EDEXCEL GCSE SCIENCE (360SCIENCE)

SCIENCE



EXAM QUESTION PACK

UNIT P1a MULTIPLE CHOICE 5009 PAPERS

STEMUP

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Surname	Initial(s)
Signature	

Paper Reference(s)

5009 5045

Edexcel GCSE

Science (5009)

Physics (5045)

P1a – Topics 9 and 10

Foundation and Higher Tier

Tuesday 15 November 2011 – 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.

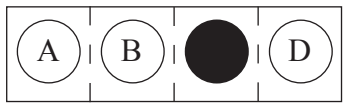
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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.

General electricity

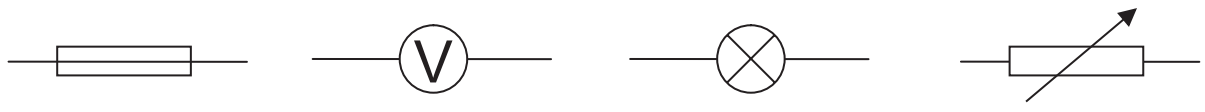
1. A solar cell uses energy from

A the Sun
B the tides
C chemical reactions
D geothermal energy

2. Before electricity was discovered, people could **not**

A boil water
B use a telephone
C light their home
D keep warm in winter

3. Which of these is the symbol for a variable resistor?



A **B** **C** **D**

4. Which of these does **not** use a battery?

A a digital camera
B a portable computer
C a bicycle dynamo
D a mobile phone

5. Which of these is a result of increasing the processing speed of computers?

A increasing use of mobile phones
B decreasing use of filament lamps
C increasing cost of fossil fuels
D decreasing cost of solar energy

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Solar cells and wind turbines

6. In a wind turbine, the generator produces electricity because

A a battery spins a coil of wire
B a battery spins in the wind
C a magnet spins next to a battery
D a magnet spins inside a coil of wire

7. Some people prefer solar cells to wind turbines because

A wind turbines have fewer moving parts
B solar panels provide cheaper electricity at night
C wind turbines make more noise
D solar panels glow in the dark

8. Which of these statements is correct for wind turbines?

A wind turbines use renewable energy
B wind turbines have no effect on the environment
C the wind will soon provide all our energy needs
D the fuel for wind turbines is expensive

9. A benefit of using solar cells is that

A solar cells have a low power output
B solar cells are expensive to install
C solar cells give a continuous supply of electricity
D solar cells produce no atmospheric pollution

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Ohm's law

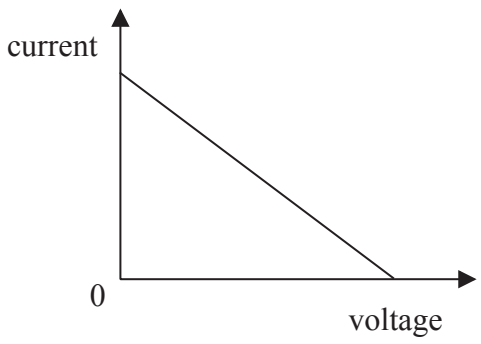
10. In the equation

$V = I \times R$

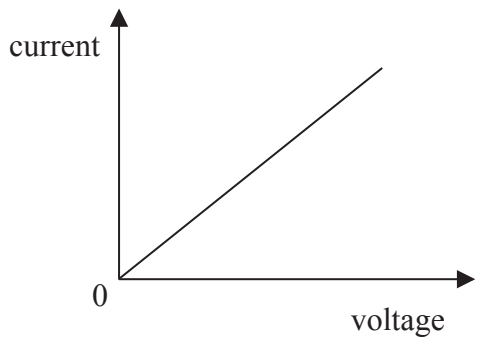
I is the

A power
B energy
C voltage
D current

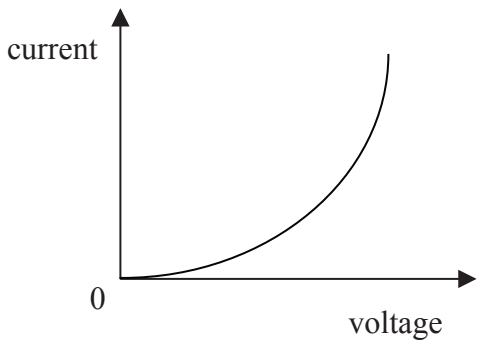
11. Which graph shows how current varies with voltage for a fixed value resistor?



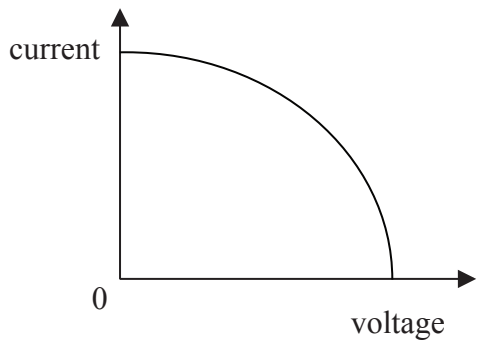
A



B



C



D

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David's hair dryer

David's hair dryer contains a heater and a motor.



12. The plug of the hair dryer contains a fuse.
The fuse

A protects the wires and the motor
B neutralises the live wire
C conducts electricity to earth
D is connected to the earth wire

13. The motor in the hair dryer works because of a force between a current-carrying wire and

A a high power generator
B a hot filament
C a magnetic field
D a thermistor

14. The efficiency of the motor will increase if

A more energy is wasted
B energy losses are reduced
C a larger fuse is used
D a smaller fuse is used

15.

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

The hair dryer is connected to the 230 V mains supply.
David switches the motor and heater on to full power of 2000 W.

The current in the fuse is about

A 0.12 A
B 0.12 V
C 8.7 A
D 8.7 V

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16.

cost = power × time × cost of 1 kWh

The cost of electricity is 16p per kWh.
How much does it cost to use the hair dryer at 2000 W for 2 hours?

A 16p
B 64p
C 16 000p
D 64 000p

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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.

Modelling batteries

Use this information to answer questions 17 to 19.

Batteries can be compared to jugs of water.
In this model, a jug full of water is like a fully-charged battery.
Emptying the jug is like discharging the battery.

17. The capacity of a jug is measured in millilitres.
The capacity of a battery is measured in

A volts
B joules
C amp-hours
D kilowatt-hours

18. John thinks about charging and discharging.
He fills and empties the jug several times.
He pours the water out of the jug at different rates.

The rate at which water leaves the jug is like

A battery power
B electrical energy
C battery voltage
D electric current

19. In the model, particles of water move.
When a real battery discharges through a wire, the moving particles are

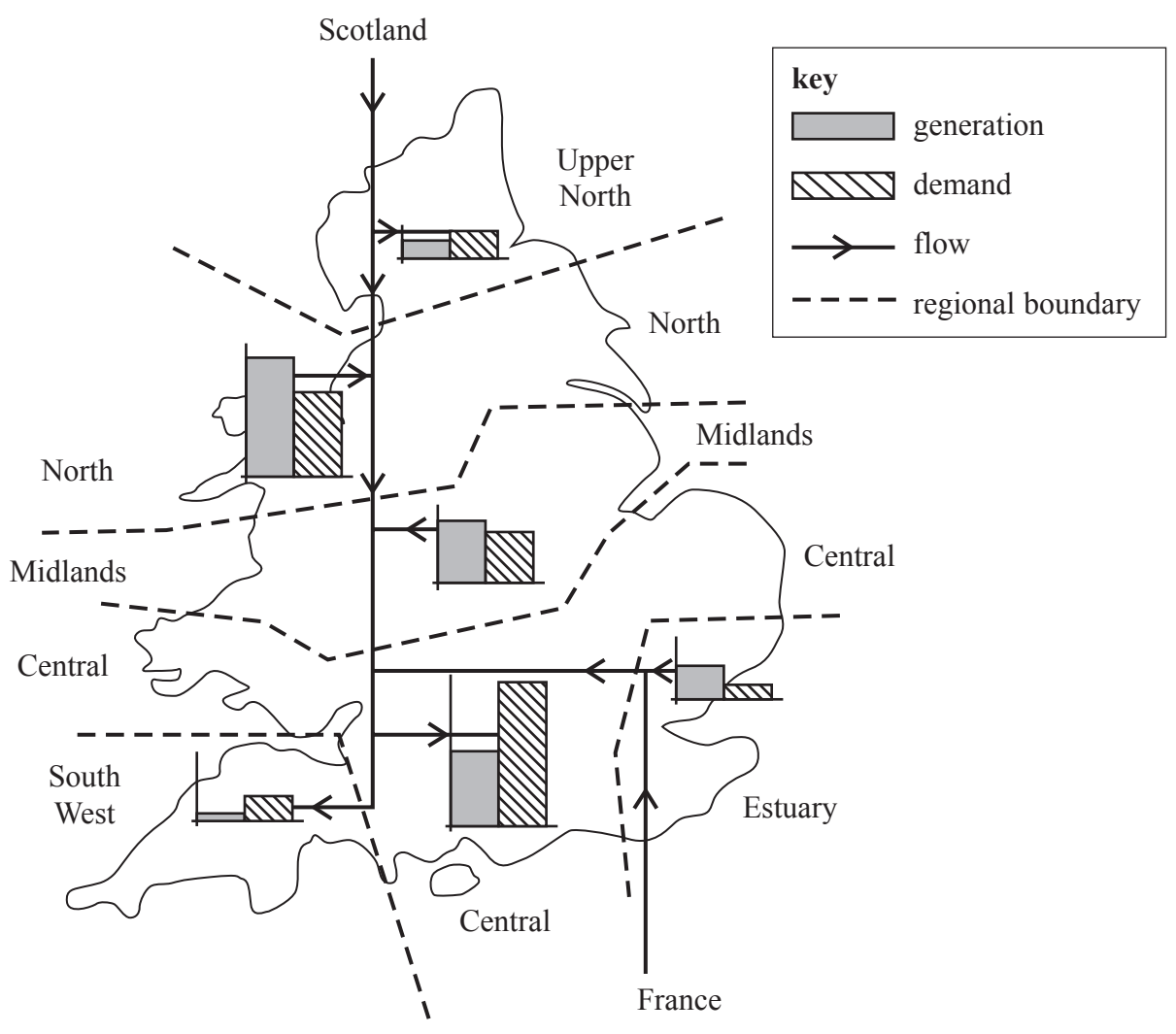
A negative neutrons
B negative electrons
C positive neutrons
D positive electrons

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The National Grid

Use this information to answer questions 20 and 21.

The map shows the amount of electricity generated and the level of demand.
The height of each bar shows these, to the same scale, for each region in England and Wales.
The flow of electricity around the country in the National Grid is shown by the arrows.



When the amount of electricity generated in a region is larger than the demand in that region, electricity flows to other parts of the country.

20. Which of these regions generates most electricity?

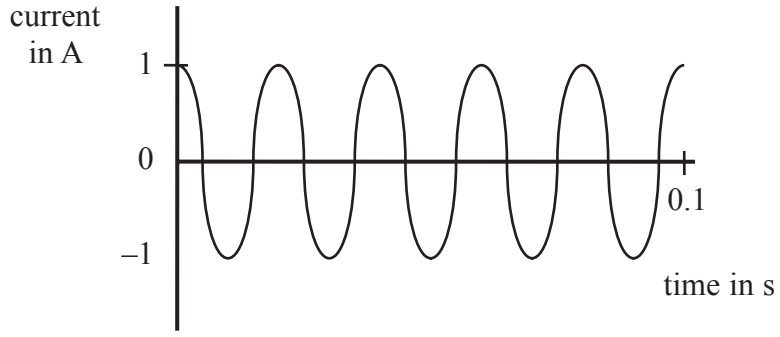
A Central
B Estuary
C Midlands
D North

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21. In which of these regions is the demand greater than the amount generated?

A Central
B Estuary
C Midlands
D North

22. This graph shows a current taken from the National Grid.



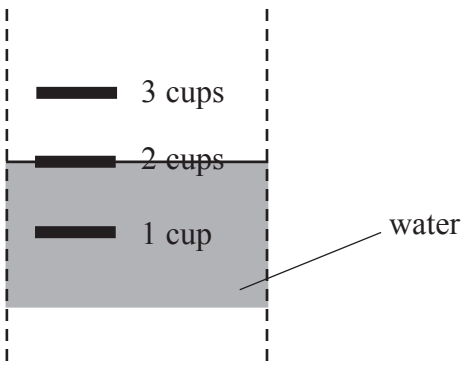
The current is called alternating current because

A it starts at 1 A
B its smallest value is 0 A
C the current is sometimes positive and sometimes negative
D there are five maximum values of current in the time of 0.1 s

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Investigating the efficiency of a kettle

John investigates the temperature rise of different amounts of water in a kettle.
The kettle has regular markings on the side like this



23. Which of these could make John's investigation unreliable?

A the markings on the kettle are thick lines
B the water volume is measured in 'cups' not litres
C electric kettles are not scientific apparatus
D the sides of the kettle are vertical

24. Next, John compares two kettles by heating water for the same length of time.
The table shows some tests John could try.

test	power of kettle (kW)	number of cups of water
P	2	4
Q	3	5
R	3	4
S	2	5

Ignoring heat loss, which two tests listed below allow John to predict correctly the effect of using different numbers of cups of water?

A P and S
B P and Q
C R and S
D P and R

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

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

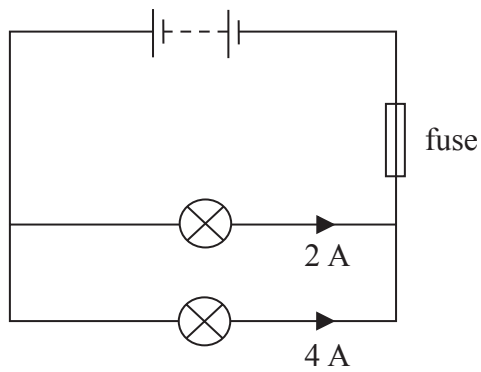
Electrical safety

25. Which row of the table is correct for a fuse and a residual current circuit breaker (RCCB)?

	a fuse on its own protects	**a RCCB on its own protects**
A	the wiring and appliance	the user
B	the user	the user
C	the wiring and appliance	the wiring and appliance
D	the user	the wiring and appliance

Use this information to answer questions 26 and 27.

The diagram shows the circuit for lighting two lamps.
The circuit contains a fuse.



26. Which of these would be the best value for the fuse?

A 1 A
B 3 A
C 5 A
D 8 A

27.

power = current × voltage

The power used in the whole circuit is 36 W.
The voltage across the lamps is about

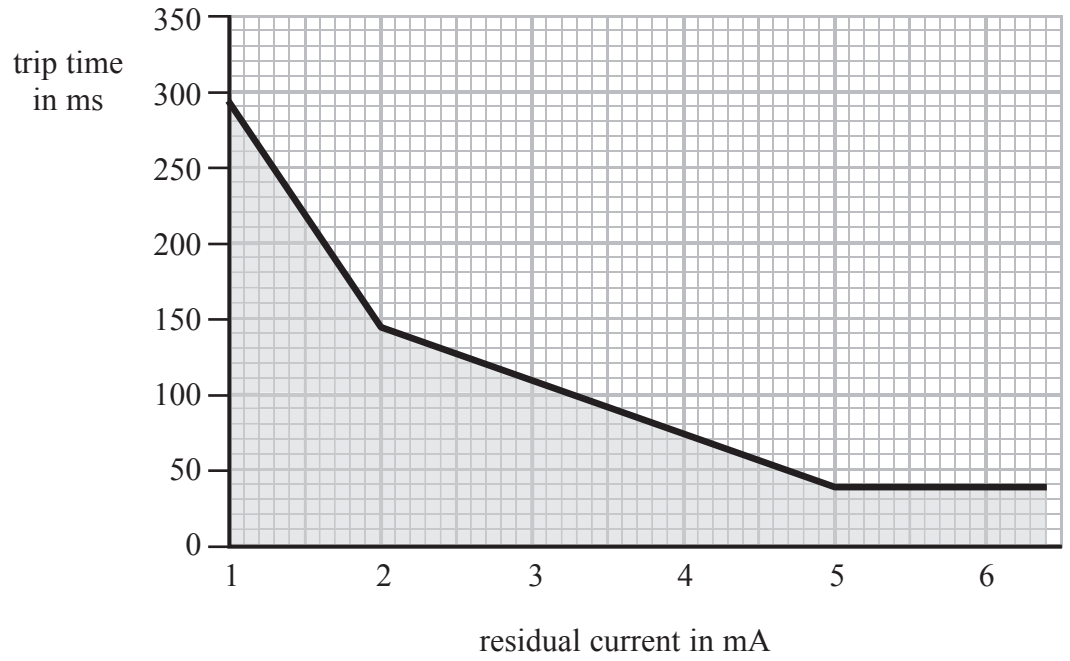
A 6 V
B 9 V
C 18 V
D 216 V

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28. The RCCB compares the currents in the

A live and earth wires
B earth and neutral wires
C fuse and live wires
D neutral and fuse wires

29. The graph is for another RCCB.
It shows the time the RCCB takes to trip (break the circuit) for different values of residual current.



