

Surname	Initial(s)
Signature	

Paper Reference(s)

5009 5045

Edexcel GCSE

Science (5009)

Physics (5045)

P1a – Topics 9 and 10

Foundation and Higher Tier

Friday 21 November 2008 – Morning

Time: 20 minutes

Materials required for examination

Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers

Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

Foundation tier candidates: answer questions 1 – 24.

Higher tier candidates: answer questions 17 – 40.

All candidates are to answer questions 17 – 24.

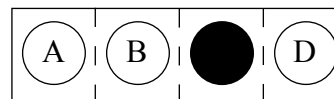
Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D
and mark it in HB pencil on the answer sheet.

For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

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Turn over

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**Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.**

Solar power

Some students read about solar power.

1. The energy going into a solar cell comes from
 - A the wind
 - B the Earth's core
 - C the Sun
 - D the sea

2. The current from a solar cell is
 - A static
 - B alternating
 - C direct
 - D neutral

3. Which of these have a different resistance in the dark and the light?
 - A light dependent resistors (LDR's)
 - B thermistors
 - C switches
 - D fixed resistors

The students find this picture of a solar powered car.



4. In the car, electrical energy from solar cells is stored
 - A in a generator
 - B in disposable batteries
 - C in a permanent magnet
 - D in rechargeable batteries

5. Solar powered cars are better for the environment than cars that use petrol.
This is because
- A solar powered cars cost more to buy
 - B solar powered cars do not cost anything to run
 - C solar powered cars are streamlined
 - D solar powered cars do not give out carbon dioxide
6. The solar powered car has an electric motor.
The motor turns because there is a force produced by
- A the current in the coil and the solar cells
 - B the current in the coil and a magnetic field
 - C the current in the coil and the voltage in the coil
 - D the current in the coil and a resistor

A wind-up radio

Use this information to answer questions 7 to 12.

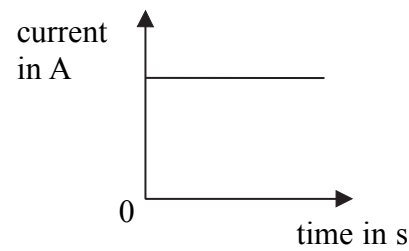
Asif bought a wind-up radio.



When the handle on the radio is turned, energy is stored in a spring.
As the spring unwinds it drives a generator.

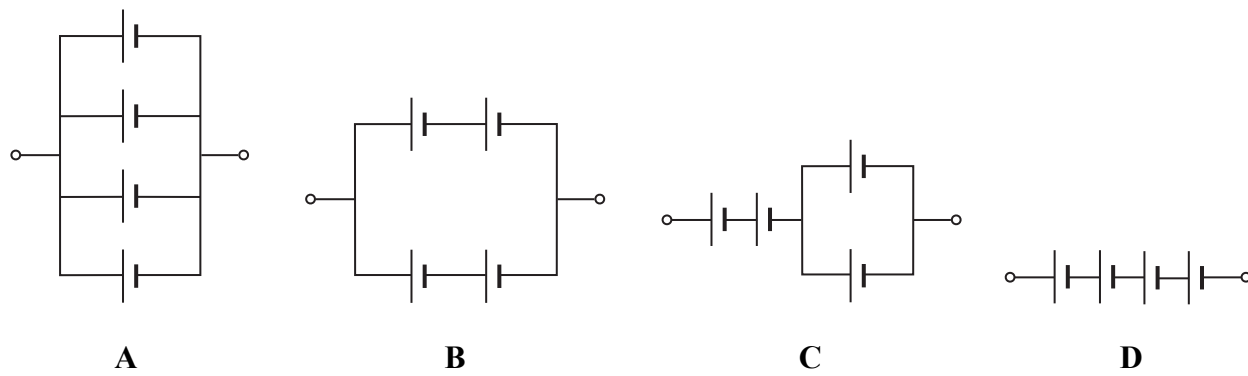
7. The generator produces an electric current when
- A a magnet rotates in a coil of wire
 - B a magnet rotates near an insulator
 - C a magnet rotates near a mains socket
 - D a magnet rotates in a vacuum
8. The useful energy change in the generator is
- A electrical energy → kinetic energy
 - B electrical energy → sound and thermal energy
 - C kinetic energy → sound and thermal energy
 - D kinetic energy → electrical energy

