



EXAM PAPERS PRACTICE

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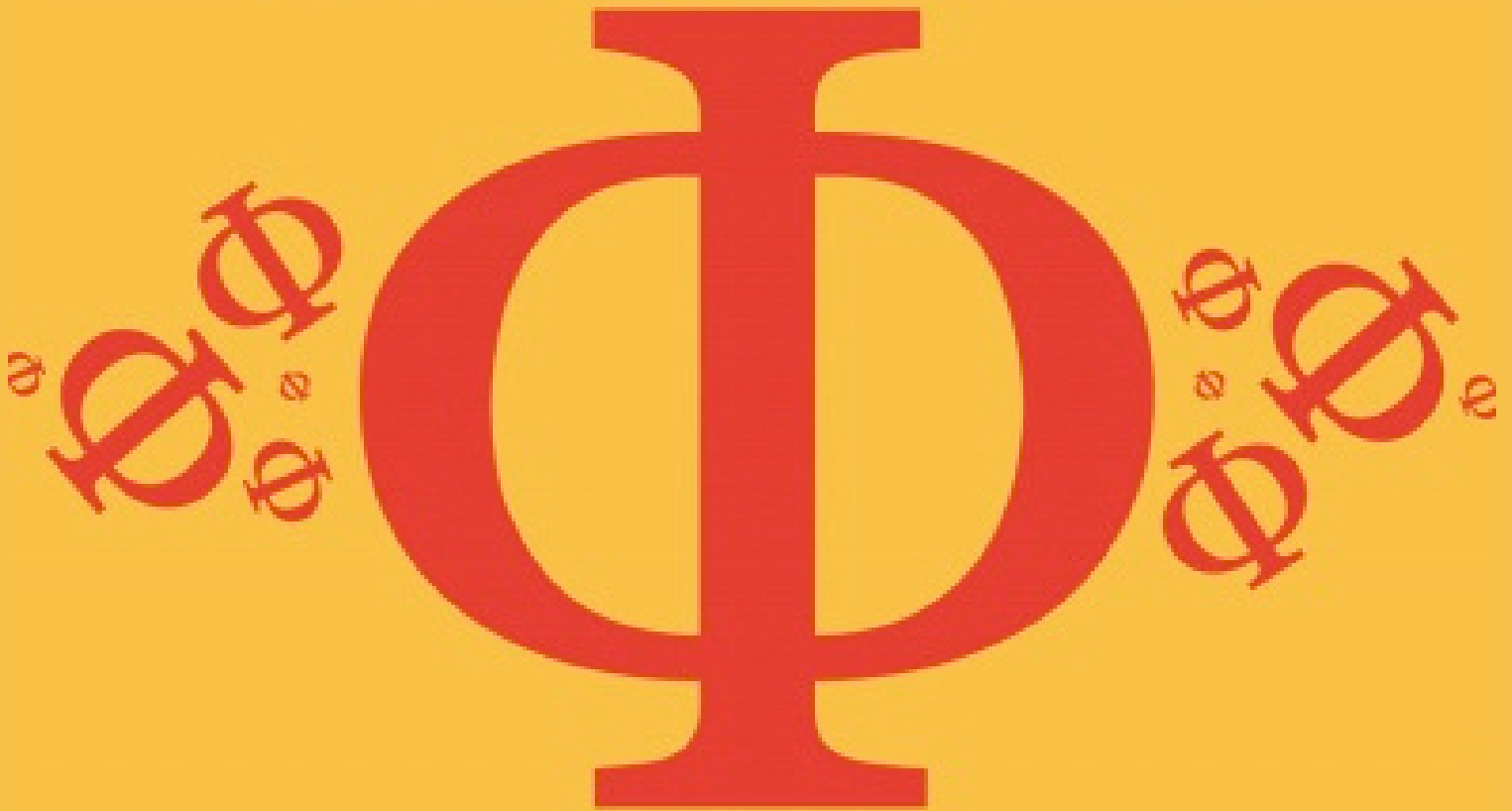
Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

5.2 Heating Effect of Electric Currents

Hard



PHYSICS

IB HL

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	Hard

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

Question 1

A student is investigating the properties of cells made using lemons. They find that their lemon cell has an emf of 1.0 V and internal resistance $5000\ \Omega$. The student wonders what the least number of lemons they would need to light a bulb with a rating of 5.0 W and 8.0 V .