Which row of the table is correct?

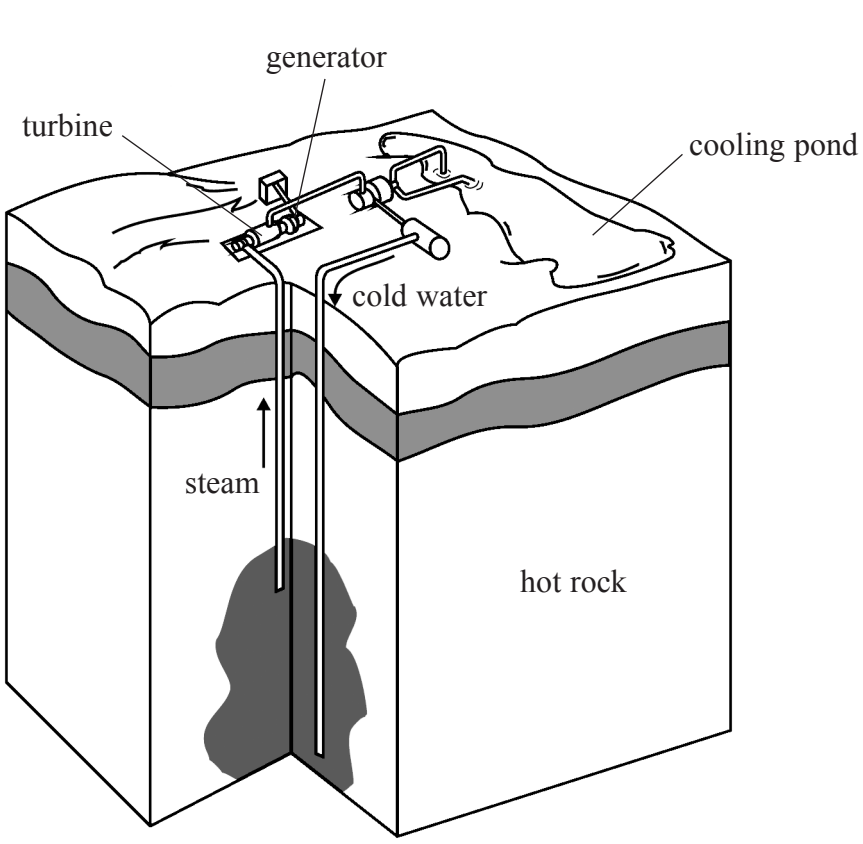
	residual current (mA)	trip time (ms)
A	1	350
B	2	200
C	4	75
D	6	60

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Producing electricity

Use this information to answer questions 30 and 31.

The diagram shows a way of taking energy from hot rock.
Cold water is pumped through hot rock below the surface of the Earth.
The water turns to steam.
The steam drives a turbine that turns an electrical generator.



30. The source of energy is

A hydroelectric
B geothermal
C seismic
D fossils

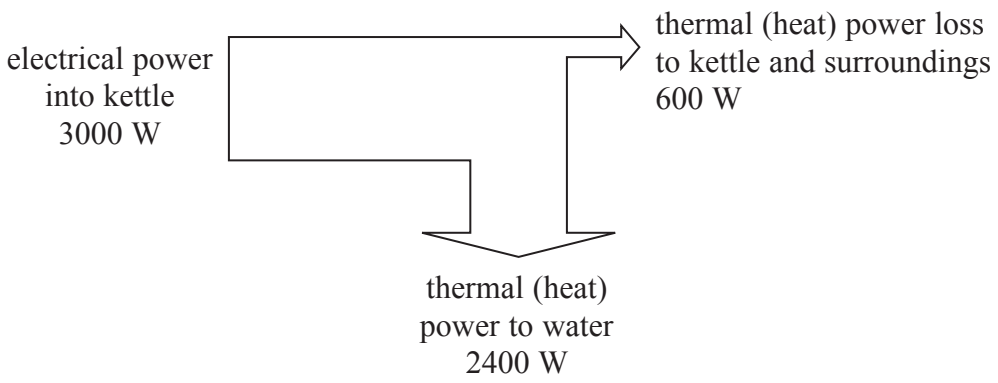
31. Scientists use computers to collect and display data from the process.
The scientists can then

A check the amount of carbon dioxide produced
B check the process continually
C adjust the temperature of the rock
D adjust the temperature of the pond

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Use this information to answer questions 32 and 33.

The diagram shows what happens to the electrical power in a kettle.



32.

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

The efficiency of the kettle at heating water is

A 0.2%
B 20%
C 80%
D 125%

33.

cost = power × time × cost per kWh

The kettle works at full power for 3 minutes.
If the total cost of this is 3p, how much does electricity cost per kWh?

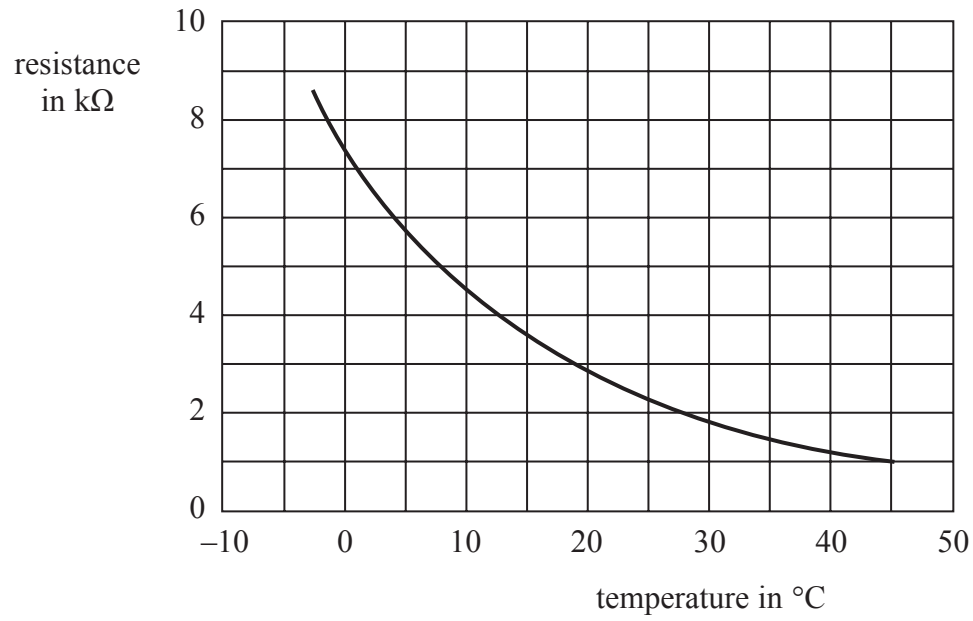
A 1p
B 9p
C 18p
D 20p

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Temperature and resistance

Use this information to answer questions 34 and 35.

Anne finds this graph about a thermistor.



34. The resistance changes from 8000 Ω to 2000 Ω.
The corresponding temperature change is about

A 6 °C
B 26 °C
C 30 °C
D 47 °C

35. John and Anne discuss the shape of the graph.

The rate at which the resistance changes with temperature is bigger at 10 °C than at 30 °C.

John

The resistance of the thermistor at 15°C is in the range 3600 Ω to 3800 Ω and also in the range 2900 Ω to 4500 Ω.

Anne

Who is correct?

A John only
B Anne only
C both John and Anne
D neither

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36. A circuit contains a lamp, a battery and a thermistor connected in series.
When the resistance of the thermistor in the circuit is doubled

A the current decreases
B the temperature is doubled
C the room starts to cool down
D the lamp becomes brighter

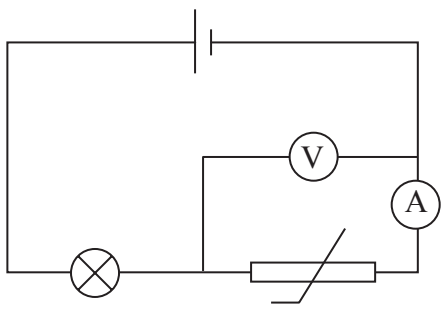
37. $V = I \times R$

At room temperature a different thermistor has a resistance of 30 Ω.
It is in a circuit and the voltage across it is 60 mV.

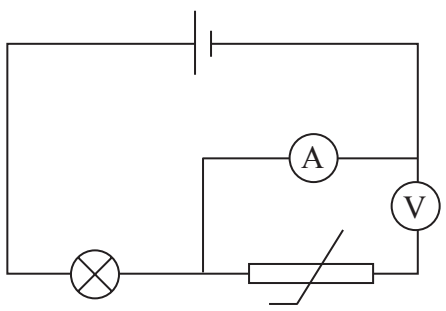
What is the current in the thermistor?

A 0.5 mA
B 2 mA
C 0.5 A
D 2 A

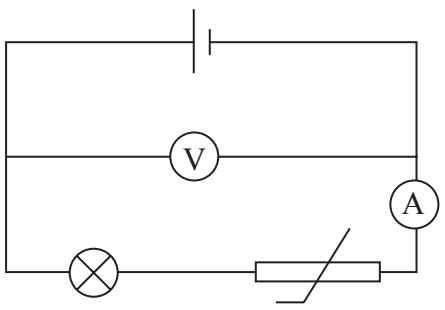
38. Which of these circuits is suitable to find the resistance of a thermistor?



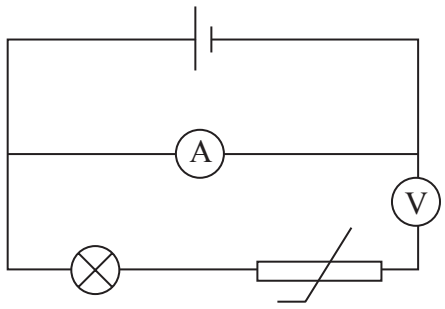
A



B



C

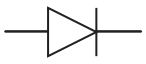


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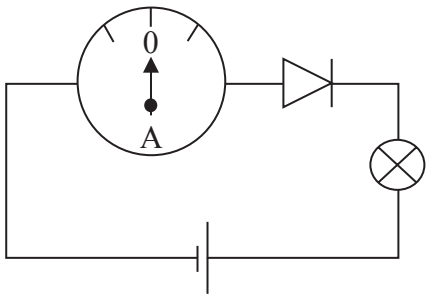
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Diodes

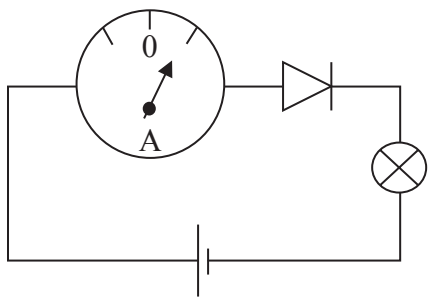
Use this information to answer questions 39 and 40.

A diode (symbol ) allows current to pass through it in one direction only.

The first diagram shows the arrangement of a diode and a cell which will not allow a current to pass.
The second diagram shows the arrangement of a diode and a cell which will allow a current to pass.

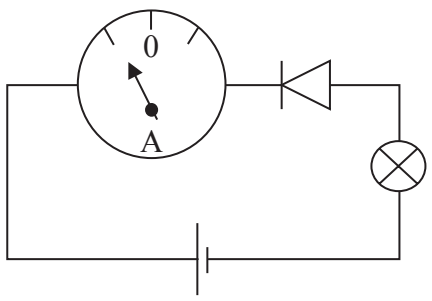


current not allowed

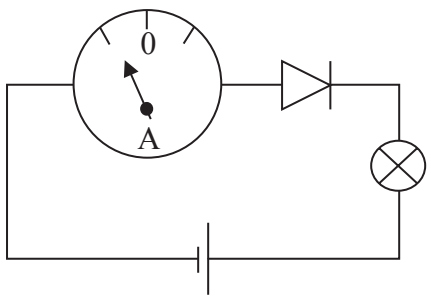


current allowed

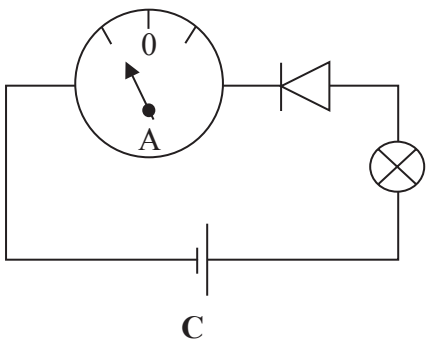
39. Which of these four arrangements of the diode and cell shows the correct ammeter reading?



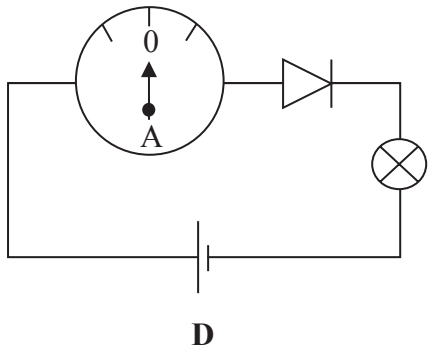
A



B



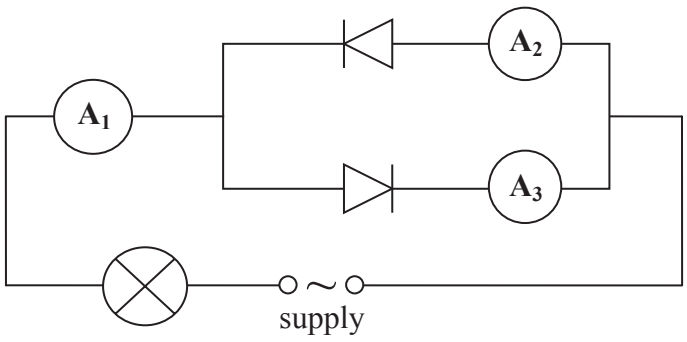
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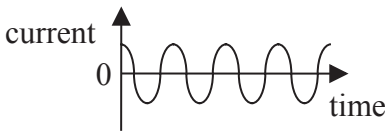
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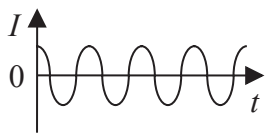
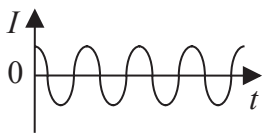
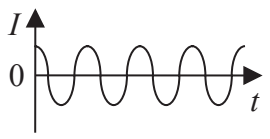
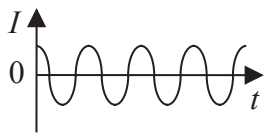
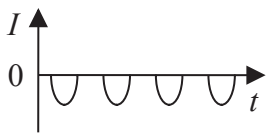
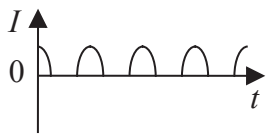
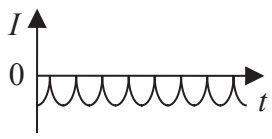
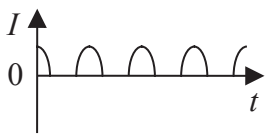
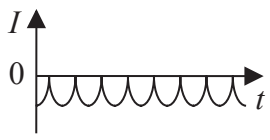
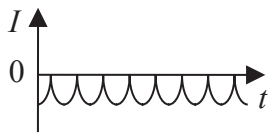
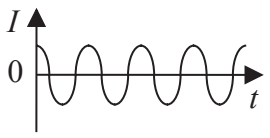
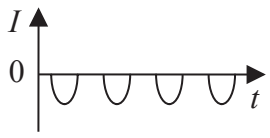
40. The diagram shows how two diodes are connected in a circuit.