9. The graph shows the current in part of the radio.



The current is

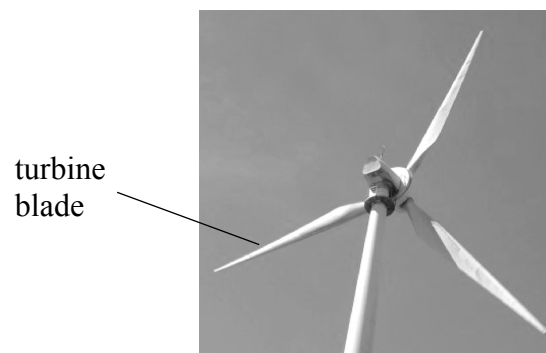
- A alternating
 - B direct
 - C stationary
 - D neutral
10. If Asif winds the radio for one minute, the spring stores enough energy for the radio to play for one hour.
Asif's radio also has a solar panel so it can use energy from the Sun.
He winds the radio for one minute.
Then he puts it in a sunny place and the radio plays for three hours.
This is because in sunlight
- A the spring stores more energy
 - B the spring needs to supply energy more slowly
 - C the radio uses much less energy
 - D the radio needs to use energy more quickly
11. Asif's old radio uses dry cells.
Each dry cell has an output voltage of 1.5 V.
Which of these shows how the cells should be connected to give an output voltage of 6 V?



12. Wind-up radios were invented for people in developing countries.
Which of these is **not** a reason why wind-up radios were invented?
- A Developing countries have little mains electricity.
 - B Many developing countries have natural resources.
 - C The energy for wind-up radios is free.
 - D Many people in developing countries cannot afford batteries.

Electricity for the home

Alan installs a wind powered generator to provide electrical energy for his home.



13. The electrical power output of the generator is the
- A energy per second transferred to electricity by the generator
 - B energy per second transferred to the turbine blades by the wind
 - C energy transferred to electricity by the generator
 - D energy transferred to the turbine blades by the wind
14. Modern societies rely on electricity because
- A producing electricity does not harm the environment
 - B it is a convenient energy resource in factory, home and office
 - C renewable energy sources are much better for the environment
 - D fossil fuels are natural resources
15. The earth wire in Alan's washing machine has become disconnected from the metal frame. Unfortunately, the live wire touches the metal frame. This situation is very dangerous because
- A anyone touching the metal frame could get an electric shock
 - B the fuse in the plug will 'blow' immediately
 - C the earth wire could heat up and start a fire
 - D the washing machine will spin too quickly
16. $\text{cost} = \text{power} \times \text{time} \times \text{cost per 1 kWh}$
- The cost of 1 kWh is 10p.
An oven has a power rating of 4 kW.
How much does it cost to use the oven for two hours?
- A 10p
 - B 20p
 - C 40p
 - D 80p

Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Energy efficiency

Jodie is looking at ways of making her house more energy efficient.
The table gives information about some ways of saving energy in a house.

saving energy with	cost of installation (£)	amount saved each year (£)
loft insulation	360	30
temperature controls fitted to radiators	240	30
energy-saving light bulbs	80	20
insulation round the hot water tank	50	20

17. Which method of saving energy is designed to prevent the house getting too warm?

- A** loft insulation
- B** temperature controls fitted to radiators
- C** energy-saving light bulbs
- D** insulation round the hot water tank

18. Which energy-saving method pays for itself in the shortest time?

- A** loft insulation
- B** temperature controls fitted to radiators
- C** energy-saving light bulbs
- D** insulation round the hot water tank

Electric current

Students Aimee, Barbara, Carole and Denise are investigating electric currents.

19. Each student tries to describe an electric current in a copper wire.

In a wire, an electric current is the rate of flow of copper atoms.

Aimee

In a wire, an electric current is the rate of flow of protons.

Barbara

In a wire, an electric current is the rate of flow of electrons.

