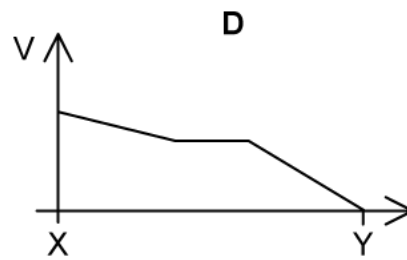
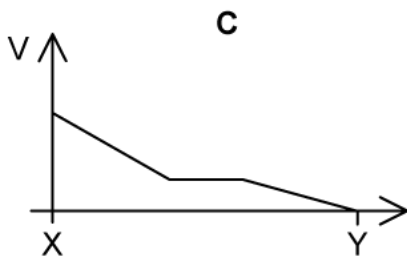
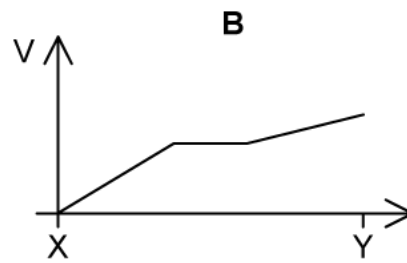
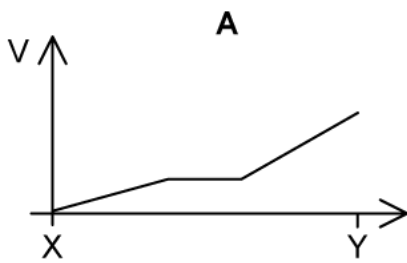
[1 mark]

Question 3

Two resistors are connected to a cell.



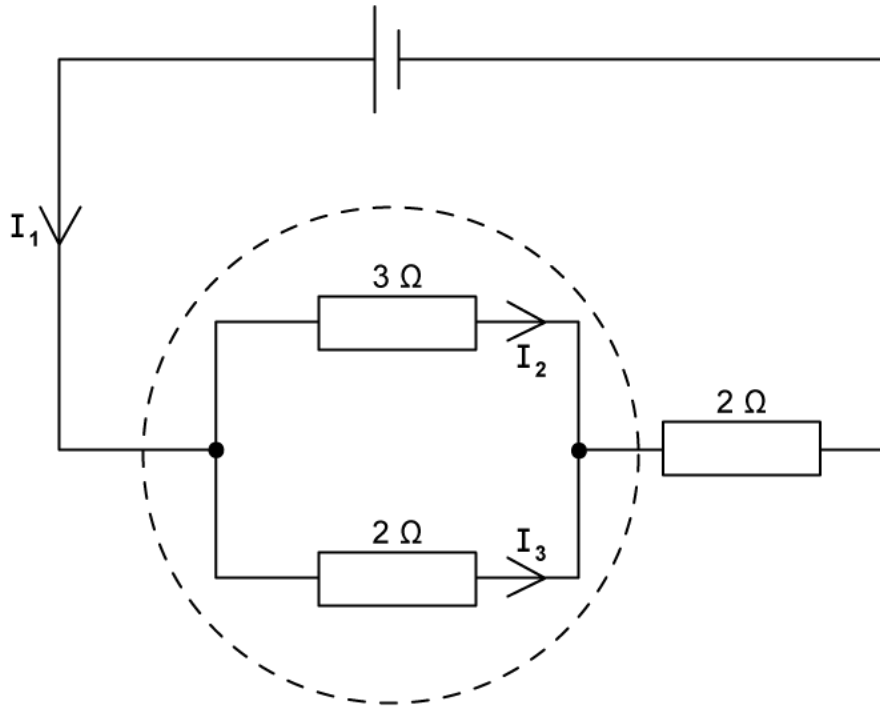
Assuming both resistors are made from wires of the same length, which graph shows how the potential V varies along the line XY ?



[1 mark]

Question 4

Kirchhoff's laws are applied to the circuit shown.