The graph shows the current leaving the supply.



Which row of the table is correct for the currents in the three ammeters?

	A_1	A_2	A_3
A			
B			
C			
D			

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)

November 2011

360Science

GCSE Science
Multiple Choice Paper P1a (5009)

GCSE Physics
Multiple Choice Paper P1a (5045)

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5009 & 5045 (P1a) Mark Scheme
November 2011

Unit P1a – 5009/5045	
Topics 1 & 2	
1	A
2	B
3	D
4	C
5	A
6	D
7	C
8	A
9	D
10	D
11	B
12	A
13	C
14	B
15	C
16	B

Unit P1a – 5009/5045	
Topics 1 & 2	
17	C
18	D
19	B
20	D
21	A
22	C
23	A
24	A

Unit P1a – 5009/5045	
Topics 1 & 2	
25	A
26	D
27	A
28	D
29	C
30	B
31	B
32	C
33	D
34	C
35	C
36	A
37	B
38	A
39	C
40	B

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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 17 June 2011 – Afternoon

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.

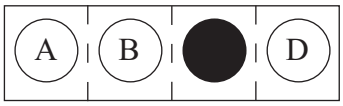
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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

Solar cells

Some students were researching solar cells.

1. A solar cell is designed to generate electric current when it is

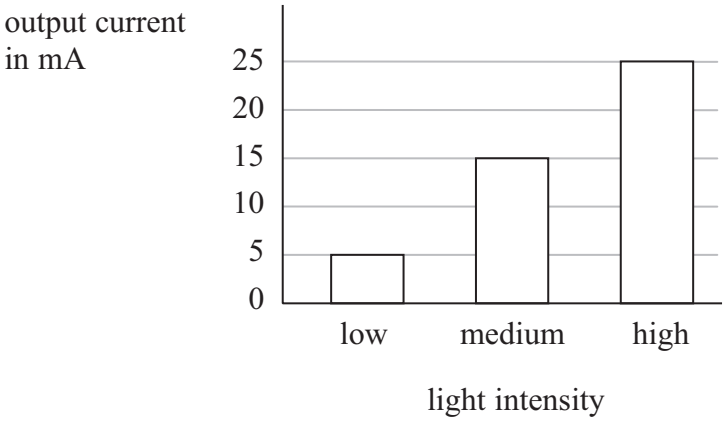
A blown by the wind
B rotated near a coil
C placed in the sunshine
D put in water

2. A **disadvantage** of solar cells is that

A they are noisy
B they are expensive
C they produce dangerous gases
D they produce alternating current

Use this information to help you answer questions 3 and 4.

The students found this information relating output current and light intensity (brightness) for a solar cell.



3. The **difference** in output current between medium light intensity and high light intensity is

A 5 mA
B 10 mA
C 15 mA
D 25 mA

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4. Which of these is correct for the solar cell?

A the higher the light intensity the higher the output current
B the solar cell only works in high light intensity
C the biggest output current is 25 V
D the smallest output current is 5 V

Electricity in the home

5. Which of these is designed to melt when the current in a circuit is too big?

A the live wire
B the neutral wire
C the fuse wire
D the earth wire

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Use this information to help you answer questions 6 to 8.

This information is about two lamps which give out the same amount of light.

energy-saving lamp	**filament (incandescent) lamp**
	
power = 11 W cost = £1.50 lifetime = 10 000 hours	power = 60 W cost = £0.30 lifetime = 1000 hours

6. How many filament lamps can be bought for the cost of one energy-saving lamp?

A 3
B 5
C 10
D 50

7. The lifetime of an energy-saving lamp compared to a filament lamp is

A 10 times longer
B 100 times longer
C 1000 times longer
D 10 000 times longer

8. The energy-saving lamp is more efficient because

A it is replaced more often
B it costs more to buy
C it is more powerful
D it wastes less energy

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Paying for electricity

9.

cost = power × time × cost of 1 kWh

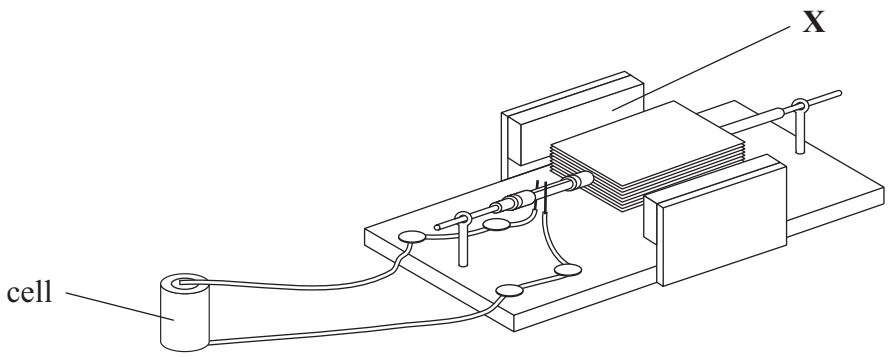
The power of an electrical heater is 2 kW.
Electricity costs 20p per kWh.

What is the cost of using the heater continuously for 2 hours?

A 8p
B 10p
C 40p
D 80p

Electric motors

10. The diagram shows a model electric motor.



Part **X** is

A a commutator
B a copper block
C a magnet
D a coil

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11. An electric motor is **designed** to transfer electrical energy into

A thermal (heat) energy
B sound energy
C kinetic energy
D chemical energy

12. An electric motor transfers 12 J of electrical energy each second. This means that the motor has

A a voltage of 12 V
B a current of 12 A
C an efficiency of 12%
D a power of 12 W

Batteries

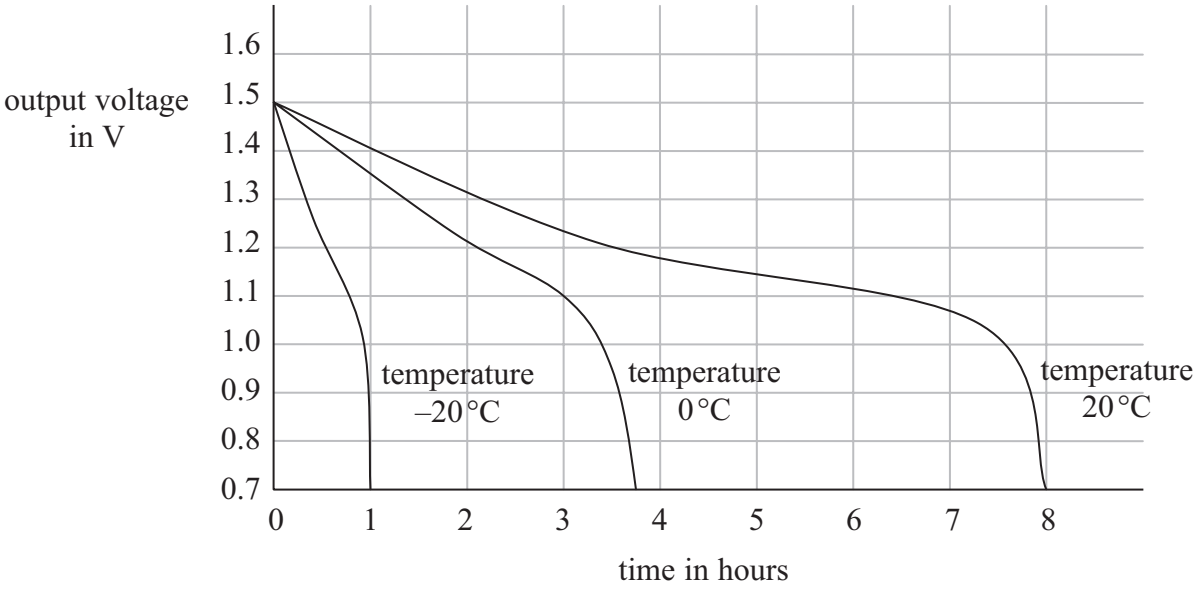
13. Rechargeable batteries are useful because

A they never stop working
B they are a renewable energy source
C it costs nothing to recharge them
D they can be re-used

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Use this information to answer questions 14 and 15.

Some students find this information about a type of torch battery.
The graph shows the effect of temperature on the output voltage.



14. The battery stops working when the output voltage reaches 1.1 V.
The torch is used continuously at a temperature of 0 °C.
About how long will the battery last before its output voltage reaches 1.1 V?

A 0.75 hours
B 3.0 hours
C 3.8 hours
D 6.5 hours

15. Which of these is correct for this type of battery?

A it works longest when the temperature is –20 °C
B at 0 °C the output voltage is steady for about 4 hours
C the output voltage is not affected by temperature
D at 20 °C it works for more than twice as long as at 0 °C

16. A different type of battery has a capacity of 8 amp-hours.
How long will the fully charged battery last if the output current is kept at 2 A?

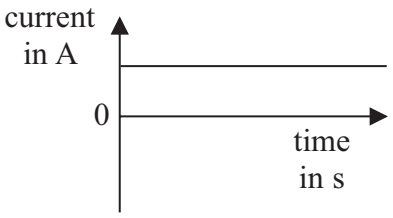
A 0.25 hours
B 4 hours
C 8 hours
D 16 hours

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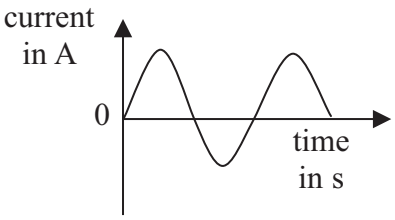
Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Investigating electric current

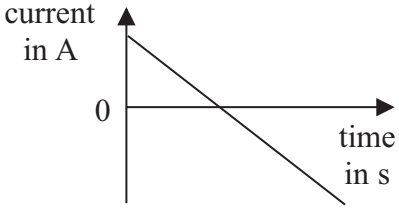
17. Which of these shows a direct current?



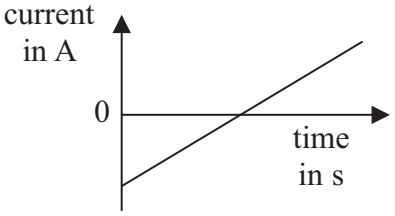
A



B



C



D

18. Which row of the table is correct for a current in a metal wire?

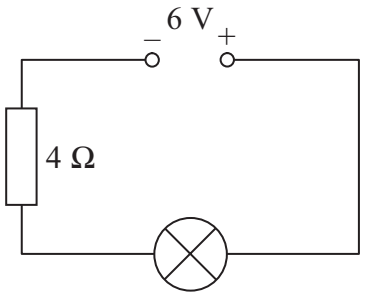
	particles moving through the wire	**charge carried by the particles**
A	ions	positive
B	ions	negative
C	electrons	positive
D	electrons	negative

19. The current in a lamp is measured by connecting

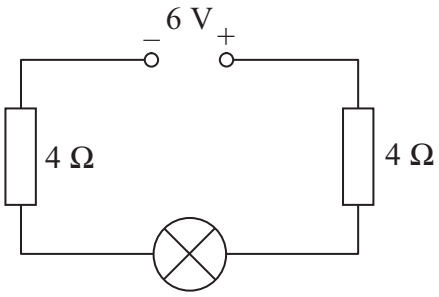
A an ammeter in series with the lamp
B an ammeter in parallel with the lamp
C a voltmeter in series with the lamp
D a voltmeter in parallel with the lamp

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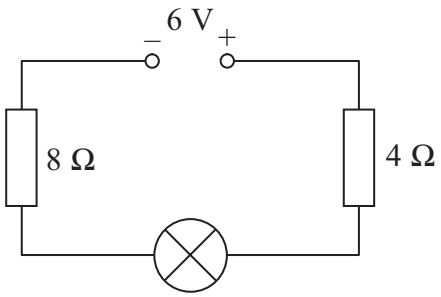
20. The lamps used in these four circuits are identical.
Which circuit has the biggest current?



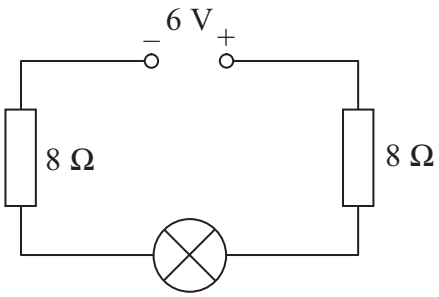
A



B



C



D

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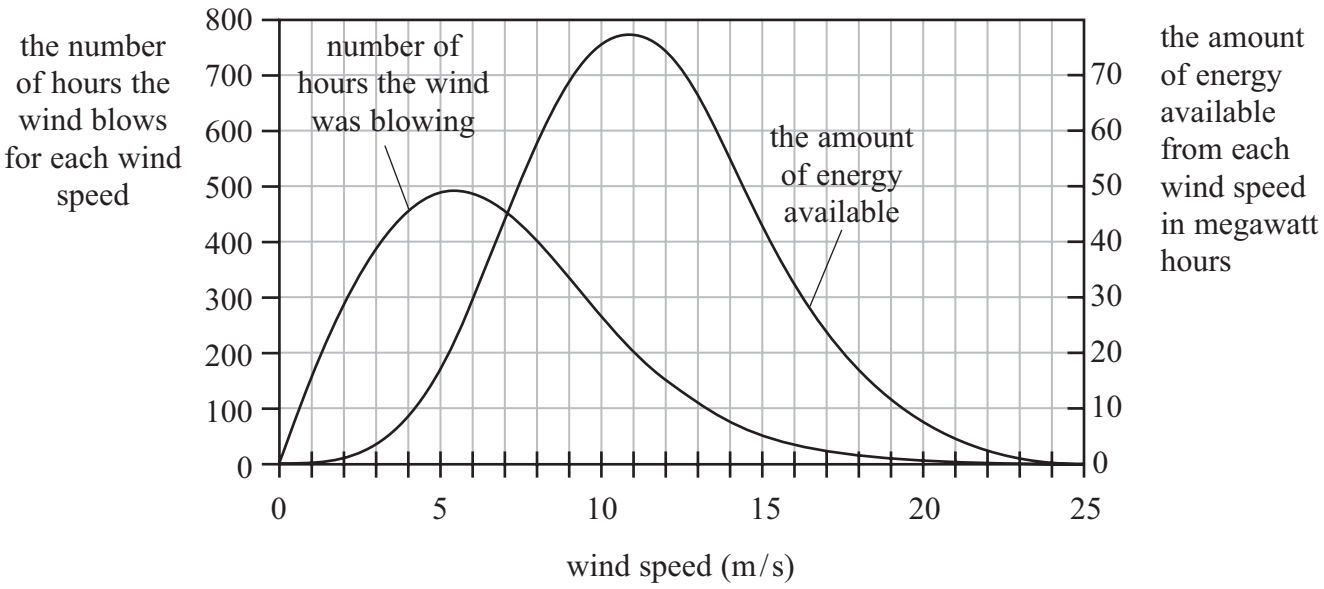
Wind farms

Use this information to answer questions 21 to 22.

A company plans to build a wind farm a few miles out to sea.
Scientists measured wind speeds for a year.

The graphs show

- the number of hours for each wind speed
- the amount of energy available from each wind speed



21. The wind blew for the longest time at about

A 5 m/s
B 8 m/s
C 12 m/s
D 20 m/s

22. Which of these is shown by the graphs?

A the available energy is directly proportional to the wind speed
B the maximum available energy is for a wind speed of about 5 m/s
C the available energy equals the wind speed at about 7 m/s
D the maximum available energy is for a wind speed of about 11 m/s

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23. Sam used a computer to collect the data and print the graphs.
He did this instead of using a pencil and paper because

A a graph printed by a computer is always valid
B data collected by a computer is always valid
C collecting large amounts of data with a computer can be more reliable
D collecting large amounts of data with a computer ensures the correct variables are measured

24.