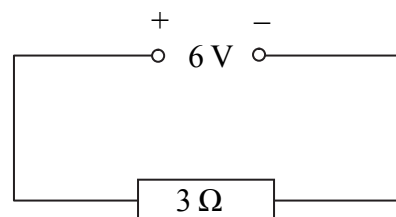
Carole

In a wire, an electric current is the rate of flow of copper ions.

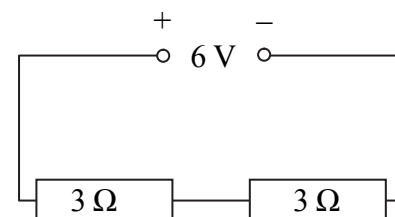
Denise

Who is correct?

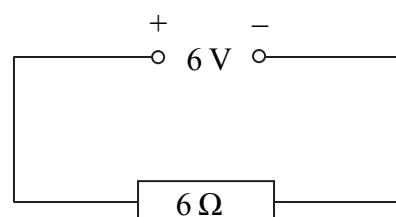
- A Aimee
 - B Barbara
 - C Carole
 - D Denise
20. The students investigate current in different circuits.
Which of these circuits has the largest current?



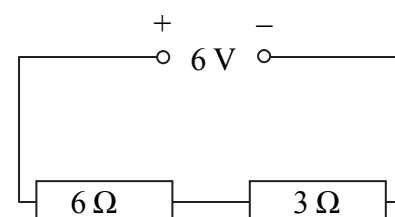
A



B



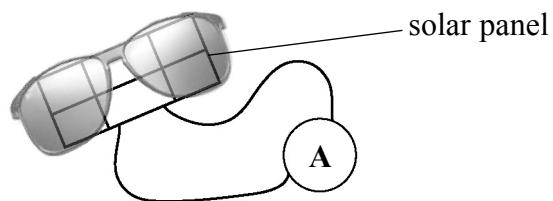
C



D

Sunglasses investigation

Alison, Bill, Cerys and Dave use a solar panel to investigate sunglasses with different coloured glass. They place the sunglasses over a solar panel and measure the current produced by the solar panel.



student	colour of glass
Alison	yellow
Bill	blue
Cerys	green
Dave	red

21. The four students discuss their investigation.

Using sunglasses with yellow glass will give the highest current reading.

Alison

We must make sure that the sunglasses cover all of the solar panel.

Bill

We should repeat each measurement twice.

Cerys

We can use our results to draw a graph.

Dave

Who has made a prediction?

- A Alison
- B Bill
- C Cerys
- D Dave

22. In this investigation the dependent variable is

- A the colour of the glass in the sunglasses
- B the brightness of the sunlight
- C the current produced by the solar panel
- D the area of the solar panel

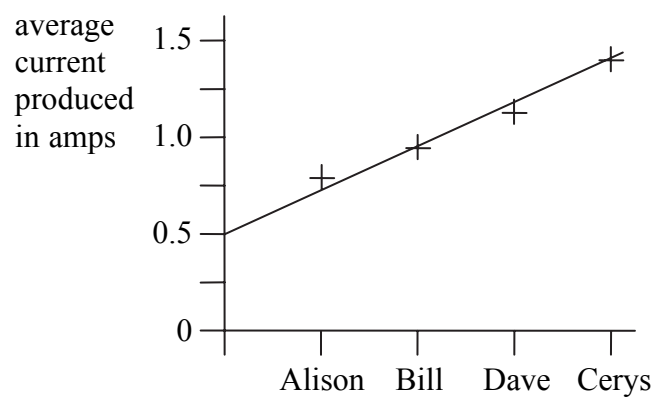
Use this information to answer questions 23 and 24.

Here are the students' results.

