

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 4 March 2011 – Morning

Time: 20 minutes

Materials required for examination

Multiple Choice Answer Sheet
HB pencil, eraser, protractor 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.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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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.**

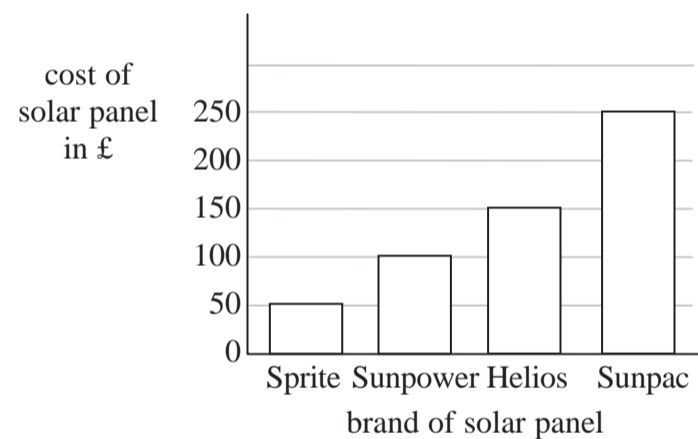
Renewable energy

1. One renewable energy source is
 - A hydroelectricity
 - B natural gas
 - C coal
 - D oil

2. In a wind turbine, the energy source used to generate electricity is
 - A gravitational potential energy of the wind
 - B kinetic energy of the wind
 - C thermal energy of the wind
 - D chemical energy of the wind

Use this information to answer questions 3 and 4.

The bar chart shows the cost of four brands of solar panel.



3. What is the cost of a Sunpower solar panel?
 - A £50
 - B £100
 - C £150
 - D £250

4. Compared to a Sprite solar panel, a Sunpac solar panel will cost
 - A 5 times as much
 - B 50 times as much
 - C 200 times as much
 - D 250 times as much

5. This lamp is designed to switch on automatically when it gets dark.



The device used to sense the change in light level is a

- A light dependent resistor
- B filament lamp
- C fixed resistor
- D thermistor

Use this information to answer questions 6 and 7.

	type of power station			
	hydroelectric	nuclear	gas-fired	coal-fired
start-up time	10 minutes	1 week	2 hours	3 days
gases released into the atmosphere	water vapour	water vapour	water vapour and carbon dioxide	water vapour, carbon dioxide and sulphur dioxide

6. Which type of power station has the shortest start-up time?
- A hydroelectric
 - B nuclear
 - C gas-fired
 - D coal-fired
7. Which type of power station releases gases that are damaging to the environment?
- A all of them
 - B hydroelectric and nuclear only
 - C gas-fired and coal-fired only
 - D coal-fired only

Batteries

Use this information to answer questions 8, 9 and 10.

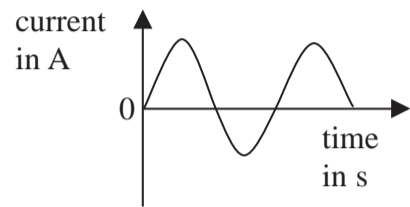
The table gives information about different types of 1.5 V batteries.

	type of battery			
	leclanche	zinc-chloride	zinc-air	lithium
operating temperature range	-5 °C to +55 °C	-18 °C to +55 °C	-10 °C to +55 °C	-40 °C to +60 °C
fall in capacity each year	7%	6%	5%	0.6%
capacity per unit volume (watt hour/cm ³)	0.15	0.18	1.0	0.5
cost to buy	low	medium	high	high

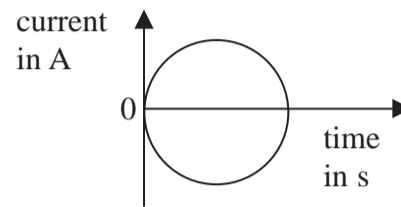
8. Which type of battery can operate at -30°C?
- A leclanche
 B zinc-chloride
 C zinc-air
 D lithium
9. The shelf-life of a battery is how many years it takes before its capacity falls by 20%. Which type of battery has the shortest shelf-life?
- A leclanche
 B zinc-chloride
 C zinc-air
 D lithium
10. Which row of the table best describes the **zinc-air** type of battery?