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

A wind turbine is operating with an efficiency of 20%.
Its useful output power is 20 kW.
The total input power to the wind turbine is

A 4 kW
B 100 kW
C 400 kW
D 2000 kW

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

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

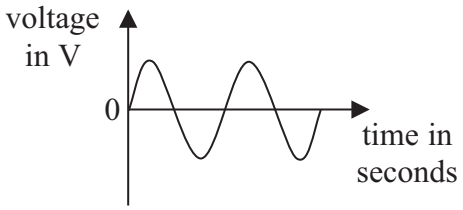
Generating electricity

25. A teacher makes a model generator containing a coil and a permanent magnet.
Both the coil and magnet can be rotated clockwise, rotated anticlockwise or not turned.

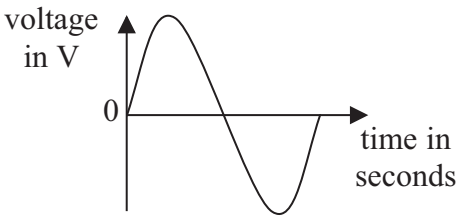
Which row of the table shows a combination that will **not** generate an electric current?

	rotation of coil	rotation of magnet
A	not turned	clockwise at 30 times a minute
B	clockwise at 30 times a minute	anticlockwise at 30 times a minute
C	clockwise at 30 times a minute	clockwise at 30 times a minute
D	not turned	anticlockwise at 30 times a minute

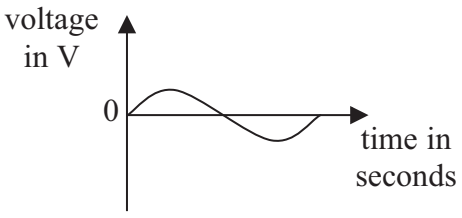
26. The graph shows the output voltage for a generator.



Which graph shows the output when the generator turns at a faster speed.

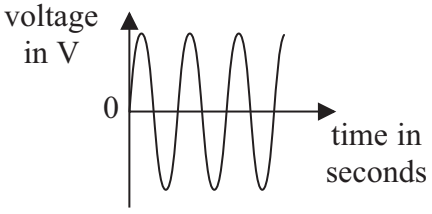


A

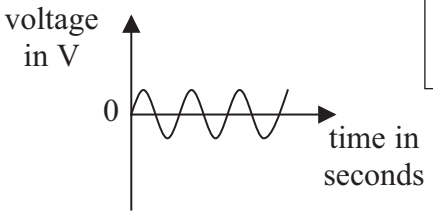


B

all graphs are drawn to the same scale as the first graph



C

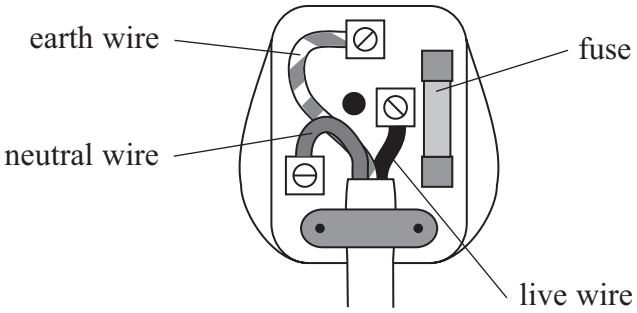


D

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Electrical machines

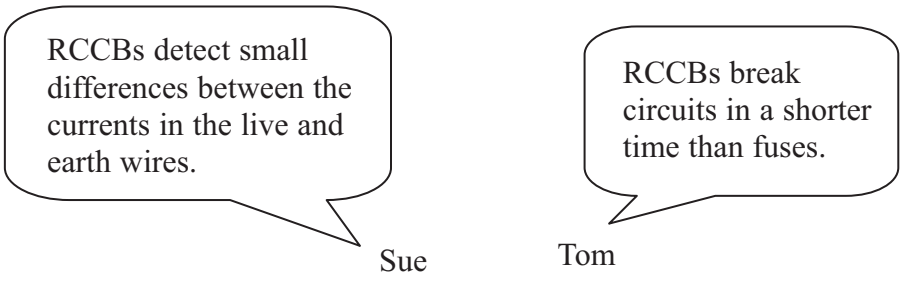
27. The diagram shows the inside of a plug for a washing machine.



Which two parts work together to protect the user of the machine?

A live wire and neutral wire
B fuse and earth wire
C live wire and earth wire
D fuse and neutral wire

28. Two students are discussing residual current circuit breakers (RCCBs) and fuses.



Who is correct?

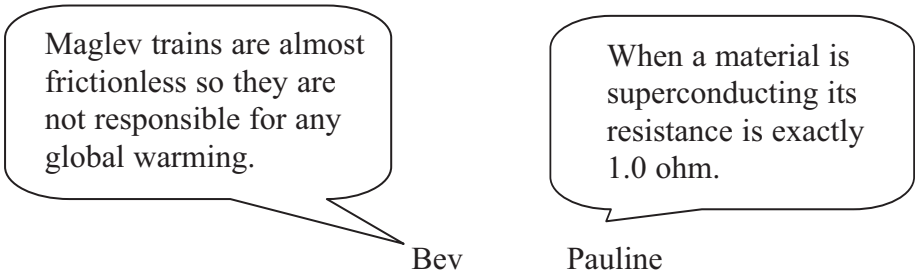
A Sue only
B Tom only
C both Sue and Tom
D neither

29. In a simple d.c. electric motor, a coil turns because

A a permanent magnet interacts with another permanent magnet
B a current in the coil interacts with a permanent magnetic field
C an electric charge in the magnet attracts the coil
D an electric charge in a magnet repels the coil

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30. Two students are discussing Maglev trains and superconductors.



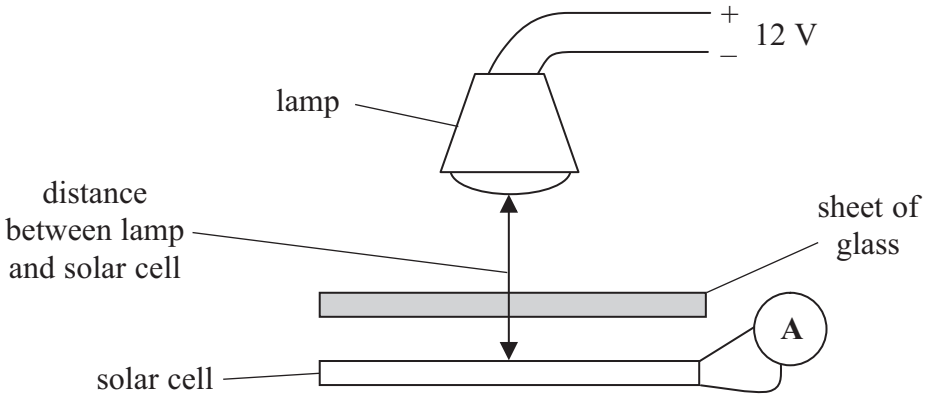
Who is correct?

A Bev only
B Pauline only
C both Bev and Pauline
D neither

Electrical investigations

Use this information to answer questions 31 and 32.

Some students investigate how the thickness of glass affects the output current of a solar cell. Different thicknesses of glass are placed between a lamp and the solar cell.



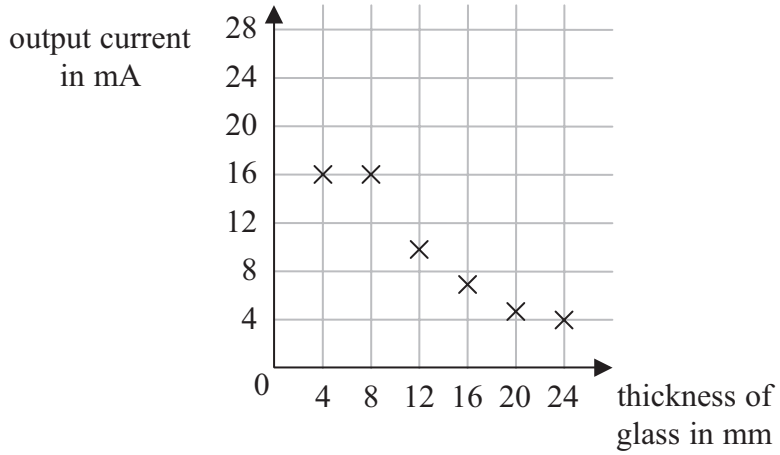
The distance between the lamp and the solar cell is kept constant.

31. Which row of the table is correct for this investigation?

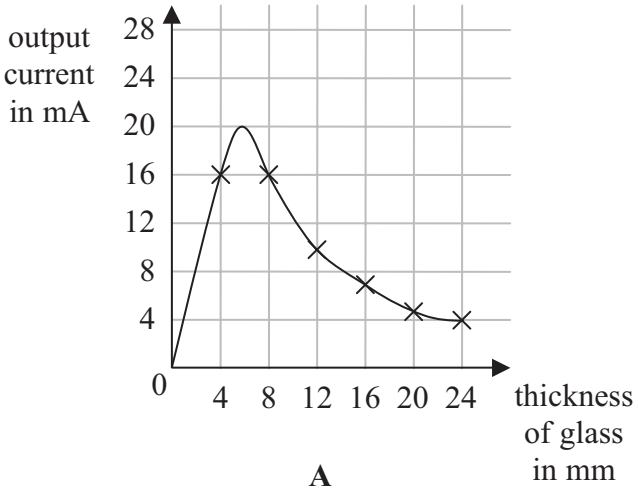
	independent variable	**dependent variable**
A	distance between lamp and solar cell	input voltage of lamp
B	distance between lamp and solar cell	output current of solar cell
C	thickness of glass sheet	input voltage of lamp
D	thickness of glass sheet	output current of solar cell

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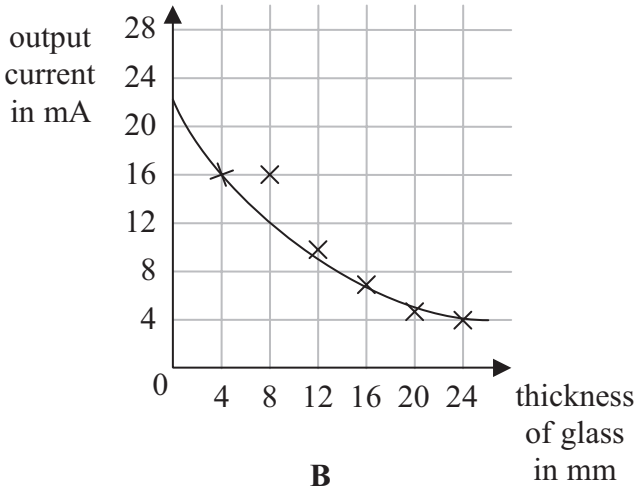
32. Some of the results the students obtained are plotted on this graph.



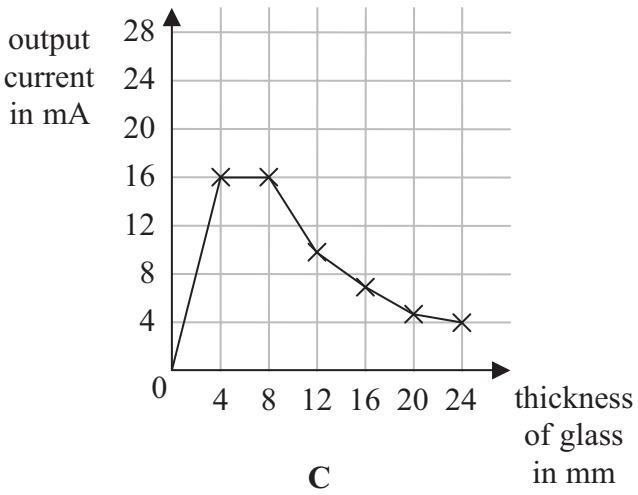
Which of these graphs is the best way of displaying the students' results?



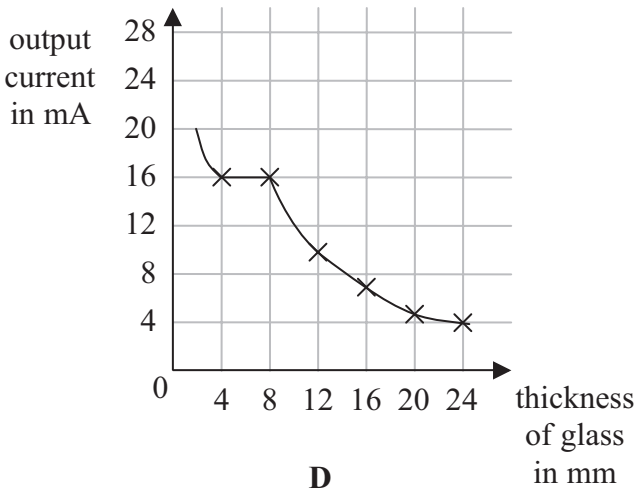
A



B



C

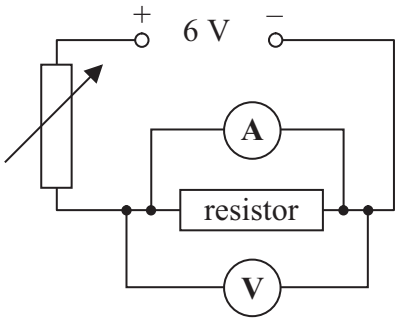


D

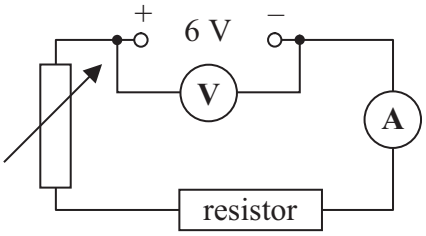
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Some students are investigating how current varies with voltage for a resistor.

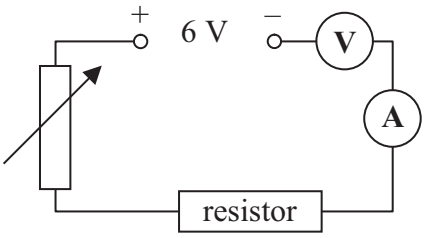
33. Which circuit should they use?



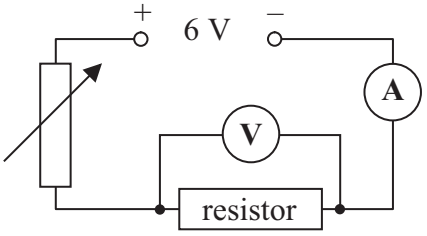
A



B



C

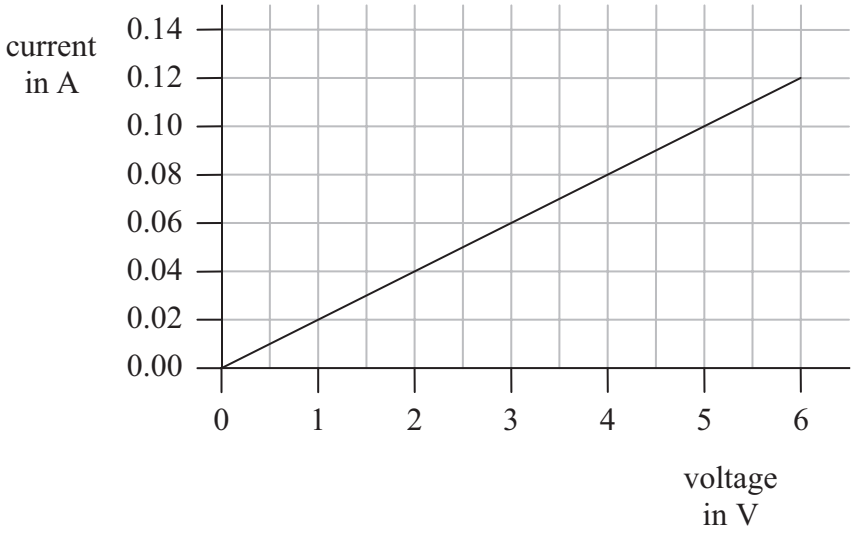


D

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Use this information to answer questions 34 and 35.