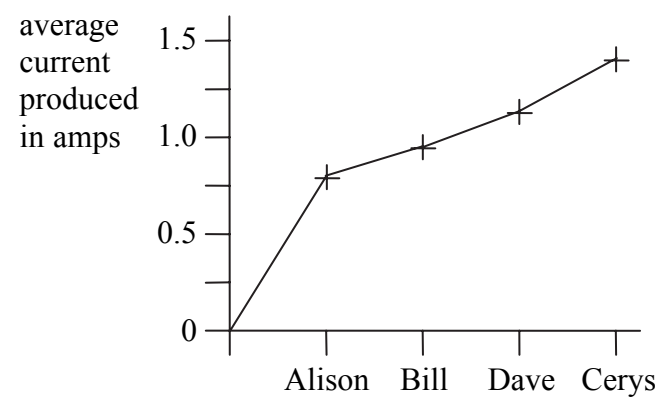
sunglasses	current produced (A)			
	1 st reading	2 nd reading	3 rd reading	average
Dave's	1.1	1.2	1.0	1.1
Alison's	0.8	0.7	0.9	0.8
Cerys'	1.2	1.5	1.6	1.4
Bill's	0.9	0.7	1.1	0.9

23. The results would be more useful to other students attempting to repeat the investigation if
- A the data were arranged in alphabetical order
 - B the data were arranged with the highest average value first
 - C the colours of the glass were in the "sunglasses" column
 - D only the average currents produced were given

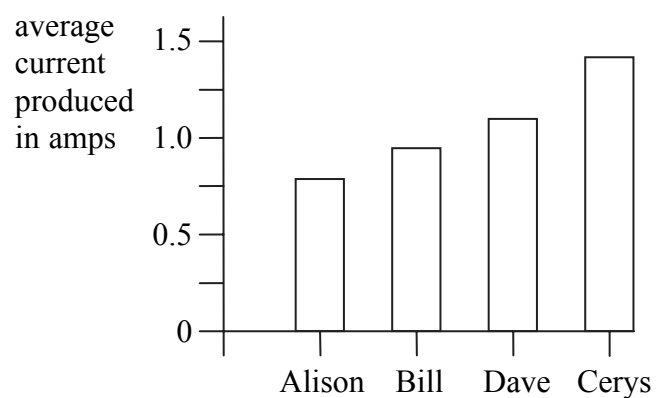
24. Which of these graphs is the best way of displaying the students' results?



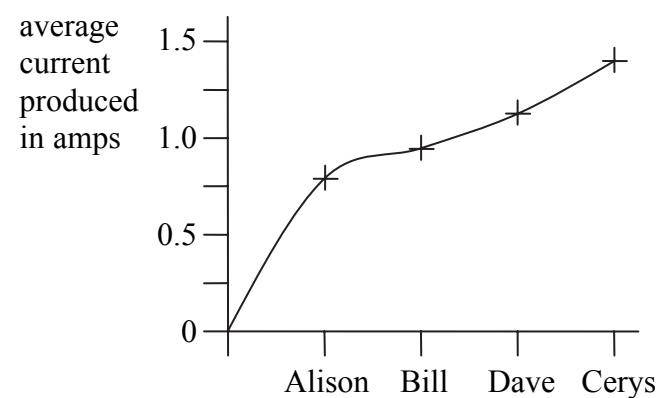
A



B



C



D

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

**Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.**

25. Bill concluded that Alison's sunglasses give the best protection against ultraviolet rays. His conclusion is not valid because
- A the experiment was not designed to test just ultraviolet rays
 - B the ammeter was not precise enough
 - C they did not repeat the measurements enough times
 - D they did not record the voltages

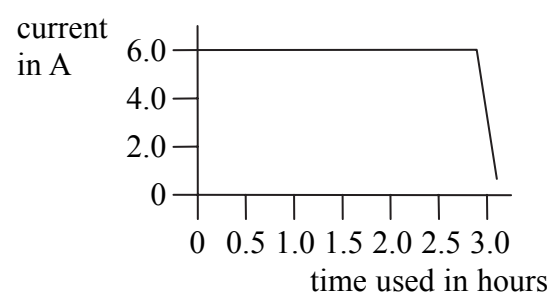
Battery powered toys

Use this information to answer questions 26 and 27.

Ben is given a battery powered train for his birthday.