	capacity per unit volume	cost to buy
A	lowest	high
B	highest	high
C	highest	low
D	lowest	low

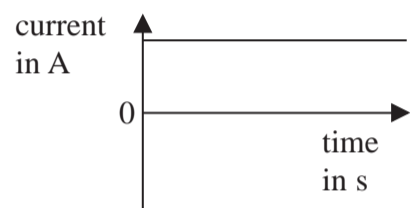
11. A battery is used to light a lamp.
Which of these shows the current from the battery?



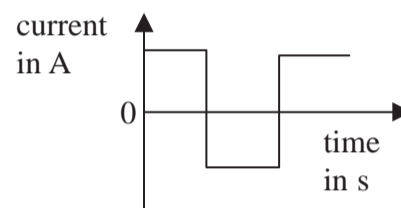
A



B



C



D

12. A battery is labelled “capacity = 2 amp-hours”.
This means that the battery should be able to supply

- A** a voltage of 2 V for 2 hours
- B** a voltage of 1 V for 2 hours
- C** a current of 2 A for 2 hours
- D** a current of 1 A for 2 hours

Generating electricity

13. The photograph shows a dynamo on a bicycle.



The dynamo generates a current when

- A a magnet rotates near a coil of wire
 - B a magnet rotates near another magnet
 - C a coil of wire rotates near an insulator
 - D an insulator rotates near a coil of wire
14. Some students plan to investigate the current generated by the dynamo.

I think we should repeat each reading three times.

Andy

I think we should use a digital ammeter.

Bev

Another group found the highest current was 1.5 A.

Carla

I think the current will double when we turn the dynamo twice as fast.

Dan

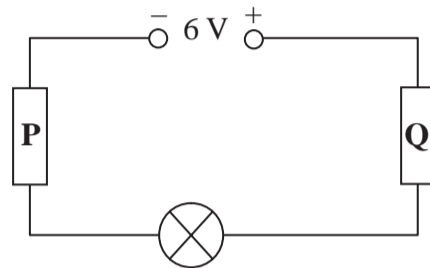
Who has made a prediction?

- A Andy
- B Bev
- C Carla
- D Dan

Electric current

Use this information to answer questions 15 and 16.

The diagram shows an electric circuit.



15. Which row of the table is correct for the current in each resistor?

	direction of current in P	direction of current in Q
A	↓	↑
B	↓	↓
C	↑	↑
D	↑	↓

- 16.

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

The voltage across the lamp is 1.5 V.

The current in the lamp is 0.3 A.

The power supplied to the lamp is

- A 0.45 W
- B 0.50 W
- C 4.5 W
- D 5.0 W

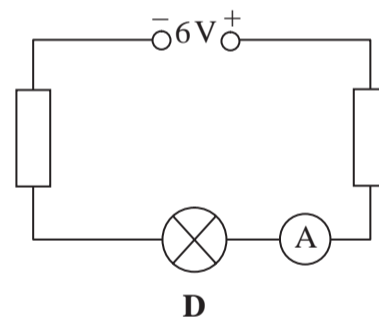
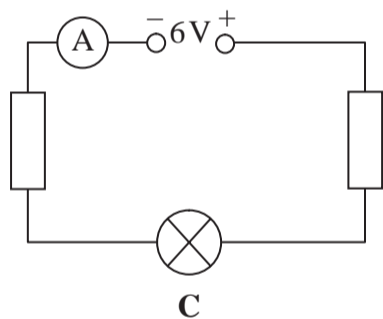
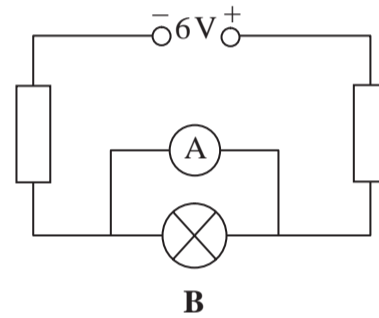
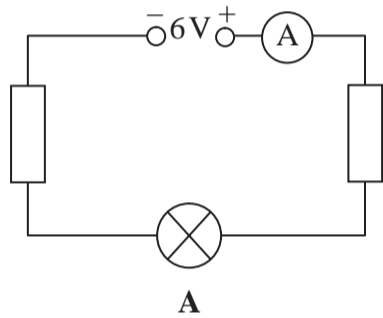
Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Current electricity