The students produced this graph.



34. $V = I \times R$

The resistance at 4 V is

A 0.08 Ω
B 0.32 Ω
C 0.5 Ω
D 50 Ω

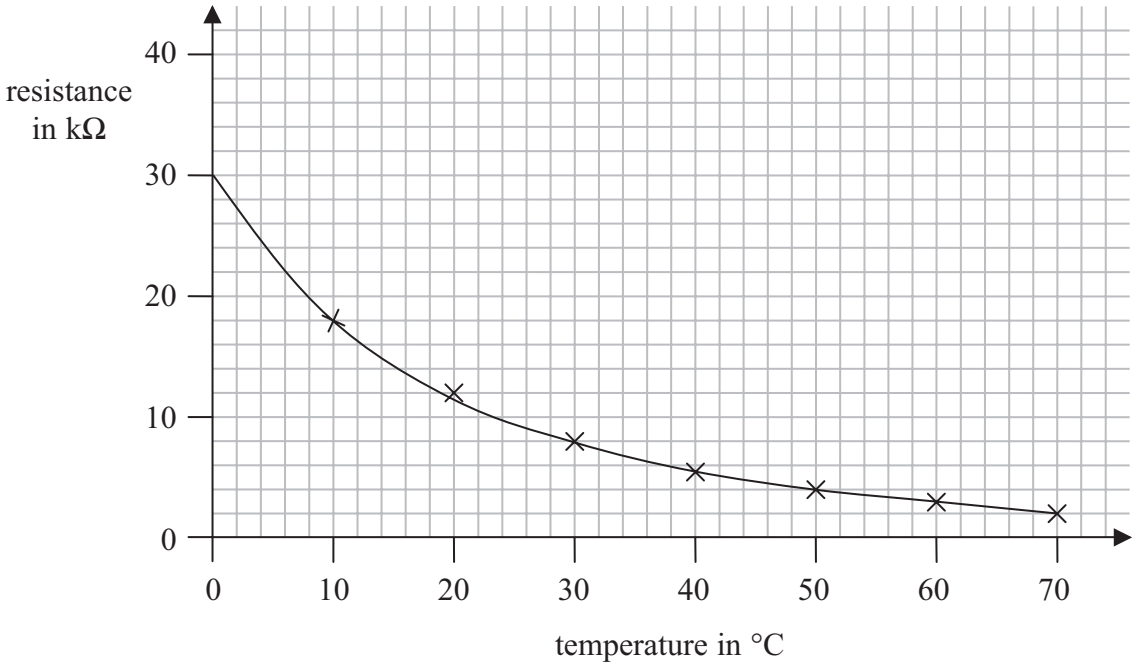
35. The graph shows that between 0 and 6 volts the resistance of the resistor is

A steadily increasing
B constant
C a maximum at 6 V
D proportional to current

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Use this information to answer questions 36 and 37.

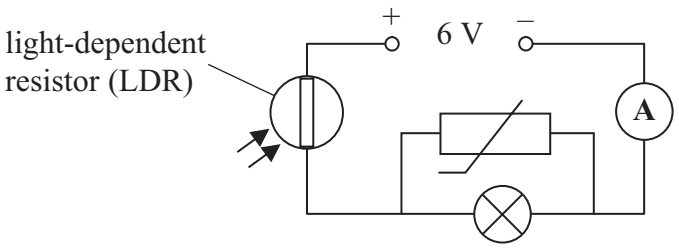
Some students are investigating sensors.
They find this information about a thermistor.



36. When the temperature increases from 10 °C to 50 °C, the resistance will

A decrease by about 14 Ω
B decrease by about 18 Ω
C decrease by about 14 000 Ω
D decrease by about 18 000 Ω

37. The students make this circuit using the same thermistor.



Which row of the table shows the conditions for the highest current in the ammeter?

	brightness of light shining on the LDR	**temperature of the thermistor**
A	bright	low
B	bright	high
C	dim	low
D	dim	high

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Solar power

38.

cost = power × time × cost of 1 kWh

A solar panel supplies an average electrical power of 50 W.
An electricity company pays 20p for 1 kWh of electrical energy.

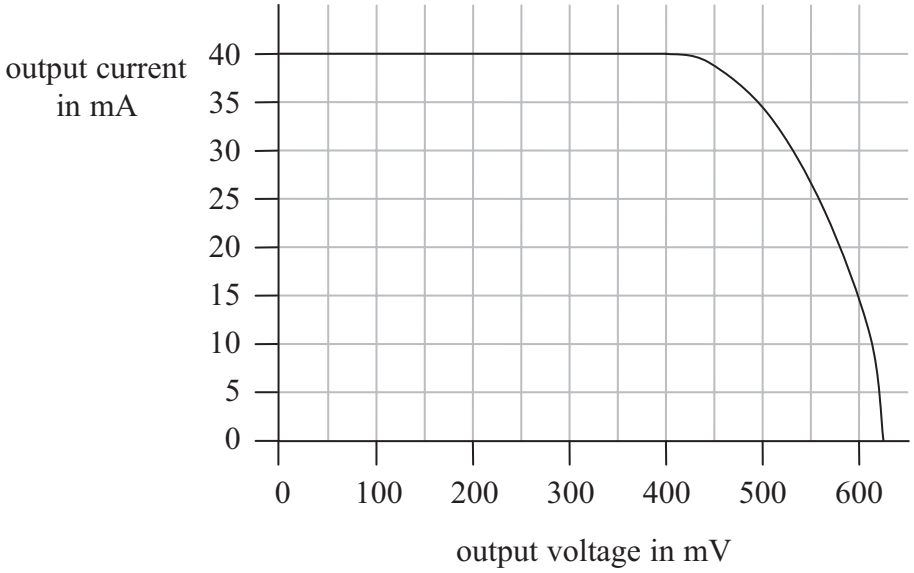
How long will it take the solar panel to produce £1 worth of electrical energy?

A 0.1 hours
B 10 hours
C 100 hours
D 1000 hours

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Use this information to answer questions 39 and 40.

The amount of light reaching a solar cell remains constant.
The graph shows how the output current is related to output voltage.



39.

power = current × voltage

When the output voltage of the solar cell is 200 mV the output power is

A 0.008 W
B 0.08 W
C 8.0 W
D 8000 W

40. Which of these is correct for the graph?

A the output power is inversely proportional to the output voltage
B between 100 mV and 400 mV the output power is constant
C between 100 mV and 400 mV the output power is directly proportional to the output voltage
D the output power is always directly proportional to the output voltage

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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June 2011

360Science

GCSE Science
Multiple Choice Paper P1a (5009)

GCSE Physics
Multiple Choice Paper P1a (5045)

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June 2011
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5009 & 5045 (P1a) Mark Scheme
June 2011

Unit P1a – 5009/5045	
Topics 9 & 10	
1	C
2	B
3	B
4	A
5	C
6	B
7	A
8	D
9	D
10	C
11	C
12	D
13	D
14	B
15	D
16	B

Unit P1a – 5009/5045	
Topics 9 & 10	
17	A
18	D
19	A
20	A
21	A
22	D
23	C
24	B

Unit P1a – 5009/5045	
Topics 9 & 10	
25	C
26	C
27	B
28	B
29	B
30	D
31	D
32	B
33	D
34	D
35	B
36	C
37	B
38	C
39	A
40	C

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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.

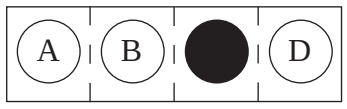
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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

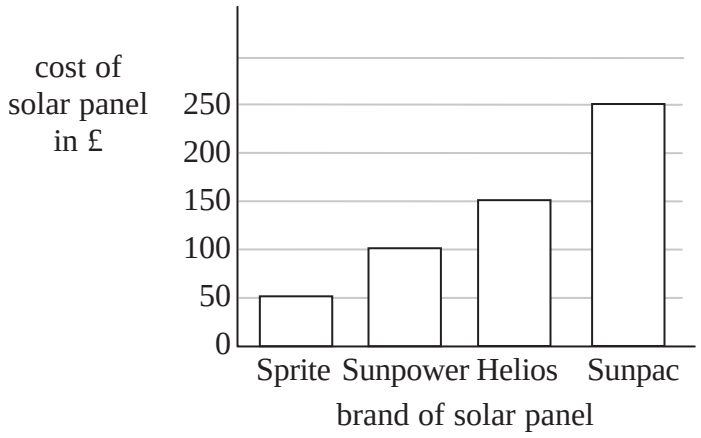
A hydroelectricity
B natural gas
C coal
D oil

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

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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

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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?

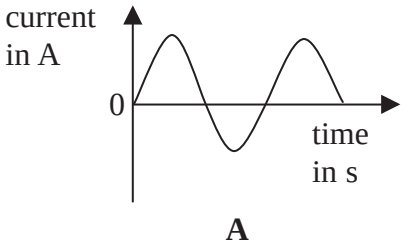
A leclanche
B zinc-chloride
C zinc-air
D lithium

10. Which row of the table best describes the **zinc-air** type of battery?

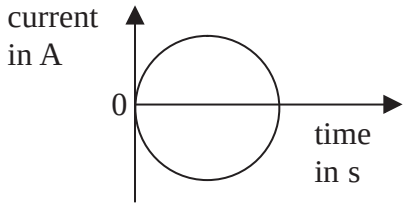
	capacity per unit volume	**cost to buy**
A	lowest	high
B	highest	high
C	highest	low
D	lowest	low

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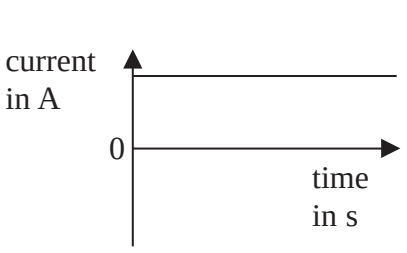
11. A battery is used to light a lamp.
Which of these shows the current from the battery?



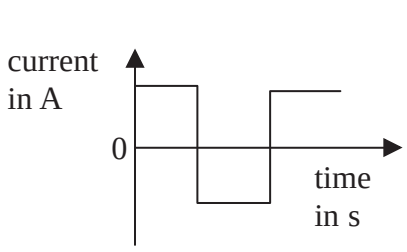
A



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

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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?

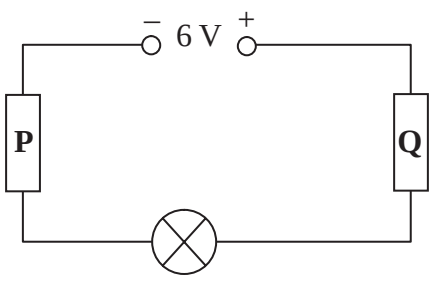
A Andy
B Bev
C Carla
D Dan

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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.

power = current × 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

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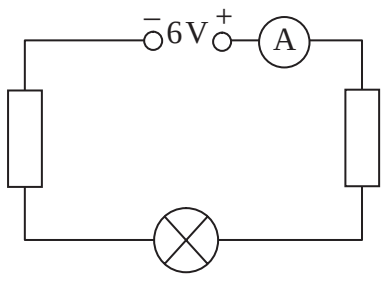
Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Current electricity

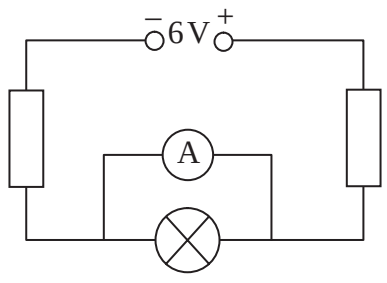
17. An electric current in a wire is a flow of

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

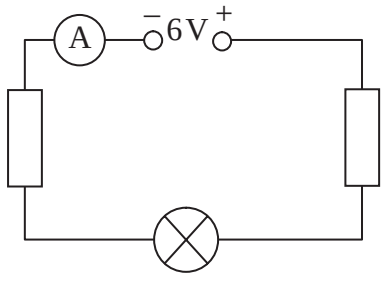
18. In which of these circuits would the ammeter **not** show the current in the lamp?



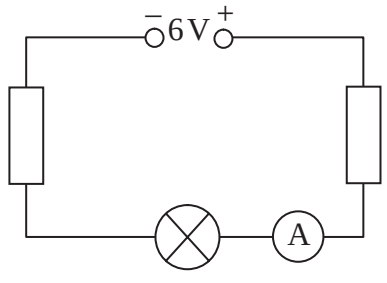
A



B



C



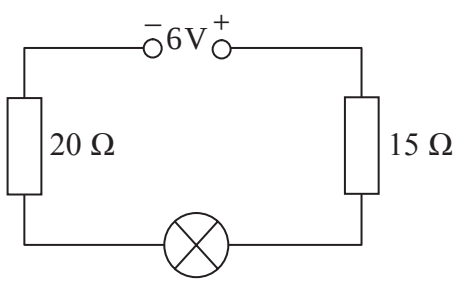
D

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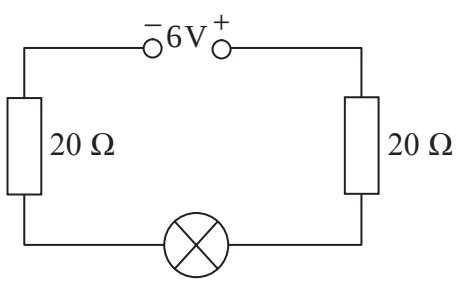
19.

$V = I \times R$

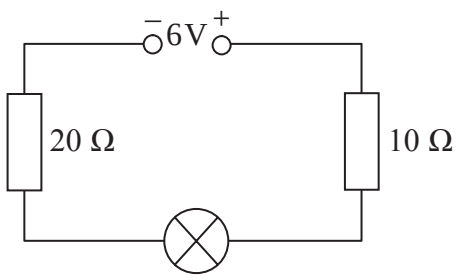
The lamps in the circuits below are identical.
Which of these circuits would give the biggest current?