26. This graph shows how the current changes while the battery is discharging.



The capacity of the battery, in ampere-hours, is about

- A 2
- B 3
- C 6
- D 18

27.

$$\text{power} = \text{current} \times \text{voltage}$$

The voltage across the train motor is 9 V.
The current in the motor is 6 A.
The power of the motor is

- A 0.67 W
- B 1.5 W
- C 15 W
- D 54 W

28.

$$\text{efficiency} = \frac{\text{useful output}}{\text{total input}} \times 100\%$$

In the motor 80 J of kinetic energy are produced for every 100 J of electrical energy supplied.
The efficiency of the motor is

- A 0.80%
- B 1.25%
- C 80%
- D 125%

Electricity and safety

Alison is researching household electricity.
She first finds out about residual current circuit breakers (RCCBs).

29. Which of these would cause an RCCB to switch off the circuit?

- A different currents in the live and neutral wires
- B a disconnected earth wire
- C different currents in the live and earth wire
- D a higher than normal current in the live and neutral wires

30. Which row of the table gives two advantages of an RCCB compared to a fuse?

	1 st advantage	2 nd advantage
A	an RCCB operates more quickly	an RCCB costs less to buy
B	an RCCB operates more quickly	an RCCB can be reset after the fault is corrected
C	with an RCCB, metal appliances do not need a neutral wire	an RCCB can be reset after the fault is corrected
D	with an RCCB, metal appliances do not need a neutral wire	an RCCB costs less to buy

Solar cells

Use this information to answer questions 31 and 32.

An African village does not have mains electricity.
The village uses a refrigerator to store essential supplies such as medicines.
The table shows some information for two methods of powering the refrigerator.

	set-up costs	running costs per year	maintenance
solar cells	£1200	zero	very little required
paraffin	£300	£200	regular services required

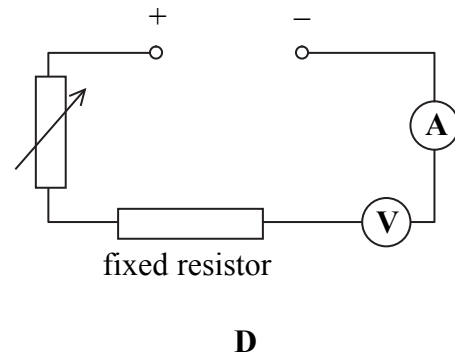
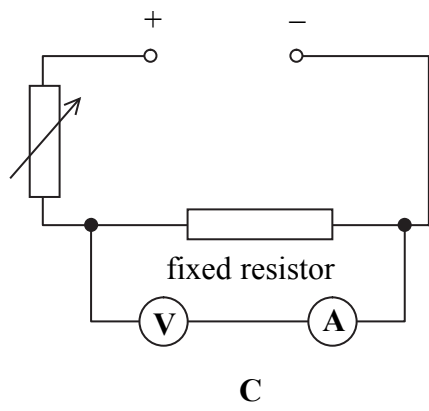
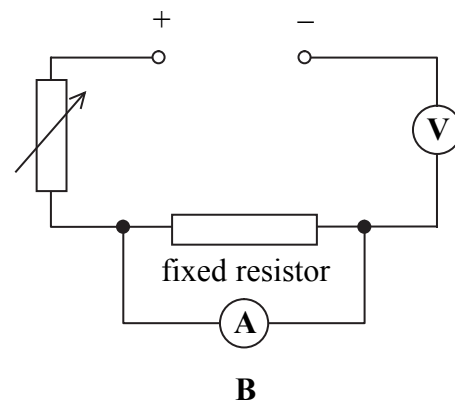
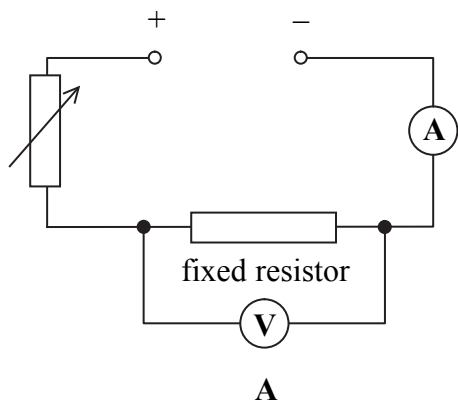
31. An advantage of using paraffin instead of solar cells is that
- A the set-up cost of using paraffin is lower
 - B the paraffin is a non-renewable energy source
 - C the paraffin burner must be serviced regularly
 - D the paraffin burner has a payback time of less than two years
32. Which of these would lead to a greater worldwide use of solar cells?
- A manufacturing solar cells with a lower output voltage
 - B manufacturing solar cells so that they have a lower efficiency
 - C reducing the cost of solar cells
 - D reducing the cost of fossil fuels