What is the best estimate of the least number of lemons?

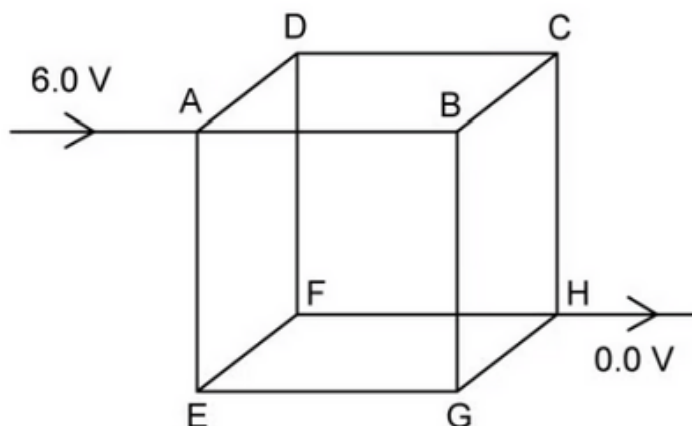
- A. 9
- B. 3000
- C. 15 000
- D. 30 000

[1 mark]

Question 2

The diagram shows a cubical wire framework made from rigid, uniform copper wire. The wires all have the same length.

Points A and H are connected to the terminals of a 6.0 V power supply. Side AB has a resistance of $2.0\ \Omega$.



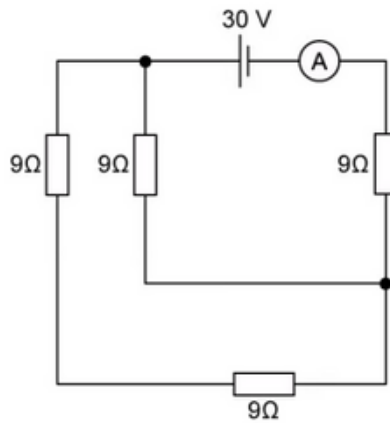
Which line correctly identifies the total resistance of the network, the potential at F and the current in BC?

	total resistance / Ω	current in side BC / A	potential at F / V
A.	$\frac{1}{3}$	3.6	6.0
B.	$\frac{5}{3}$	0.6	2.4
C.	$\frac{1}{3}$	1.2	3.6
D.	$\frac{5}{3}$	0.6	6.0

[1 mark]

Question 3

What is the current reading on the ideal ammeter shown?

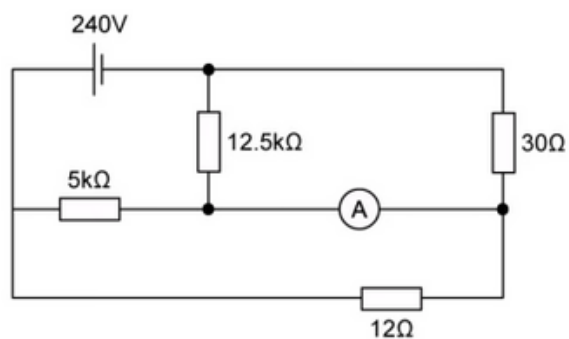


- A. 1.0 A
- B. 2.0 A
- C. 3.3 A
- D. 6.6 A

[1 mark]

Question 4

What is the current reading on the ideal ammeter shown?



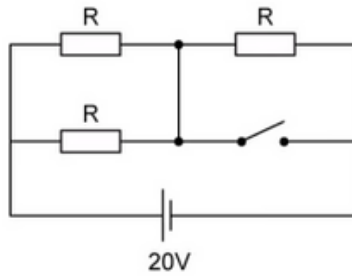
- A. 0 A
- B. 0.12 mA
- C. 12 A
- D. 26.7 A

[1 mark]

Question 5

The circuit shown includes three identical cylindrical resistors, with dimensions such that the cross-sectional area is 5 mm^2 , the length is 20 cm and the resistance is $R \Omega$.