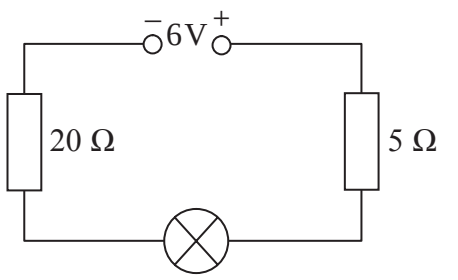
A



B



C



D

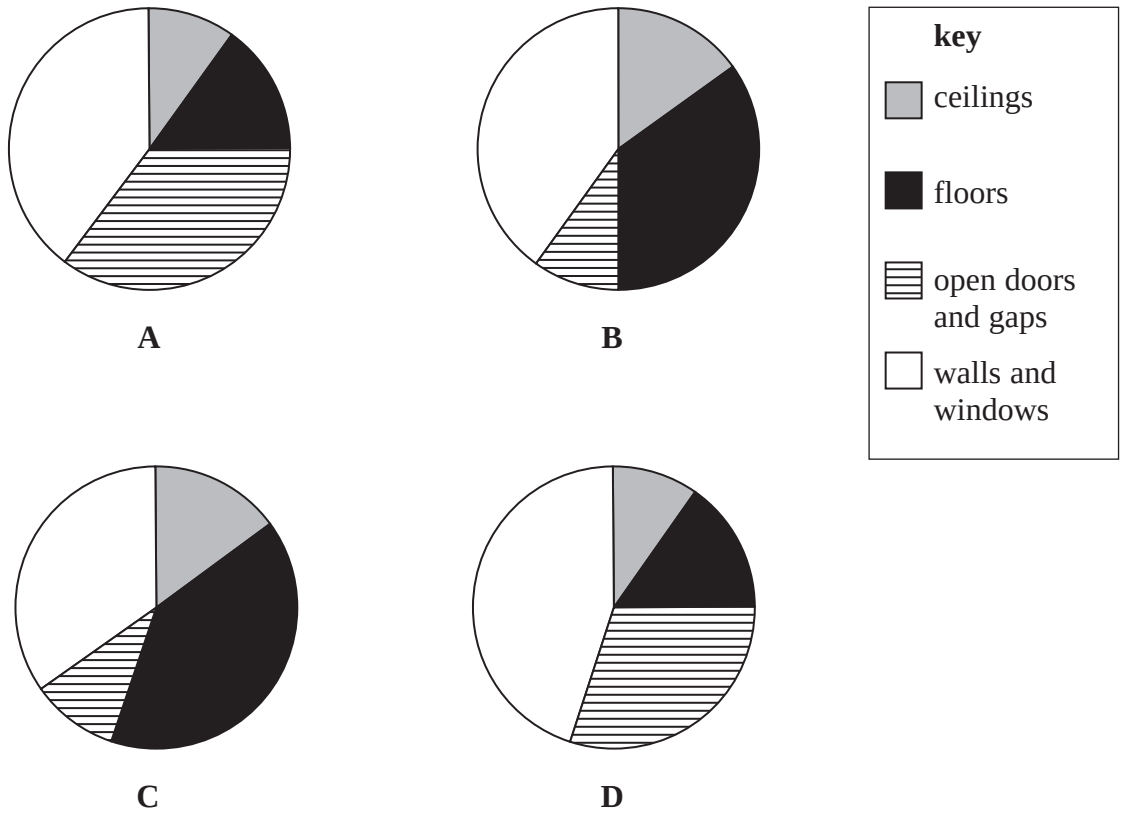
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Saving energy

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?



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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

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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.

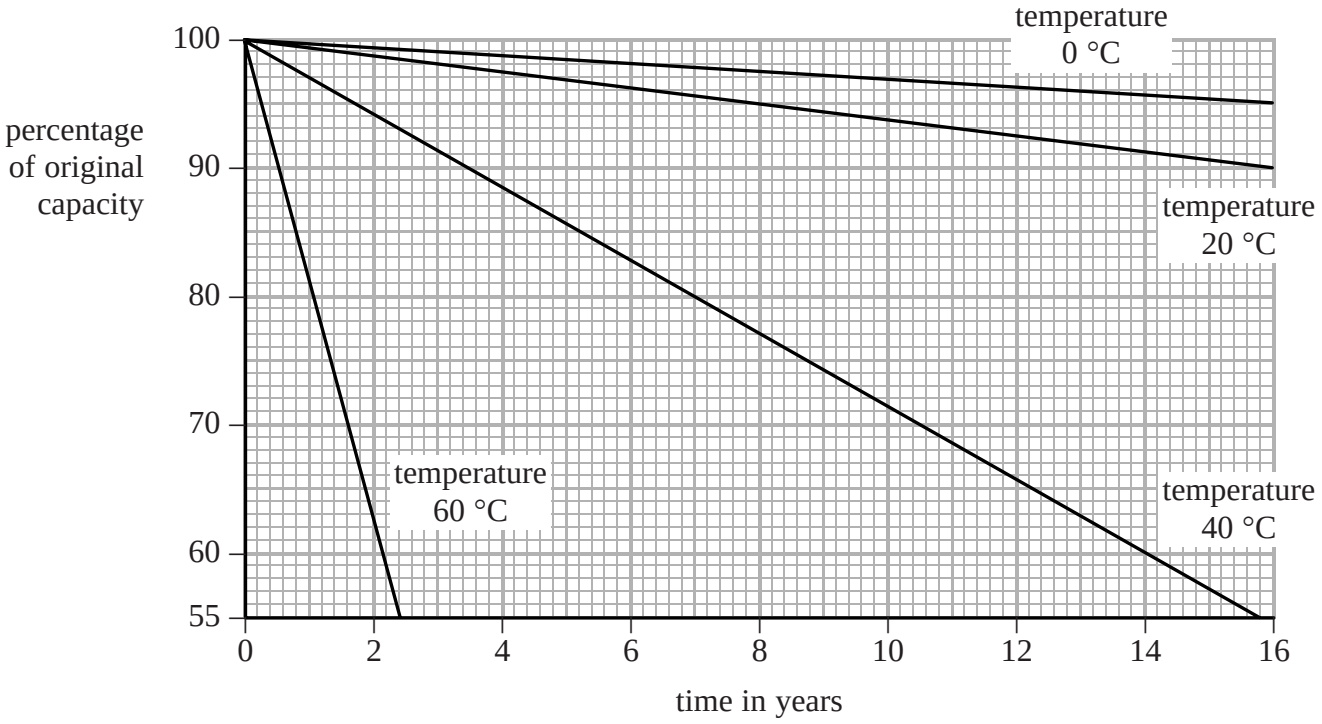
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

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.

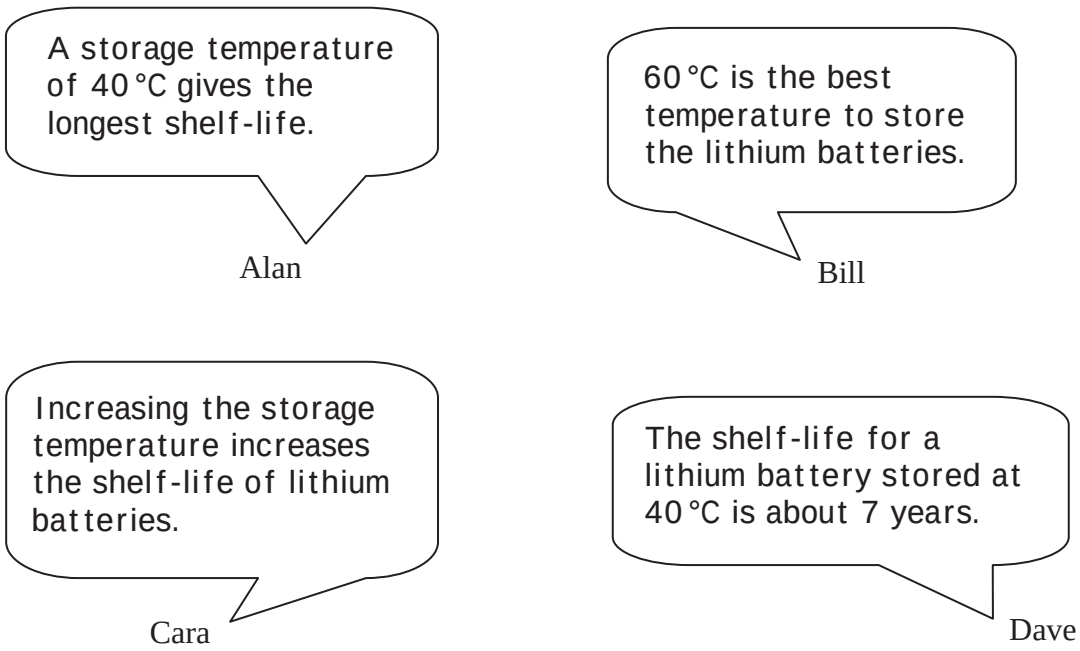


25. A lithium battery is stored at 20 °C.
About how many years does it take for the battery to lose 5% of its capacity?

A 98
B 16
C 8
D 2

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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.



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

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Electricity in the home

29.

power = current × voltage

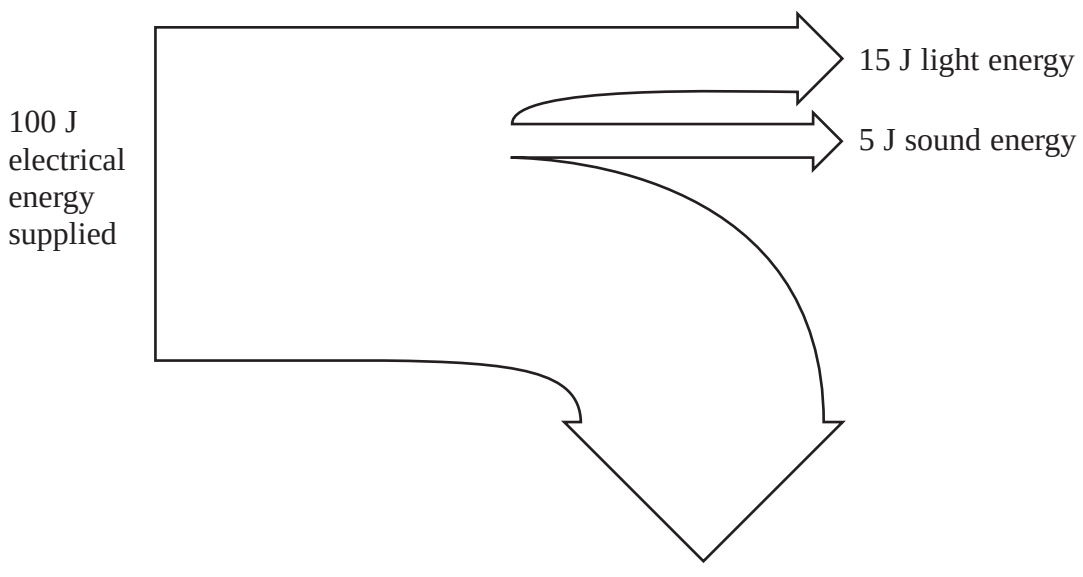
An electric shower has a power rating of 6.9 kW.
The voltage of the mains supply is 230 V.
The current in the shower is about

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%

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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

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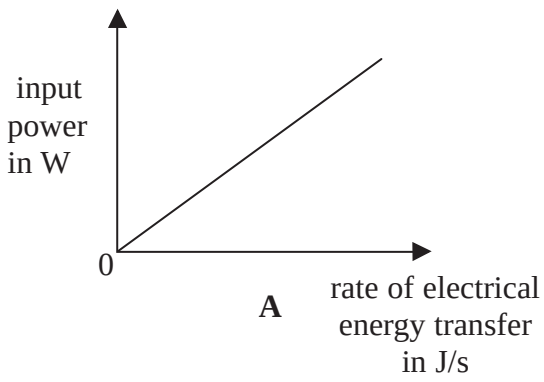
34.

cost = power × time × cost of 1 kWh

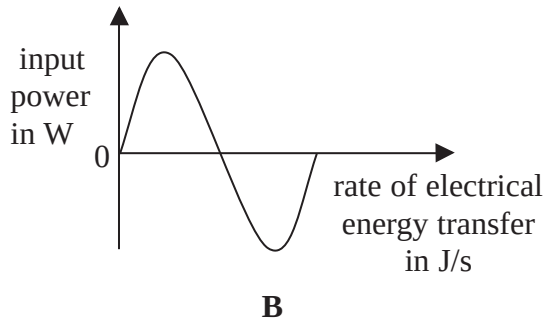
An electric oven has a power of 5 kW.
1 kWh of electrical energy costs 12p.
How long will it take the oven to use £3 worth of electrical energy?

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

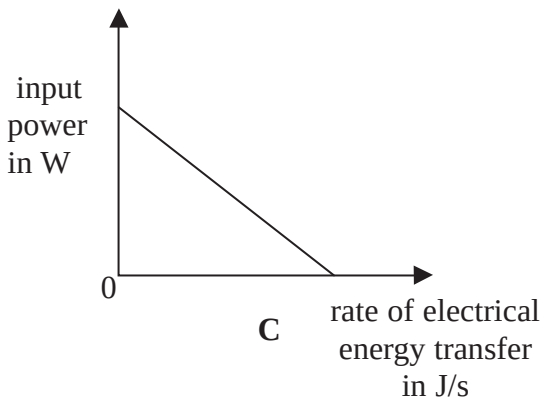
35. The input power of an electrical appliance is related to the rate of electrical energy transfer in the appliance.
Which of these shows the relationship?



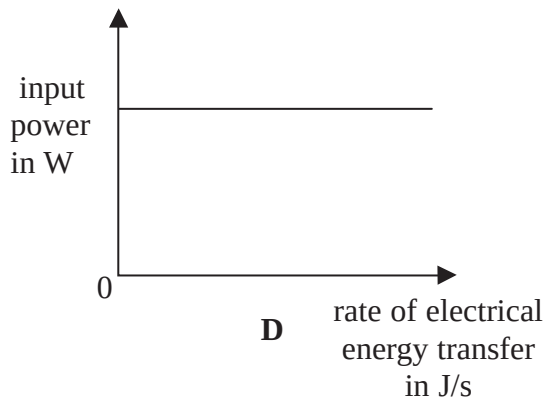
A



B



C



D

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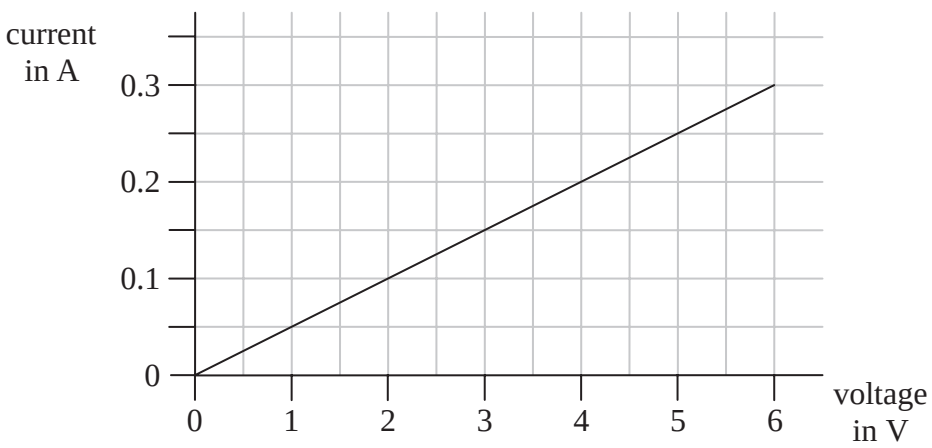
Resistance investigations

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.



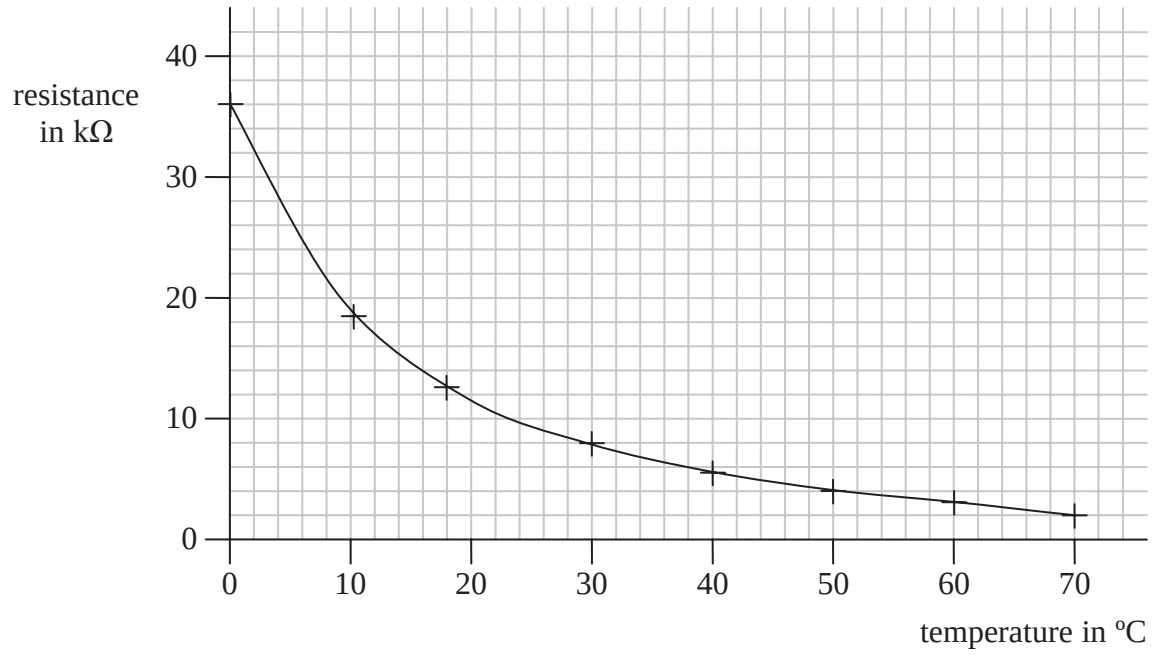
The value of the resistor used is

A 0.05 Ω
B 1.8 Ω
C 2.0 Ω
D 20 Ω

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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 ºC to 23 ºC, 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.