Electric circuit investigation

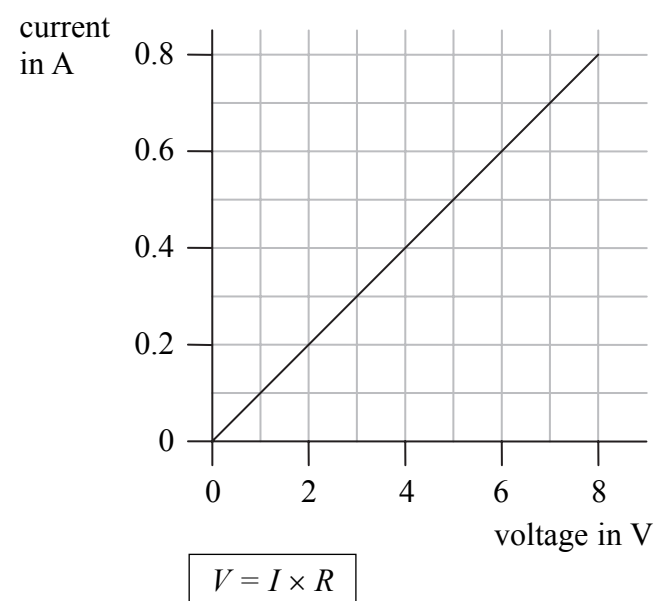
Use this information to answer questions 33 to 36.

Jane and Kim are investigating how the current in a fixed resistor varies with voltage.

33. Which circuit should they use?

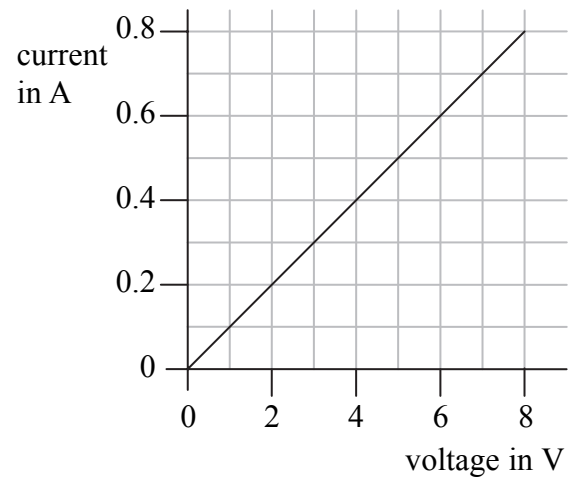


Jane and Kim plot a graph of their results.

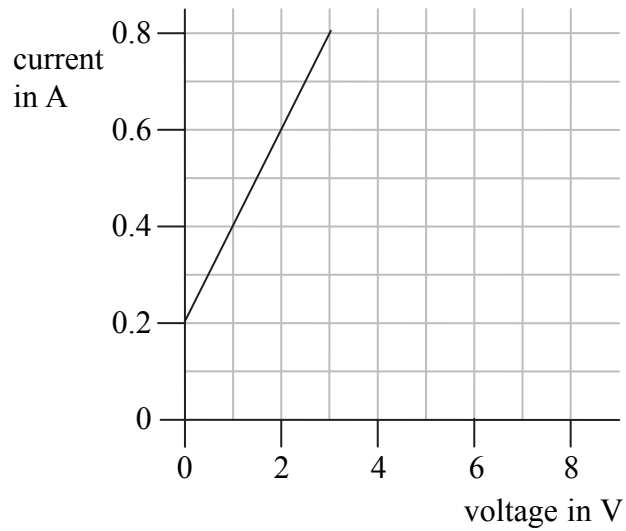


34. The resistance of the resistor used is
- A 0.1 Ω
 - B 6.4 Ω
 - C 8.0 Ω
 - D 10 Ω
35. Which of these is a correct conclusion from the graph?
- A resistance increases as current increases
 - B resistance is constant as current increases
 - C resistance decreases as current increases
 - D resistance varies as current increases

