



**Topic Test: OxfordAQA
International GCSE Combined
Science 9204 Physics**
Electricity and magnetism

Name: _____

Class: _____

Date: _____

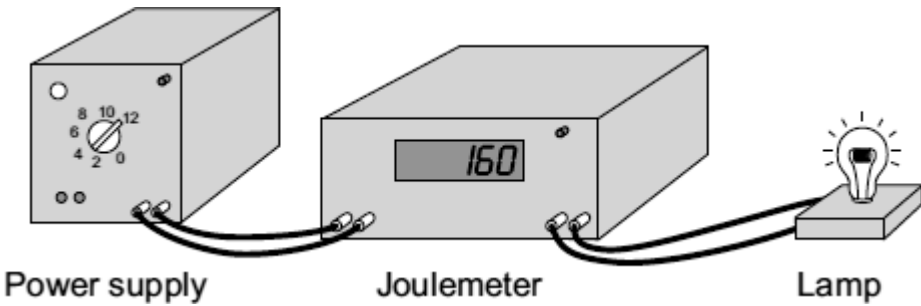
Time: **38 minutes**

Marks: **38 marks**

Comments:

1

A student used a joulemeter to measure the energy transformed by a lamp.



The student set the joulemeter to zero, and then switched on the power supply.

After 120 seconds (2 minutes), the reading on the joulemeter had increased to 2880.

(a) In the space below, draw the circuit symbol used to represent a lamp.

(1)

(b) (i) Use the equation in the box to calculate the power of the lamp.

$$\text{power} = \frac{\text{energy transformed}}{\text{time}}$$

Show clearly how you work out your answer.

Power = _____

(2)

(ii) Which **one** of the following is the unit of power?

Draw a ring around your answer.

joule newton watt

(1)

(c) Complete the following sentence using one of the phrases from the box.

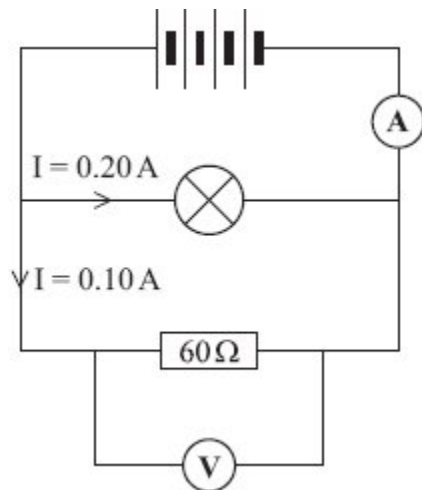
larger than	the same as	smaller than
-------------	-------------	--------------

If the lamp was left switched on for 10 minutes, the amount of energy transformed would be _____ the amount of energy transformed in 2 minutes.

(1)
(Total 5 marks)

2

A circuit was set up as shown in the diagram.



(a) Each cell provides a potential difference of 1.5 volts.

(i) What is the total potential difference provided by the four cells in the circuit?

Total potential difference = _____ volts

(1)

(ii) What will be the reading on the voltmeter?

(1)

(b) The current through the lamp is 0.20 amps.
The current through the resistor is 0.10 amps.

What is the reading on the ammeter?

Reading on ammeter = _____ amps

(1)

(c) Use a phrase from the box to complete the following sentence.

greater than equal to smaller than

The resistance of the lamp is _____ 60Ω .