17. An electric current in a wire is a flow of

- A metal ions
- B metal atoms
- C negative protons
- D negative electrons

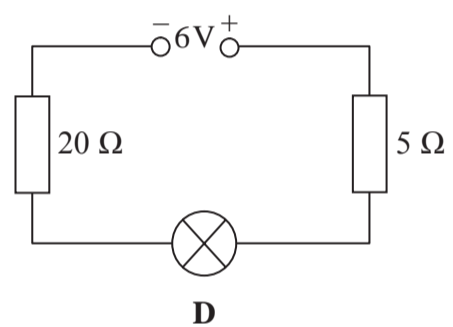
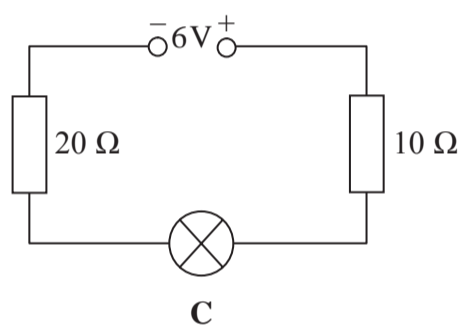
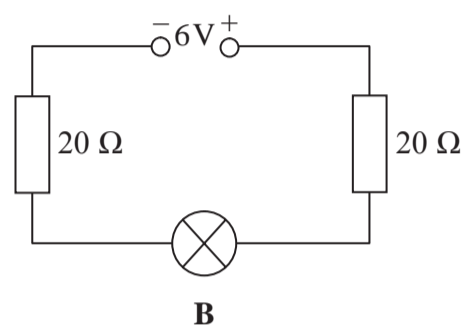
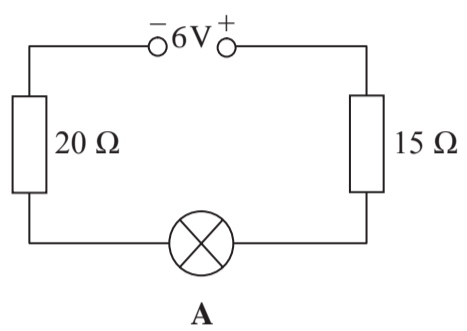
18. In which of these circuits would the ammeter **not** show the current in the lamp?



19.

$$V = I \times R$$

The lamps in the circuits below are identical.
Which of these circuits would give the biggest current?

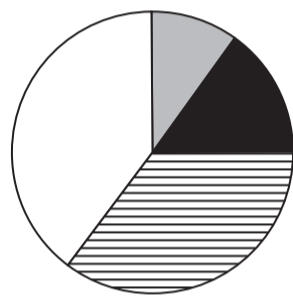


Saving energy

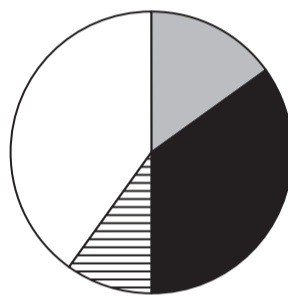
20. This table shows the percentage of energy lost through different parts of a house.

energy lost through	percentage of total loss (%)
ceilings	10
floors	15
open doors and gaps	30
walls and windows	45

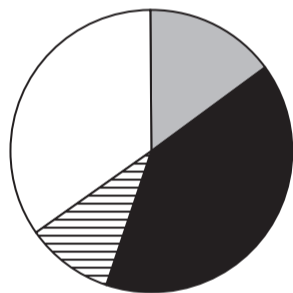
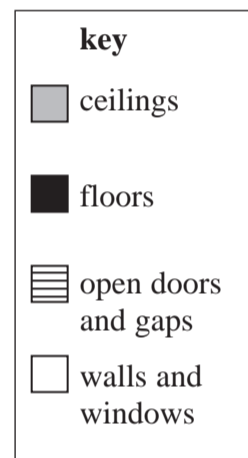
Which of these pie charts correctly shows this information?