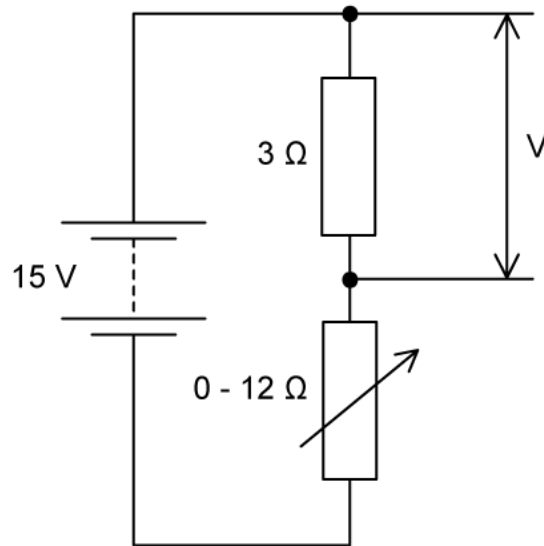
What is the equation for the dotted loop?

- A. $0 = 2I_3 - 3I_2$
- B. $0 = 2I_2 - 3I_3$
- C. $6 = 3I_2 + 2I_3 + 2I_1$
- D. $6 = 3I_2 + 2I_3$

[1 mark]

Question 5

In the circuit shown, the fixed resistor has a value of $3\ \Omega$ and the variable resistor varies between $0\ \Omega$ and $12\ \Omega$.



The power supply has an emf of 15 V and negligible internal resistance.

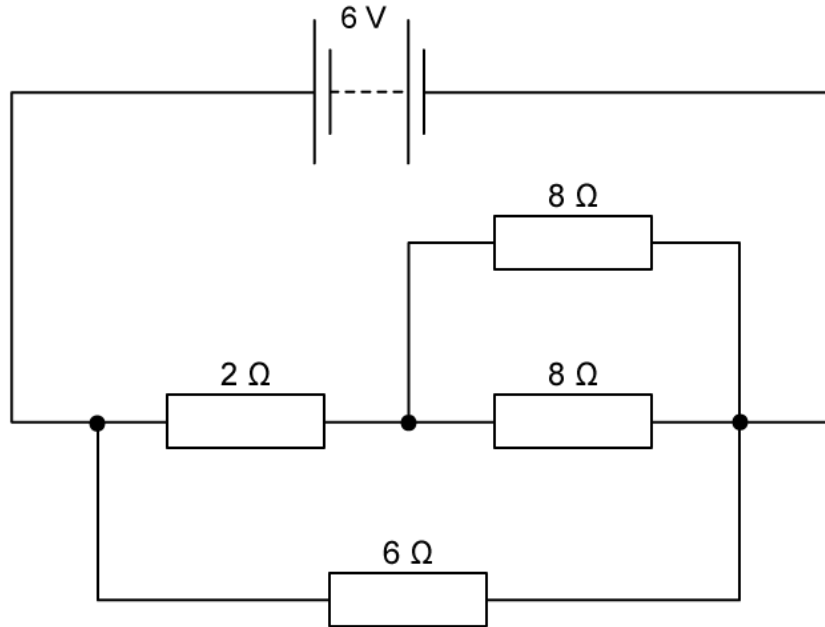
What is the range of potential differences V which can be measured across the $3\ \Omega$ resistor?

- A. 3 V
- B. 6 V
- C. 9 V
- D. 12 V

[1 mark]

Question 6

Four resistors are connected to a battery of e.m.f. 6 V as shown.



If the battery has negligible internal resistance, what is the current in the battery?