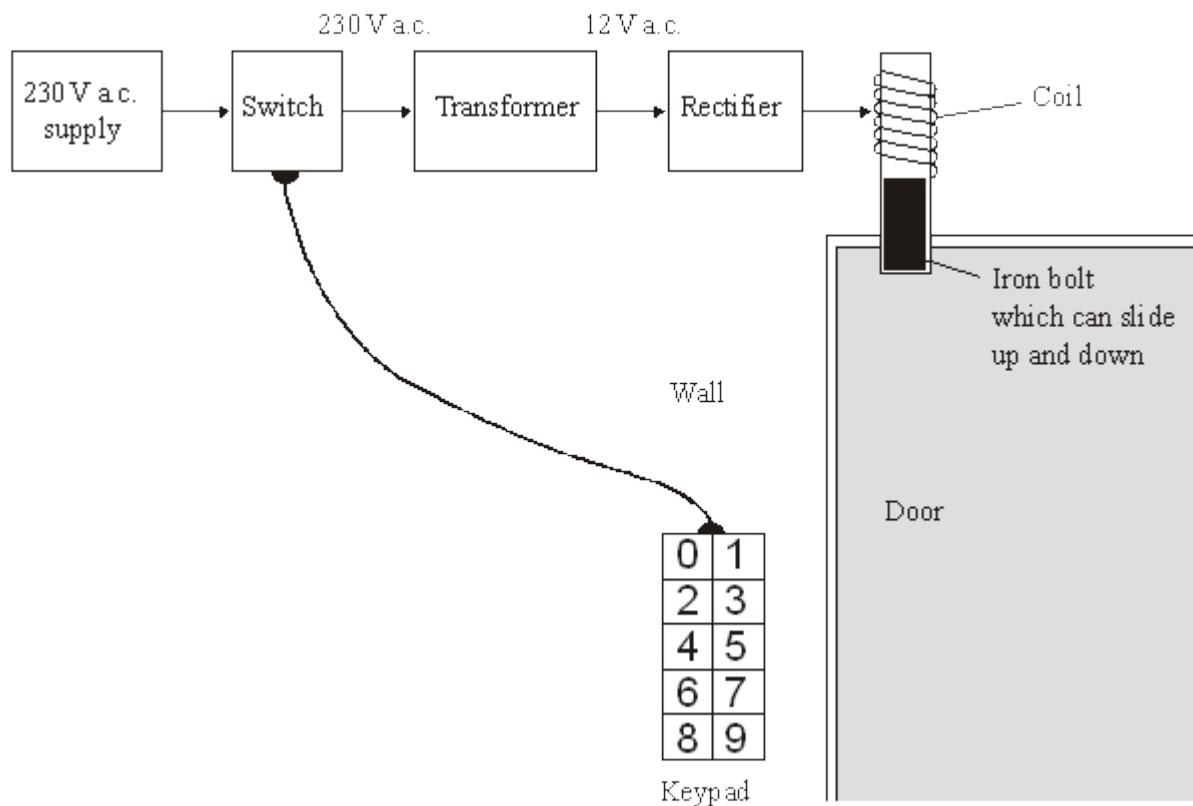
Give a reason for your answer.

(2)
(Total 5 marks)

3

The diagram shows the design for a remotely controlled door bolt.

When the correct numbers are entered into the keypad the transformer switches on. Then the door can be opened.



(a) What kind of transformer is shown in the diagram?

(1)

(b) What does the abbreviation a.c. stand for?

(1)

(c) Complete the sentences using the correct words from the box.

attracts	downwards	magnet	reflects	repels
sideways	switch	transformer	upwards	

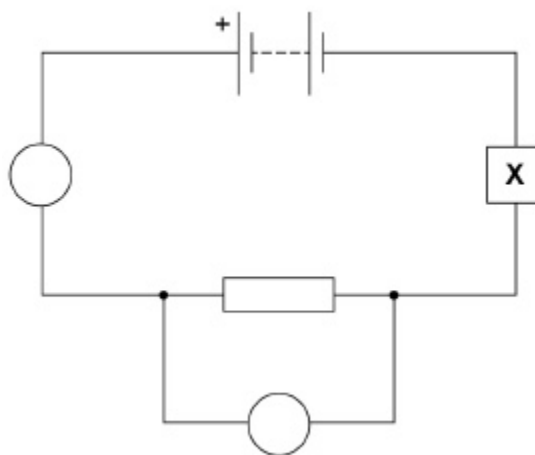
- (i) When a current flows in the coil, the coil becomes a _____ .
- (ii) The coil _____ the iron bolt which moves _____

(3)
(Total 5 marks)

4

A student investigated how the potential difference (p.d.) across a resistor varied with current.

Figure 1



- (a) Complete the circuit symbols for the meters the student used to measure the p.d. and current.

(1)

(b) Component **X** can be used to change the current in the circuit.

Which of the following would be most suitable to use as component **X**?

Tick **one** box.