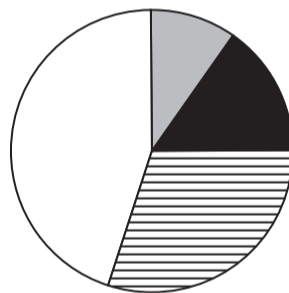
A



B



C



D

21. The table shows information about four energy-saving methods for a house.

energy-saving method	cost (£)	amount saved each year (£)
cavity wall insulation	350	100
loft insulation	200	45
hot water tank jacket	18	35
draught proofing	100	25

Which energy-saving method has the shortest payback time?

- A cavity wall insulation
- B loft insulation
- C hot water tank jacket
- D draught proofing

Household electricity

22. In a washing machine, the earth wire connects

- A the metal case to earth
- B the live wire to earth
- C the live wire to the neutral wire
- D the neutral wire to the fuse

23. This information was printed in a newspaper:

“An energy-saving lamp uses up to 80% less electrical energy than a filament lamp, but produces the same amount of light.”

This statement tells you that compared to the filament lamp, an energy-saving lamp is

- A more powerful
- B brighter
- C more efficient
- D more expensive

24. Which of these correctly describes the sequence of events in a fuse when a fault occurs in an appliance?

- | | | | | | |
|----------|--|---|--|---|--|
| A | a large current flows in the live wire | → | the fuse in the neutral wire heats up | → | the fuse melts and causes a short circuit |
| B | a large current flows in the live wire | → | the fuse in the live wire heats up | → | the fuse melts and causes a short circuit |
| C | a large current flows in the live wire | → | the fuse in the live wire heats up | → | the fuse wire melts and breaks the circuit |
| D | the fuse in the live wire melts | → | a large current flows in the live wire | → | the fuse wire melts and breaks the circuit |