$V = I \times R$

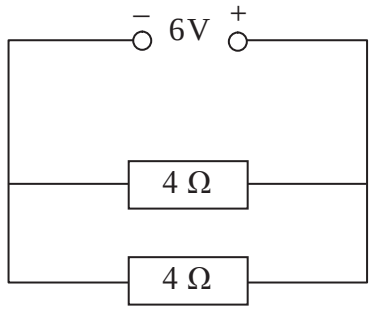
In one part of the investigation, the current in the thermistor was 0.40 mA and the voltage across it was 8 V.

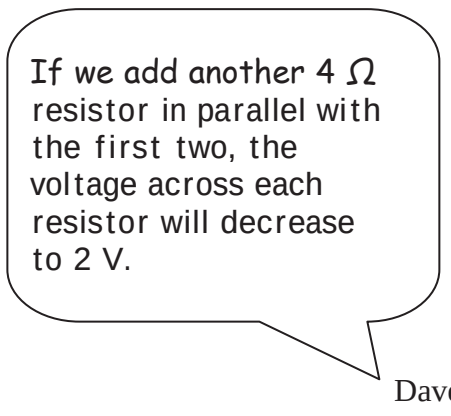
The temperature of the thermistor was about

A 9 °C
B 54 °C
C 60 °C
D 70 °C

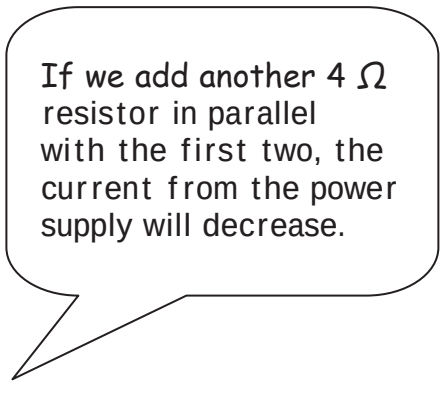
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40. Two students discuss making changes to this circuit.
They are told to ignore any resistance the power supply may have.





Dave



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

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Mark Scheme (Results)

March 2011

GCSE

360Science

GCSE Science
Multiple Choice Paper P1a (5009/01)

GCSE Physics
Multiple Choice Paper P1a (5045/01)

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March 2011

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5009 & 5045 (P1a) Mark Scheme

Unit P1a – 5009/5045	
Topics 9 & 10	
1	A
2	B
3	B
4	A
5	A
6	A
7	C
8	D
9	A
10	B
11	C
12	D
13	A
14	D
15	D
16	A

Unit P1a – 5009/5045	
Topics 9 & 10	
17	D
18	B
19	D
20	D
21	C
22	A
23	C
24	C

Unit P1a – 5009/5045	
Topics 9 & 10	
25	C
26	D
27	C
28	D
29	B
30	C
31	D
32	A
33	B
34	B
35	A
36	B
37	D
38	C
39	A
40	D

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5009 5045

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Science (5009)

Physics (5045)

P1a – Topics 9 and 10

Foundation and Higher Tier

Friday 12 November 2010 – Afternoon

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	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.

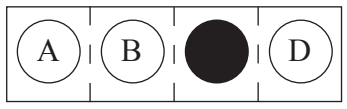
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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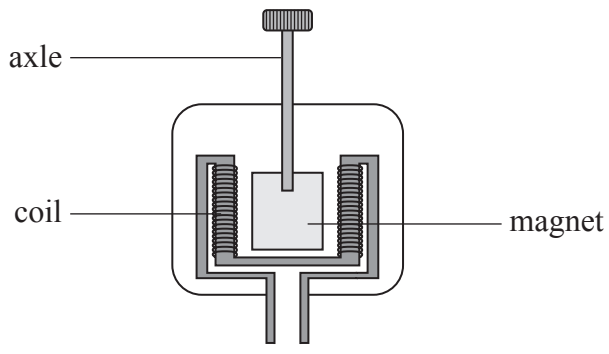
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Producing an electric current

1. An electric current is produced when

A a wire moves into a coil
B a magnet rests on a coil
C a wire rests on a magnet
D a magnet moves into a coil

2. The diagram shows a dynamo.



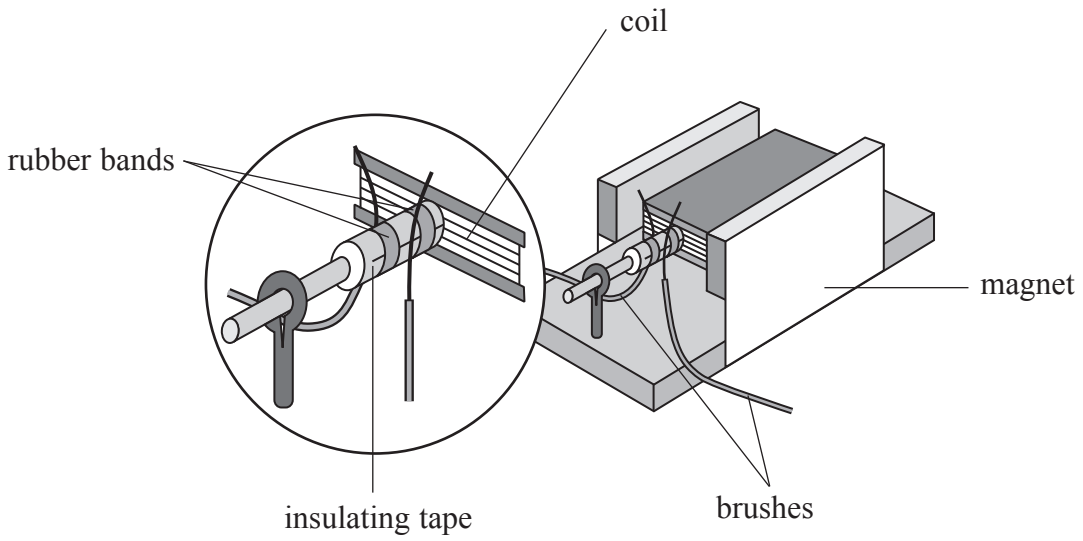
In the dynamo, which of these will increase the size of the voltage generated?

A spinning the magnet slower
B reversing the poles of the magnet
C spinning the magnet the other way
D spinning the magnet faster

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Electric motors

The diagram shows an electric motor.
Part of the motor is shown enlarged.



3. This motor changes energy from

A kinetic to potential
B electrical to kinetic
C potential to chemical
D chemical to electrical

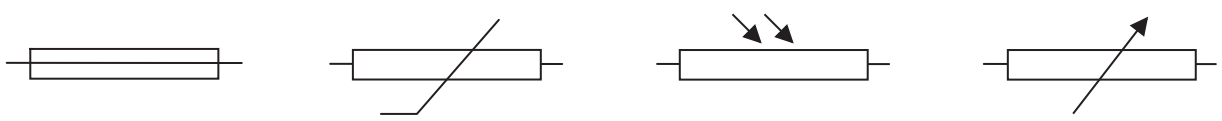
4. The brushes are **designed** to

A change the poles of the fixed magnets
B insulate the coil from the battery
C provide force to rotate the coil
D reverse the current in the wire of the coil

5. The current in the wire of the coil is a flow of

A protons
B electrons
C neutrons
D copper ions

6. Which of these is a symbol for a thermistor?



A **B** **C** **D**

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Comparing kettles

John compares two kettles, X and Y.
He uses cold water to fill each of them to the lines marked ‘MAX’.
He then measures the times for the water in each to start boiling.

7. John compares the times taken for the water to boil in each kettle.
Kettle X took less time to start boiling than kettle Y.
Which of these could be the reason why?

A X has more water than Y
B X has colder water than Y
C X is less efficient than Y
D X is more powerful than Y

8. Electrical power is the rate of transfer of electrical

A charge
B energy
C current
D voltage

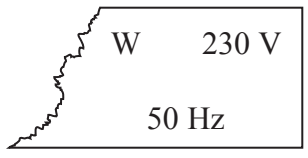
9. One of the kettles has a rating of 240 V, 750 W.
This kettle will transfer

A 240 J/s
B 510 J/s
C 750 J/s
D 990 J/s

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10. power = current × voltage

Here is the information which is on the bottom of a different kettle.
Part of the label has been damaged.



The current in the kettle's element is 10 A.
The power of the kettle is about

A 5 W
B 23 W
C 500 W
D 2300 W

11. Which of these is needed to protect the wires connecting the kettle to the mains?

A a fuse wire
B a live wire
C a neutral wire
D an earth wire

Batteries

12. The current produced by batteries is

A direct
B indirect
C positive
D alternating

13. Compared to the batteries used in cars, torch batteries are safer because they

A protect you from receiving a dangerous shock
B can be used to light brighter lamps
C do not contain acid
D are renewable

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14. Using rechargeable batteries can save money because

A they have a much higher voltage than ordinary batteries
B the energy they produce is free
C they can be used again and again
D they never run down

15. The table gives the price of some car batteries.

capacity (amp-hours)	price (£)
82	80
41	44
53	53
62	60

Which of these is correct for the car batteries?

A bigger capacity batteries cost more
B doubling the capacity halves the price
C you get half the capacity for double the price
D you get four times the capacity for twice the price

16.

$$V = I \times R$$

A battery is connected to the lamp of a torch.
The current in the lamp is 0.5 A and its resistance is 6 Ω.
What is the voltage across the lamp?

A 3.0 V
B 5.5 V
C 6.5 V
D 12.0 V

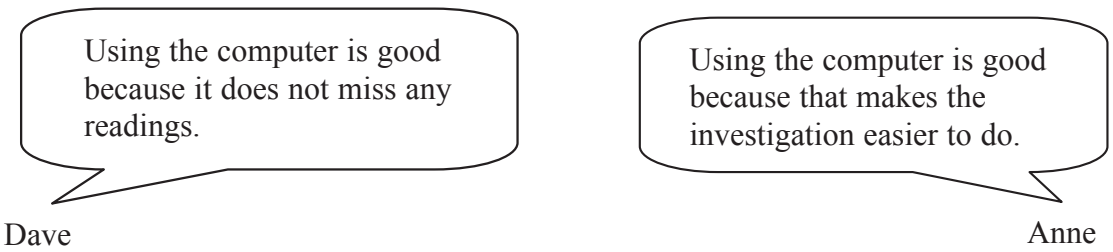
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Wind power

For several months, Dave investigates the wind at the top of a mountain.
He sets up a meter there to take automatic readings of the wind speed.
The wind speed is recorded by a computer every 10 minutes.

17. Dave discusses his investigation with Anne.



Who is correct?

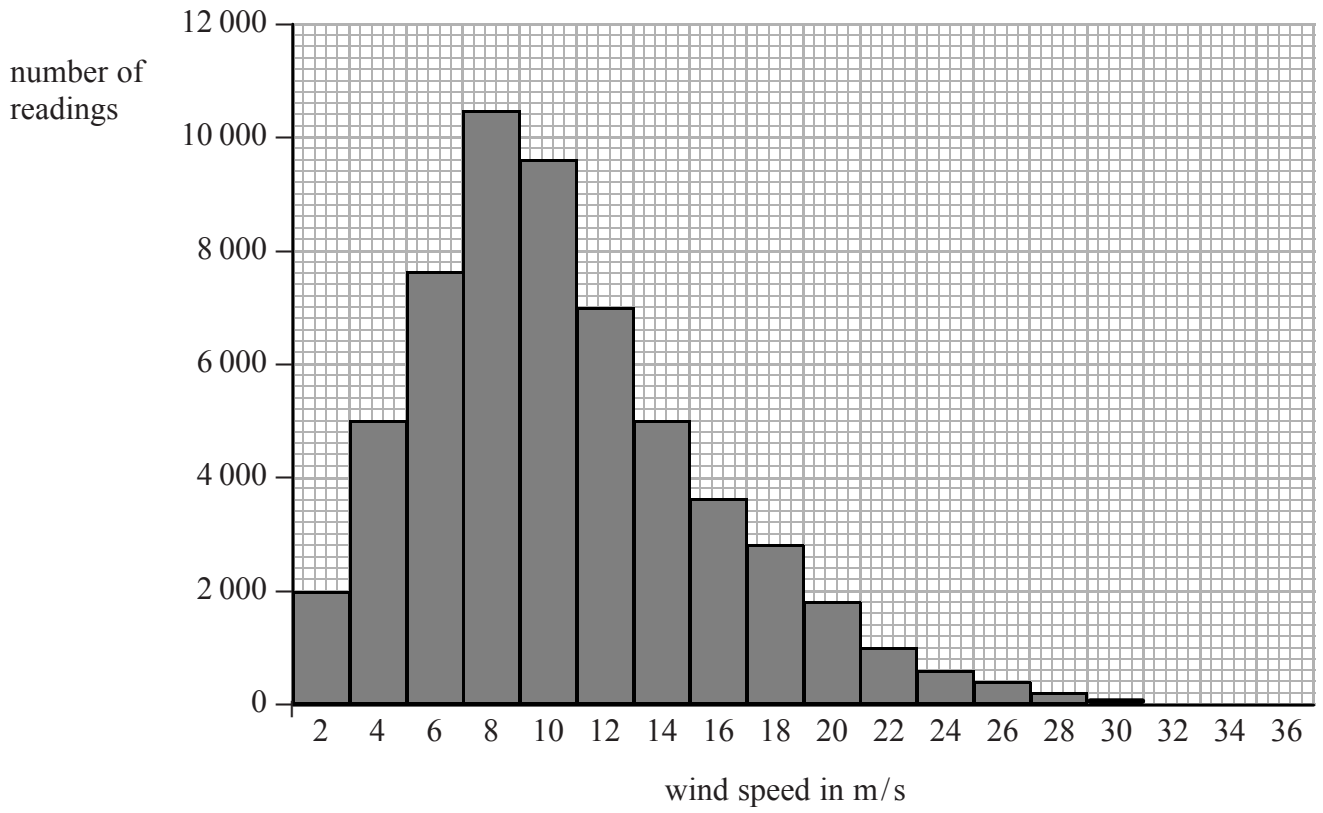
A Dave only
B Anne only
C both Dave and Anne
D neither

18. Dave suggests that the temperature affects the wind speed.
He adjusts his computer to record the wind speed only when the temperature is higher than 20 °C.
This makes his investigation

A less valid
B more valid
C more reliable
D less reliable

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19. The chart shows Dave's results.