Fuse

LDR

Thermistor

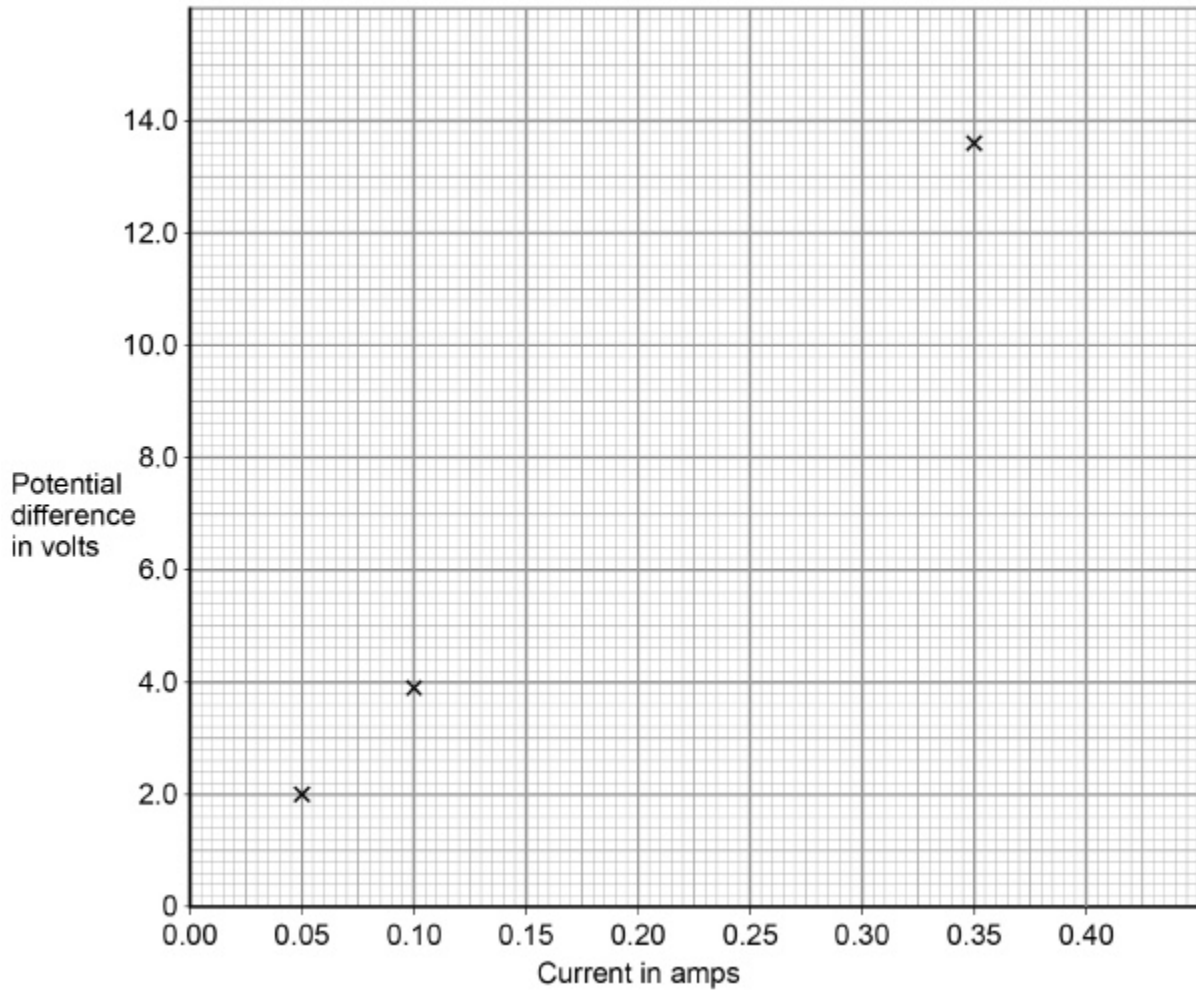
Variable resistor

(1)

The table shows the student's results.

Current in amps	Potential difference in volts
0.05	2.0
0.10	3.9
0.15	6.1
0.20	7.8
0.25	10.1
0.30	12.0
0.35	13.6

Figure 2



(c) Complete **Figure 2** using results from the table. Three of the points have been plotted for you.

(2)

(d) Draw a line of best fit.

(1)

(e) Determine the resistance of the resistor when the p.d. across it is 5.0 V.

Give the unit.

Use the Physics Equations Sheet.

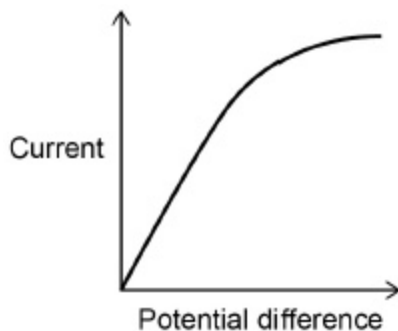
Resistance = _____ Unit _____

(4)

(f) The student replaced the resistor with a different component and repeated the investigation.

A sketch graph of the results is shown in Figure 3.