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

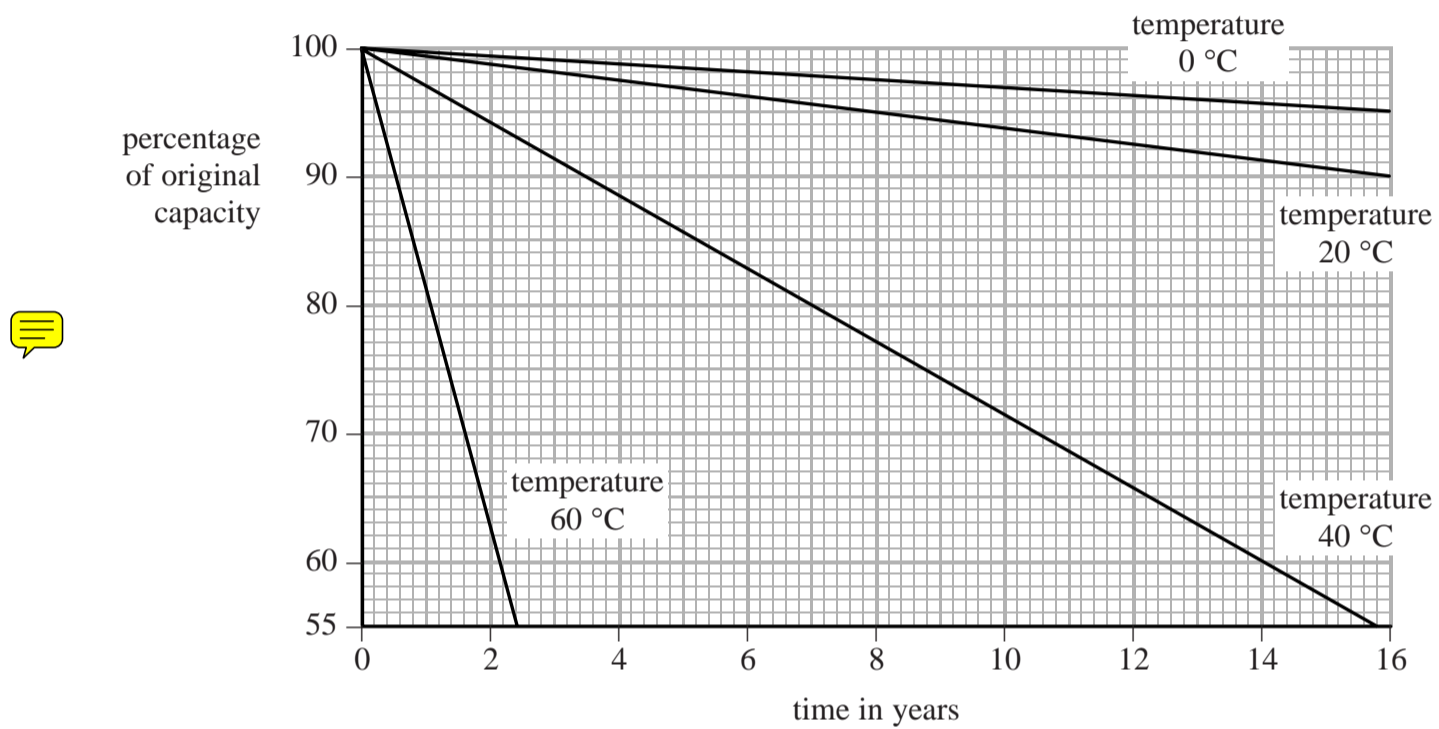
Foundation tier candidates do not answer any more questions after question 24.

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

Batteries

Use this information to answer questions 25 and 26.

The chart shows how storage temperature affects the capacity of a lithium battery over time.



25. A lithium battery is stored at 20 °C.
About how many years does it take for the battery to lose 5% of its capacity?

- A 98
- B 16
- C 8
- D 2

26. The shelf-life of a battery is how long it can be stored before its capacity falls to 80% of its original value.
Some students discuss the data.

A storage temperature of 40 °C gives the longest shelf-life.

Alan

60 °C is the best temperature to store the lithium batteries.

Bill

Increasing the storage temperature increases the shelf-life of lithium batteries.

Cara

The shelf-life for a lithium battery stored at 40 °C is about 7 years.

Dave

Who has made a correct statement?

- A** Alan
B Bill
C Cara
D Dave
27. People are encouraged to return used batteries for recycling.
This is because batteries
- A** need their electrons recharging
B cause a build-up of electric charge in landfill sites
C can release toxic chemicals into the environment
D always have some voltage even after much use
28. A farmer uses wind turbines and solar cells to generate electricity.
The electrical energy produced is stored in batteries.
The batteries are needed **because** wind turbines and solar cells
- A** use renewable energy sources
B are inefficient energy suppliers
C are expensive methods of generating electricity
D do not produce a continuous supply of electricity

Electricity in the home

29.