- A. 2 A
- B. 3 A
- C. 4 A
- D. 5 A

[1 mark]

Question 7

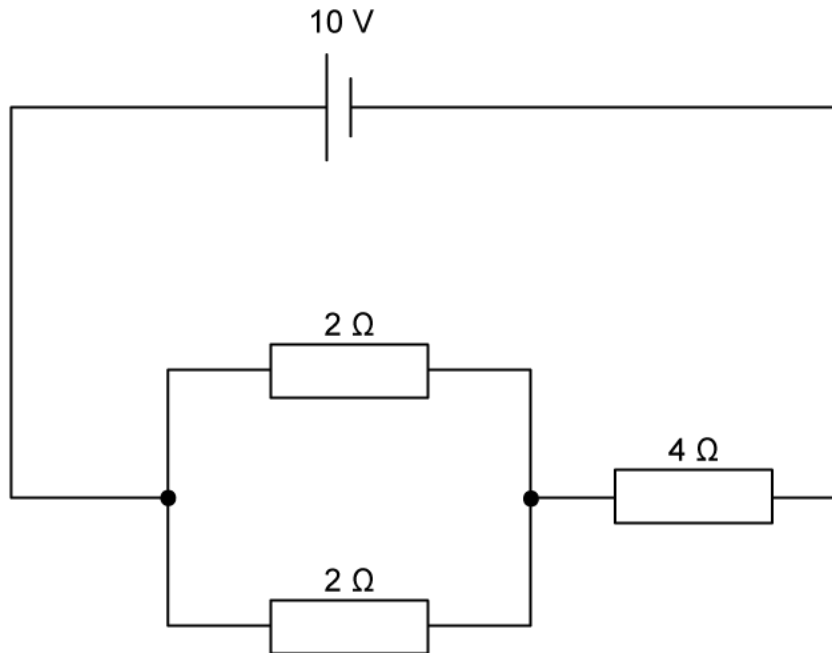
Which of the following cannot be the units for resistivity?

- A. V m A^{-1}
- B. $\text{J m s}^{-1} \text{A}^{-1}$
- C. $\text{J m s}^{-1} \text{A}^{-2}$
- D. $\Omega \text{ m}$

[1 mark]

Question 8

Three resistors are connected to a cell of e.m.f. 10 V and negligible internal resistance as shown.



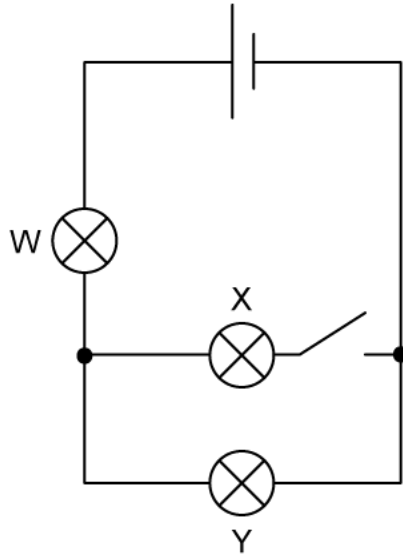
What is the power dissipated in one of the $2\ \Omega$ resistors and in the whole circuit?

| | power dissipated in the $2\ \Omega$ resistor / W | power dissipated in the whole circuit / W |
|----------|--|---|
| A | 1 | 18 |
| B | 1 | 20 |
| C | 2 | 18 |
| D | 2 | 20 |

[1 mark]

Question 9

Three identical lamps, W, X and Y are connected to a cell of negligible internal resistance as shown.



When the switch is closed, each lamp is lit. Which of the following correctly describes the brightness of lamps W, X and Y when the switch is opened?

| | lamp W | lamp X | lamp Y |
|----------|---------------|---------------|---------------|
| A | increases | increases | decreases |
| B | decreases | off | decreases |
| C | decreases | off | increases |
| D | increases | decreases | decreases |

[1 mark]

Question 10

A science student who lives in the UK, where the mains voltage is 240 V, buys a light bulb marked 60 W which she uses in her bedroom. The student takes the lightbulb with her on a trip to Canada where the mains voltage is 100 V and also uses it there.

Which line correctly identifies the approximate power dissipated in the bulb in the UK and Canada?

| | UK / W | Canada / W |
|----|--------|------------|
| A. | 30 | 10 |
| B. | 60 | 30 |
| C. | 60 | 10 |
| D. | 120 | 60 |

A.

[1 mark]