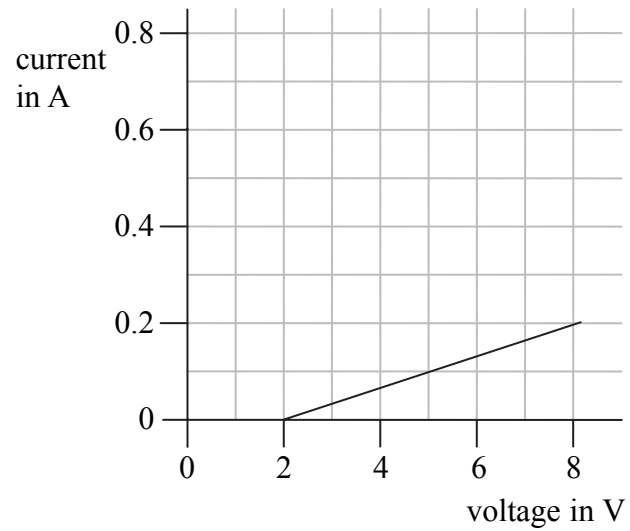
36. Jane and Kim repeat their investigation. The new resistor has a higher resistance. Here is their first graph again.



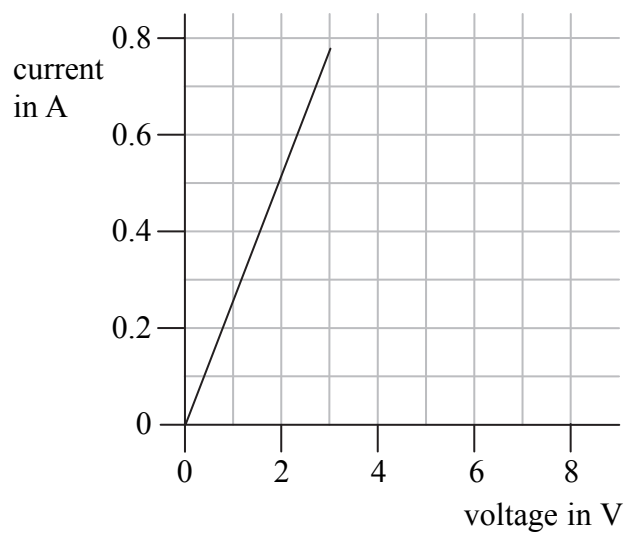
Which of these could be their new graph?