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

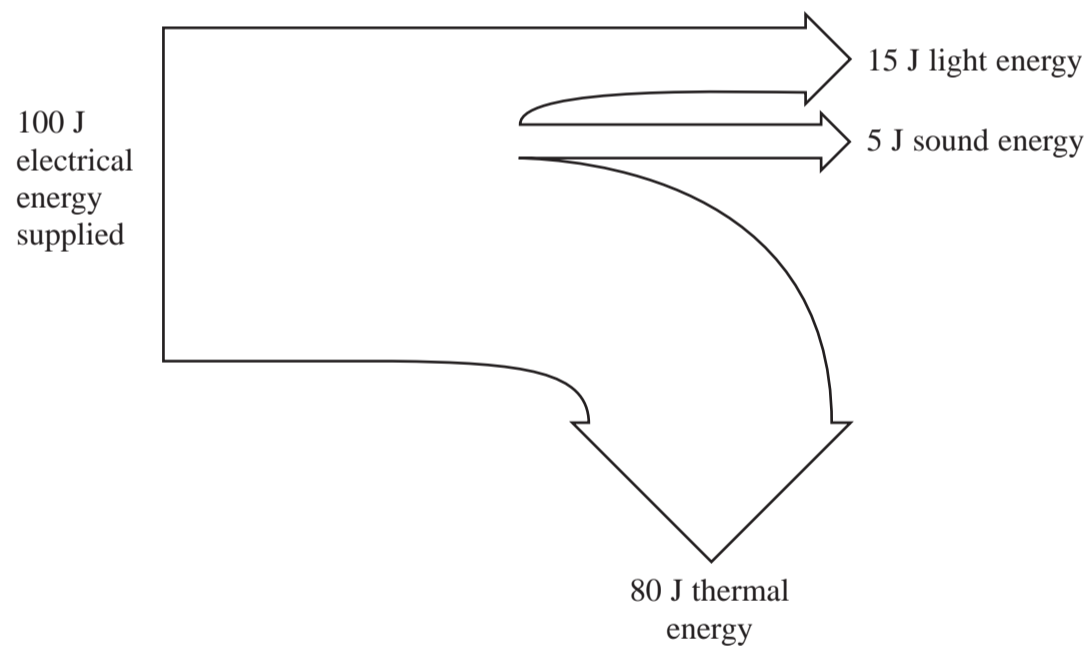
An electric shower has a power rating of 6.9 kW.
The voltage of the mains supply is 230 V.
The current in the shower is about

- A 0.03 A
- B 30 A
- C 33 A
- D 1600 A

30.

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

The diagram shows what happens to the energy supplied to a television.



The efficiency of the television is

- A 95%
- B 80%
- C 20%
- D 15%

31. This hair drier is designed to have no earth wire.



Which row of the table is correct for the fuse fitted to this hair drier?

	the fuse is fitted in	the fuse prevents
A	the live wire	shock to the user
B	the neutral wire	shock to the user
C	the neutral wire	damage to the appliance
D	the live wire	damage to the appliance

32. A residual current circuit breaker (RCCB) is designed to
- A** disconnect the supply very quickly
 - B** melt a fuse very quickly
 - C** give a small electric shock
 - D** be replaced after use
33. A residual current circuit breaker should act when there is a difference between the currents
- A** in the live and earth wires
 - B** in the live and neutral wires
 - C** in the fuse and earth wires
 - D** in the fuse and live wires

34.

$$\text{cost} = \text{power} \times \text{time} \times \text{cost of 1 kWh}$$

An electric oven has a power of 5 kW.

1 kWh of electrical energy costs 12p.