When the switch is closed, the total resistance of the circuit is $5 \text{ k}\Omega$.



What is the resistivity of the material that the resistors are made from?

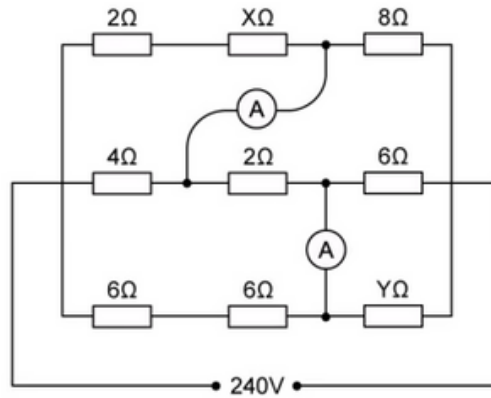
- A. $0.08 \Omega \text{ m}$
- B. $0.25 \Omega \text{ m}$
- C. $8.0 \Omega \text{ m}$
- D. $25 \Omega \text{ m}$

[1 mark]



Question 6

The readings on both ammeters are zero. What are the values of X and Y?



	X/Ω	Y/Ω
A.	2	12
B.	2	6
C.	4	12
D.	4	6

[1 mark]

Question 7

A strain gauge is a device which measure force. An applied tension on a thin wire of known resistance changes the length and cross-sectional area so that the value of the resistance is changed in a predictable way (assuming that volume remains constant).

When the length of the wire is increased by 5 % what will be the effect on the resistance?

- A. - 5 %
- B. + 5 %
- C. - 10 %
- D. + 10 %

[1 mark]

Question 8

Two rods have the same length, and the same resistance. One rod is made from copper and the other from aluminium.

Copper is three times as dense as aluminium but has half the value of resistivity.

A student wants to know the ratio of:

$$\frac{\text{mass aluminium rod}}{\text{mass copper rod}}$$

Which option is the correct answer?

- A. 6
- B. $\frac{3}{2}$
- C. $\frac{2}{3}$
- D. $\frac{1}{6}$

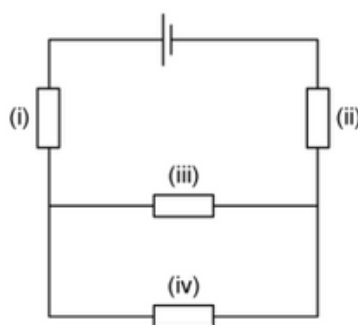


[1 mark]

Question 9

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The identical resistors marked (i), (ii), (iii) and (iv) are connected as shown. The battery which has negligible internal resistance supplies a total power of 20 W.



What is the power dissipated in resistor (iv)?

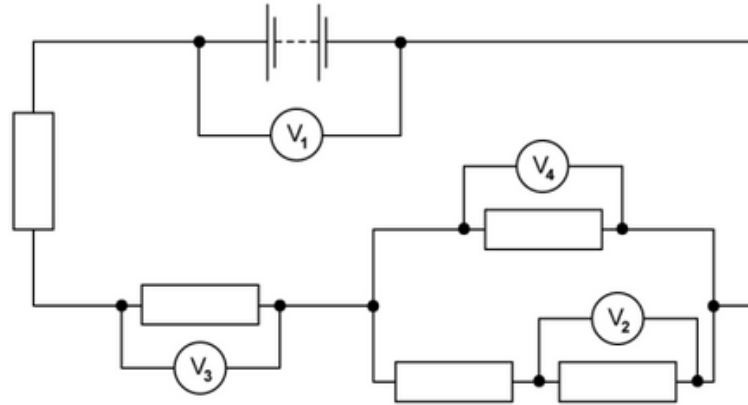
- A. 2.0 W
- B. 3.0 W
- C. 4.0 W
- D. 6.0 W

[1 mark]



Question 10

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