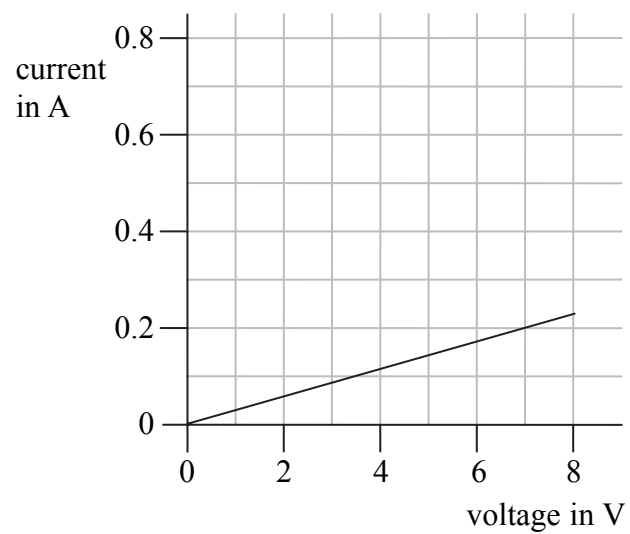
A



B



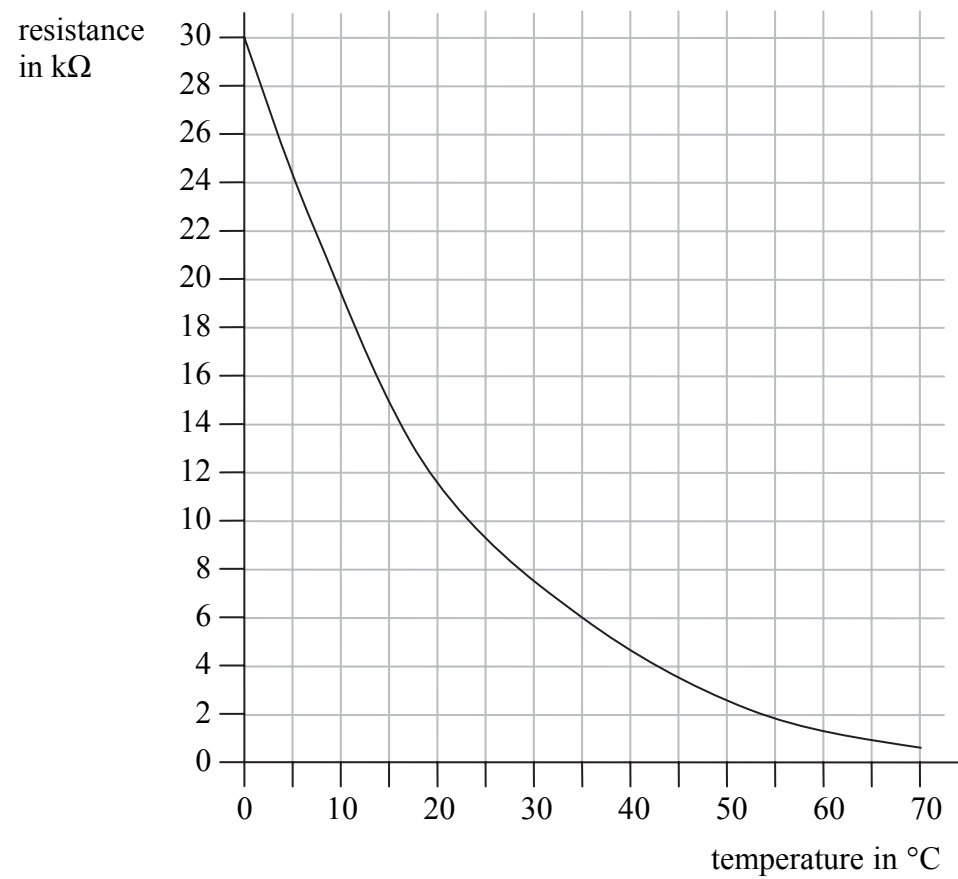
C



D

Investigating thermistors

Rachel and Zoë are investigating a thermistor.
They produce this graph for a thermistor.

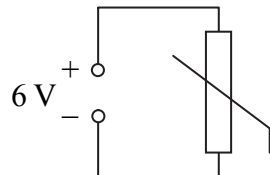


37. To make the resistance of the thermistor decrease from 15 kΩ to 6 kΩ the temperature must
- A increase by 35°C
 - B decrease by 20°C
 - C decrease by 35°C
 - D increase by 20°C
38. Rachel measures the resistance of the thermistor at different temperatures. She takes each measurement 3 times. What should Rachel do with each set of 3 measurements?
- A choose the best one and ignore the others
 - B ignore any anomalous results and average the others
 - C choose the middle measurement and average it
 - D include any anomalous results and average all the results

39.

$$V = I \times R$$

The thermistor is used as part of a switch controlling a heater.



When the current in the thermistor is 0.5 mA the heater switches off.
The temperature of the thermistor when the heater is switched off is about

- A 2°C
- B 12°C
- C 19°C
- D 58°C

40. Rachel and Zoë are discussing the use of ICT and dataloggers to collect and display data for their thermistor investigation.

Using a datalogger and ICT will produce measurements without any errors.

Rachel

Using a datalogger and ICT we can display our results more quickly.

Zoë

Who is correct?

- A Rachel only
- B Zoë only
- C both Rachel and Zoë
- D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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