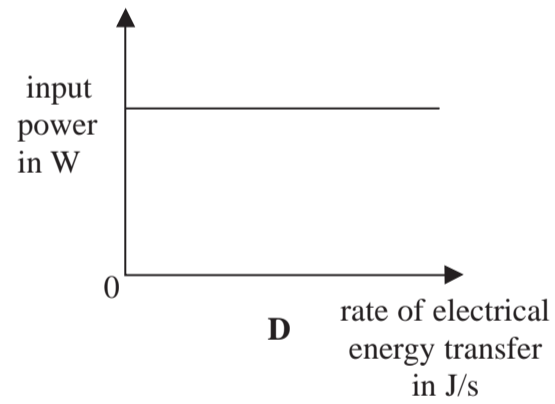
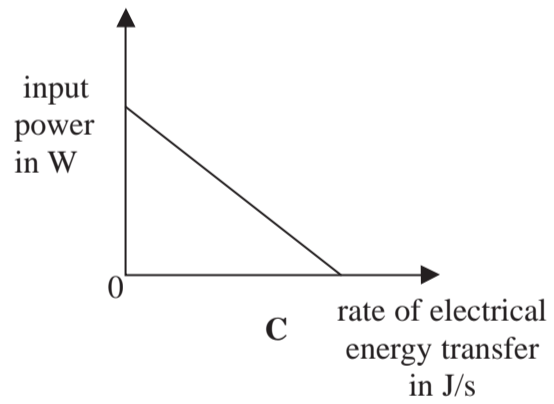
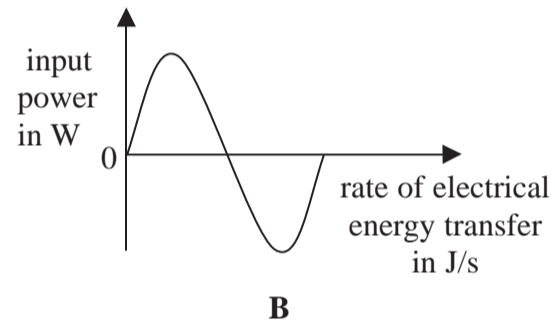
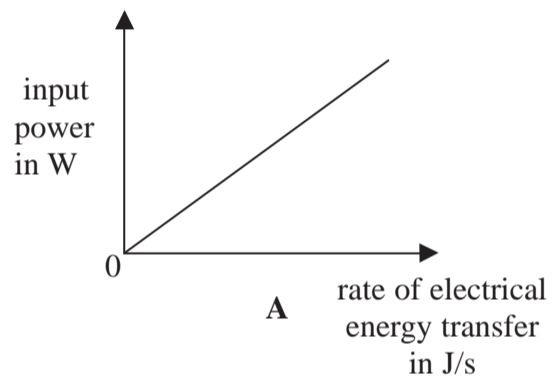
How long will it take the oven to use £3 worth of electrical energy?

- A 0.05 hours
- B 5 hours
- C 20 hours
- D 25 hours

35.

The input power of an electrical appliance is related to the rate of electrical energy transfer in the appliance.

Which of these shows the relationship?



Resistance investigations

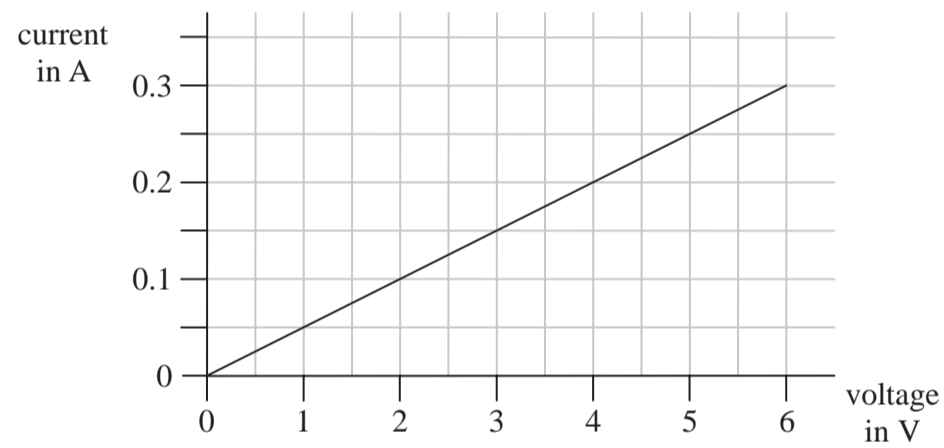
36. Some students investigate how the current in a resistor varies with voltage. Which row of the table is correct for their investigation?

	an ammeter is connected	a voltmeter is connected
A	in series with the resistor	in series with the resistor
B	in series with the resistor	in parallel with the resistor
C	in parallel with the resistor	in series with the resistor
D	in parallel with the resistor	in parallel with the resistor

- 37.

$$V = I \times R$$

The students plot a graph of their results.