Figure 3

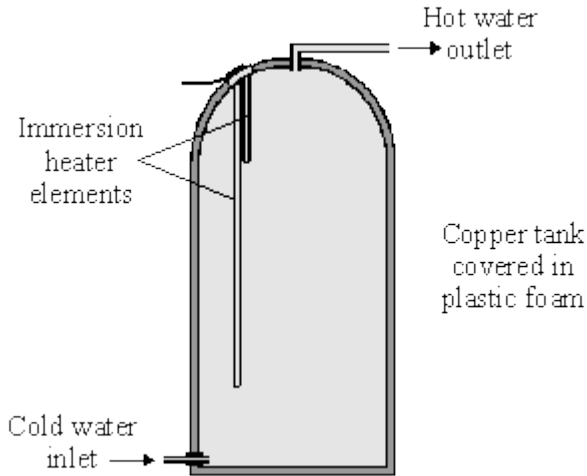


Explain why the current and p.d. for this component vary as shown in **Figure 3**.

(4)
(Total 13 marks)

5

The diagram shows a type of electric immersion heater in a hot water tank. These hot water tanks are normally found in airing cupboards.



Information on the immersion heater states:

230 V
10 A

- (a) (i) What is the equation which shows the relationship between power, current and voltage?

(1)

- (ii) Calculate the power of the heater. Show clearly how you get to your answer and give the units.

Power = _____

(2)

- (b) (i) What rating of fuse should be in the immersion heater circuit?

(1)

- (ii) There are three wires in the cable to the immersion heater. Two of the wires are connected to the immersion heater. The third wire is connected to the copper tank.

Explain the function of this third wire and the fuse in the circuit.

(3)

- (c) (i) What is the equation which shows the relationship between resistance, current and voltage?

(1)

- (ii) Calculate the resistance of the heater. Show clearly how you get to your answer and give the units.

Resistance = _____

(2)

(Total 10 marks)

Mark schemes

1

(a)



accept 'the humpback bridge' symbol
accept circle with cross but no lines
if more than one symbol drawn, no mark unless lamp is labelled

1

(b) (i) 24

allow 1 mark for correct substitution ie $\frac{2800}{120}$

allow 1 mark for an answer 1440
ignore any unit

2

(ii) watt

1

(c) larger than

accept correct indication inside the box
accept an answer meaning larger than ie greater than

1

[5]

2

(a) (i) 6

1

(ii) 6 (volts)

accept their (a) (i) ignore any units

1

(b) 0.30

accept 0.3

1

(c) smaller(than)

accept correct alternatives to smaller than e.g. less than

1

a bigger current flows through the lamp

only accept if 'smaller than' is given

accept converse

accept a correct calculation

accept resistance is half of 60

accept resistance = 30 (Ω)

*do **not** accept answers in terms of p.d*

1

[5]

3	(a) step-down (transformer)	1	
	(b) alternating current <i>accept minor misspellings but do not credit 'alternative current'</i>	1	
	(c) (i)(ii) magnet attracts upwards <i>correct order essential accept 'up'</i>	3	
			[5]
4	(a) correct symbol for ammeter in series and correct symbol for voltmeter in parallel	1	
	(b) Variable resistor	1	
	(c) all points plotted correctly <i>allow $\pm\frac{1}{2}$ a small square allow 1 mark for 3 correctly plotted points</i>	2	
	(d) straight line of best fit	1	
	(e) $5.0 = 0.125 \times R$	1	
	$R = 5.0 / 0.125$ <i>allow a correct rearrangement using an incorrect value of I</i>	1	
	40 <i>allow a correct calculation using an incorrect value of I</i>	1	
	Ω <i>an answer of 40 scores 3 marks</i>	1	

(f) initially the resistance is constant
allow current is directly proportional to potential difference

1

as current increases temperature (of filament) increases

1

amplitude of vibration of ions increases

allow frequency of collisions of electrons with ions increases

1

resistance increases

1

[13]

5

(a) (i) $P = V \times I$

or equivalent

*credit a triangle if part (ii) correctly uses the relationship
credit power = volts x amps **or** watts $V \times A$
do not accept C for current*

1

(ii) ($P = 230 \times 10 =$) 2300

credit 2.3

1

W **or** J/s

kW

1

(b) (i) 15 A

*credit 13 A **or** amps*

1

(ii) any **three** from

earth

any short (to the metal tank) causes fuse to blow

fuse is in the live wire

to prevent damage to the heater

credit to stop the current

3

(c) (i) $V = I \times R$

or equivalent

credit a triangle if part (ii) correctly uses the relationship

1

(ii) $(230 = 10 \times R \Rightarrow) 23$

ohms **or** Ω

2

[10]