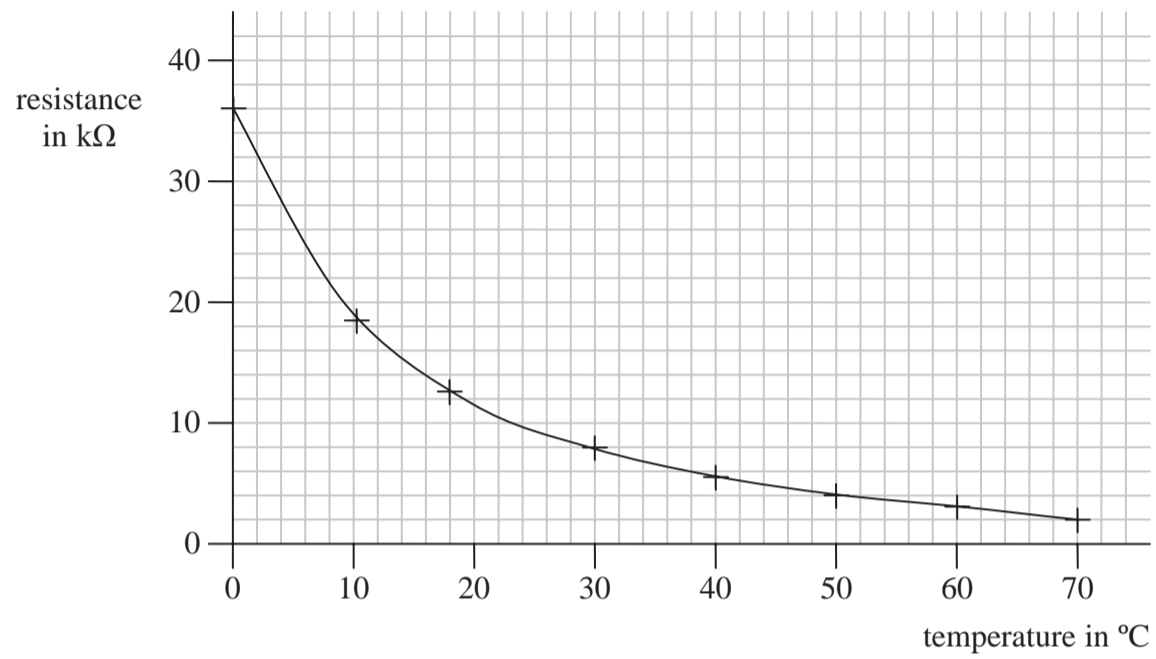


The value of the resistor used is

- A** 0.05 Ω
- B** 1.8 Ω
- C** 2.0 Ω
- D** 20 Ω

Use this information to answer questions 38 and 39.

The students investigate how the resistance of a thermistor varies with temperature. They produce this graph.



38. When the students warm the thermistor from 0 °C to 23 °C, its resistance

- A increases by about 10 kΩ
- B decreases by about 10 kΩ
- C decreases by about 26 kΩ
- D decreases by about 36 kΩ

39.

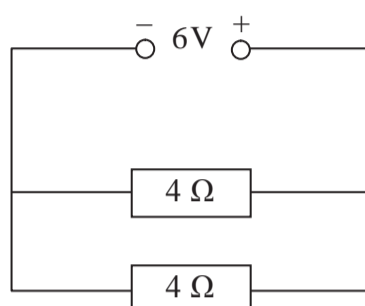
$$V = I \times R$$

In one part of the investigation, the current in the thermistor was 0.40 mA and the voltage across it was 8 V.

The temperature of the thermistor was about

- A 9 °C
- B 54 °C
- C 60 °C
- D 70 °C

40. Two students discuss making changes to this circuit.
They are told to ignore any resistance the power supply may have.



If we add another $4\ \Omega$ resistor in parallel with the first two, the voltage across each resistor will decrease to 2 V.

Dave

If we add another $4\ \Omega$ resistor in parallel with the first two, the current from the power supply will decrease.

Pat

Who is correct?

- A Dave only
- B Pat only
- C both Dave and Pat
- D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END