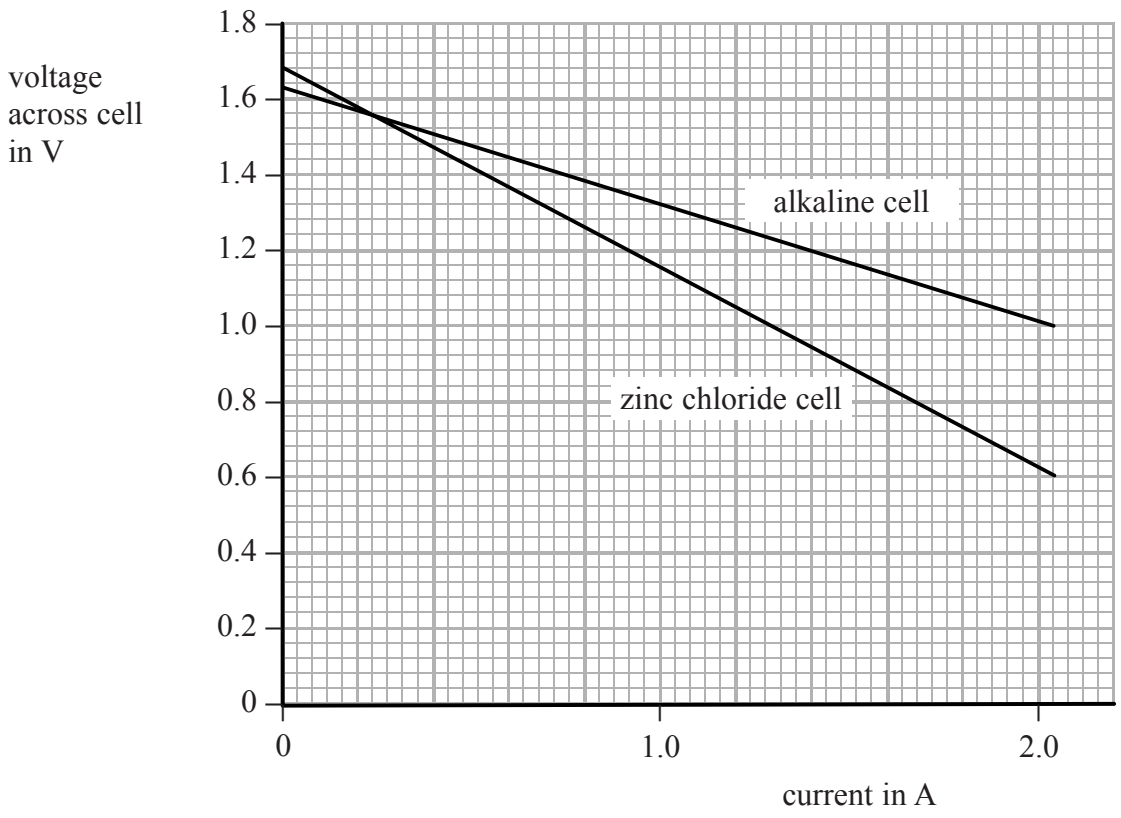
Dave said that the wind speed was 34 m/s sometimes.
This is not shown on the graph because

A there are only 30 bars
B the scale goes up to 36 m/s
C the largest number of readings was at 8 m/s
D the scale cannot show a very small number of readings

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Different types of cells

20. Julia connected a voltmeter across an alkaline cell and measured the current and voltage for different values of current.
Then she repeated the experiment with a zinc chloride cell.
Here are her results.



Which of these is correct for the range of currents shown?

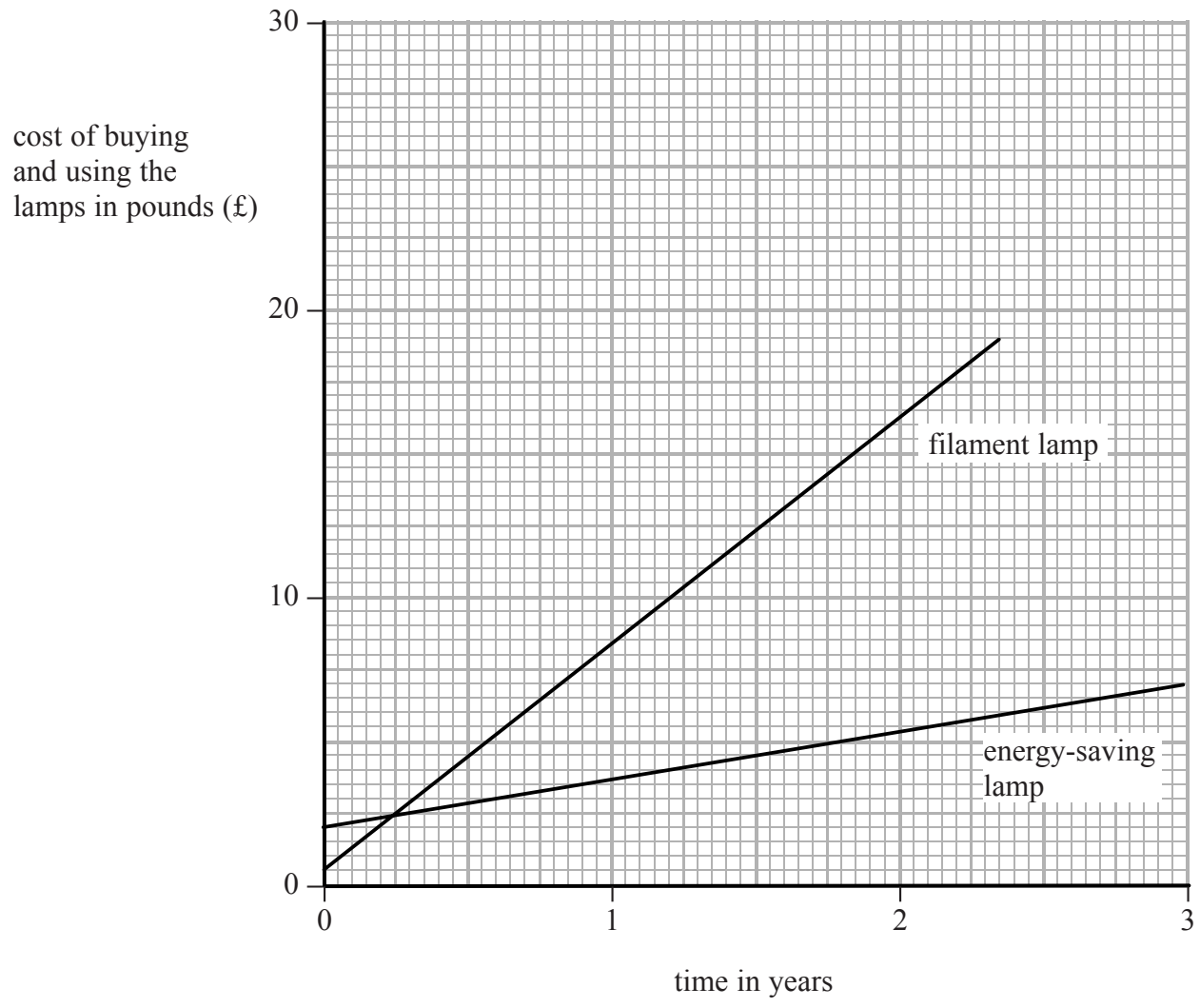
A the alkaline cell voltage is always the bigger
B the maximum voltage shown is about 1.64 V
C the cells have the same voltage at a current of about 0.25 A
D the voltage changes with current faster for the alkaline cell

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Cost effectiveness of light bulbs

Use this information to answer questions 21 and 22.

A 100 W filament lamp and an 18 W energy-saving lamp produce about the same amount of light. The graph shows the cost of buying and using the two lamps for 3 years.



21. The graph shows that the cost of buying an 18 W energy-saving lamp is about

A 25 p
B £ 2
C £ 4
D £ 5

22. It is cheaper to buy and use a filament lamp for about

A 0.25 years
B 2 years
C 4 years
D 5 years

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23.

cost = power x time x cost of 1 kWh

Electrical energy costs 20p for each kilowatt hour.
How much does it cost to run a 100 W filament lamp for 3 hours?

A 0.6p
B 6p
C 15p
D 60p

24. We are advised to use energy-saving lamps.
This is because

A there is less chance of a person receiving an electric shock
B power stations can produce more electricity at lower voltages
C less fuel will be used to make electrical energy for the same amount of light energy
D electricity supply companies charge more for each kWh for filament lamps

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

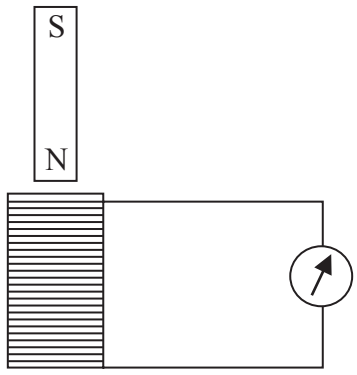
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Making electricity

Use this information to answer questions 25 and 26.

Frank lowers the north pole of a magnet towards a coil.
The pointer on the meter turns to the right.



25. To turn the pointer to the left, Frank should

A lower the magnet further towards the coil keeping the coil stationary
B raise the coil towards the magnet keeping the magnet stationary
C lower the coil keeping the magnet stationary
D raise the magnet and the coil together

26. Frank and Bev discuss how to increase the size of the induced voltage.

Keep a stronger magnet stationary inside the coil.

Frank

Lower the coil and magnet together at the same speed.

Bev

Whose idea will increase the induced voltage?

A Frank only
B Bev only
C both Frank and Bev
D neither

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Power from water

Water in a river or stream can force a turbine to turn as the water moves downstream.



27. This type of power source would be described as

A wave
B tidal
C geothermal
D hydroelectric

28. This type of power source is designed to transfer energy from

A gravitational potential to chemical
B chemical to kinetic
C gravitational potential to electrical
D electrical to kinetic

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Use this information to answer questions 29 and 30.

The table gives information about three different waterways being considered for electricity generation.

description of waterway	**picture of waterway**	**peak flow rate (m^3/s)**	**height the water falls (the head of water) (m)**
brook		0.01	50
stream		0.25	10
river		1.00	2

The height the water falls is called the head.

29. Which of these statements is correct for the three waterways shown in the table?

A the waterway with the peak flow rate of 0.25 m^3/s has the head of 50 m
B the waterway with the biggest head has the lowest peak flow rate
C the waterway with the peak flow rate of 1.00 m^3/s is the stream
D the waterway with the biggest head is the river

30. John found this equation for estimating the power from a water-powered generator.

$$\text{Power (kW)} = \text{Head (m)} \times \text{Peak flow } (m^3/s) \times 5$$

John's estimate of the power output from the generator in the river should be

A 0.4 kW
B 2.5 kW
C 10 kW
D 12.5 kW

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Investigating electrical devices

31.

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

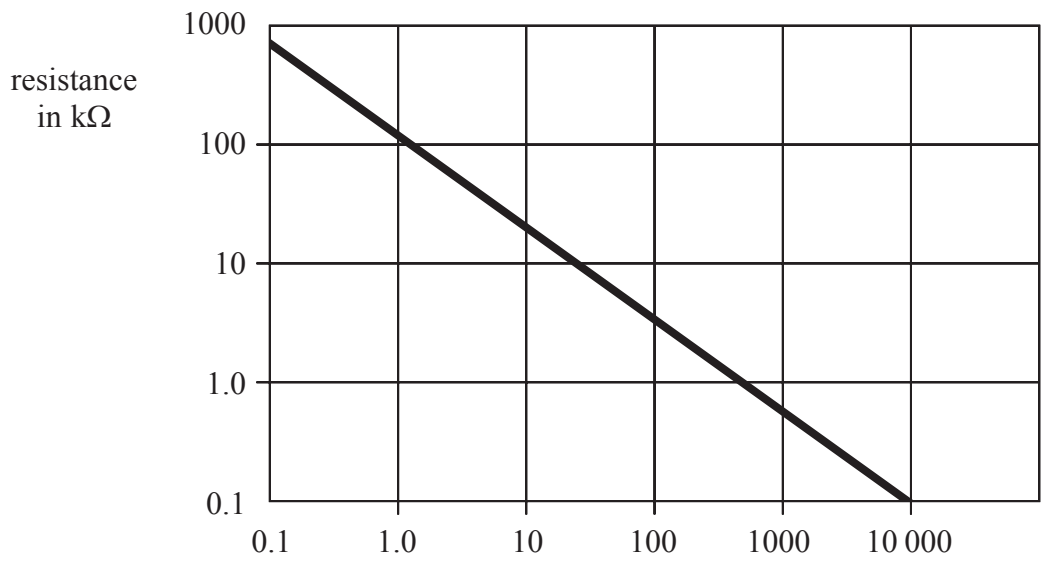
John finds that the efficiency of a solar cell is 24%.
When it supplies 1.2 W of electricity, how much solar energy falls on the cell in each second?

A 0.05 J
B 5 J
C 20 J
D 28.8 J

32.

$V = I \times R$

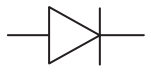
The graph shows how the resistance of a light-dependent resistor depends on the brightness of the incident light.
The brightness is measured in units called lux.



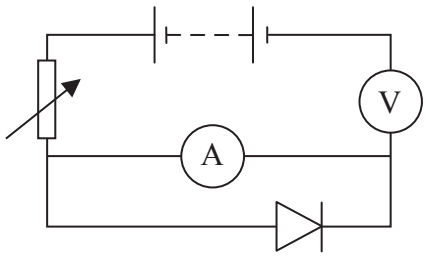
There is a current of 0.02 mA in the light-dependent resistor when the voltage across it is 2 V.
The brightness for this would be about

A 1.0 lux
B 10 lux
C 100 lux
D 1000 lux

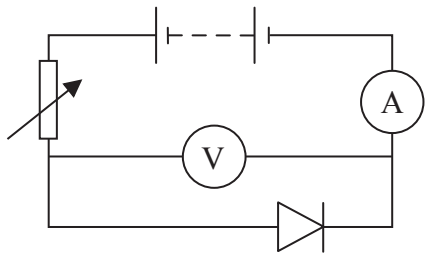
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33. Roger finds that the symbol used in circuits for a device called a diode is  .

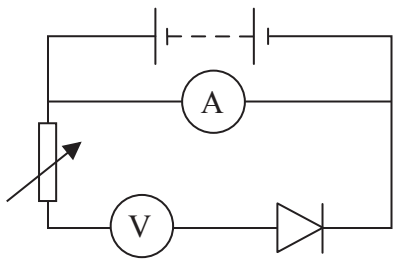
Which of these circuits should Roger set up to find the resistance of the diode?



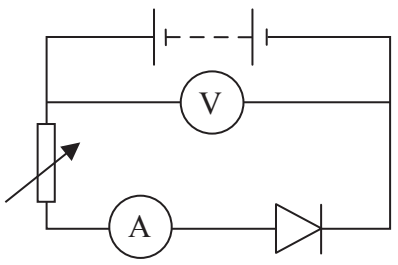
A



B

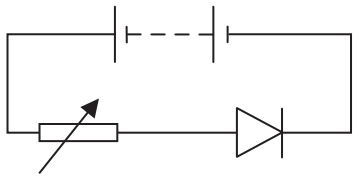


C

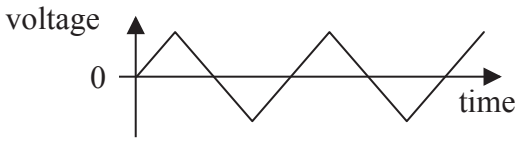


D

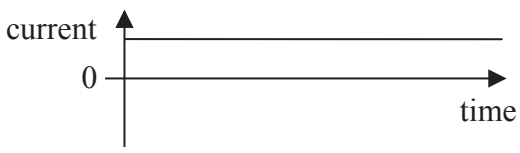
34. A diode affects the current in a circuit.
There **is a current** in the circuit when the battery is connected as shown.



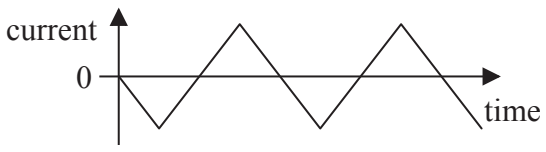
There **is no current** in the circuit when the battery is reversed.
Roger replaces the battery with a device which provides a voltage like this.



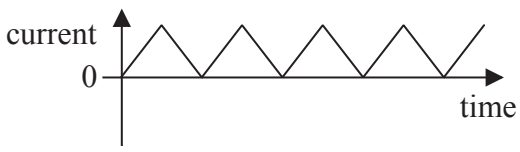
Which of these graphs could show the current that is now in the circuit?



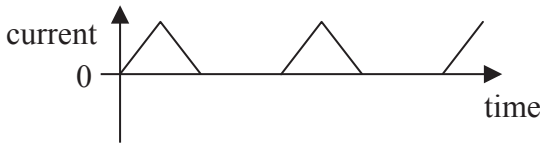
A



B



C



D

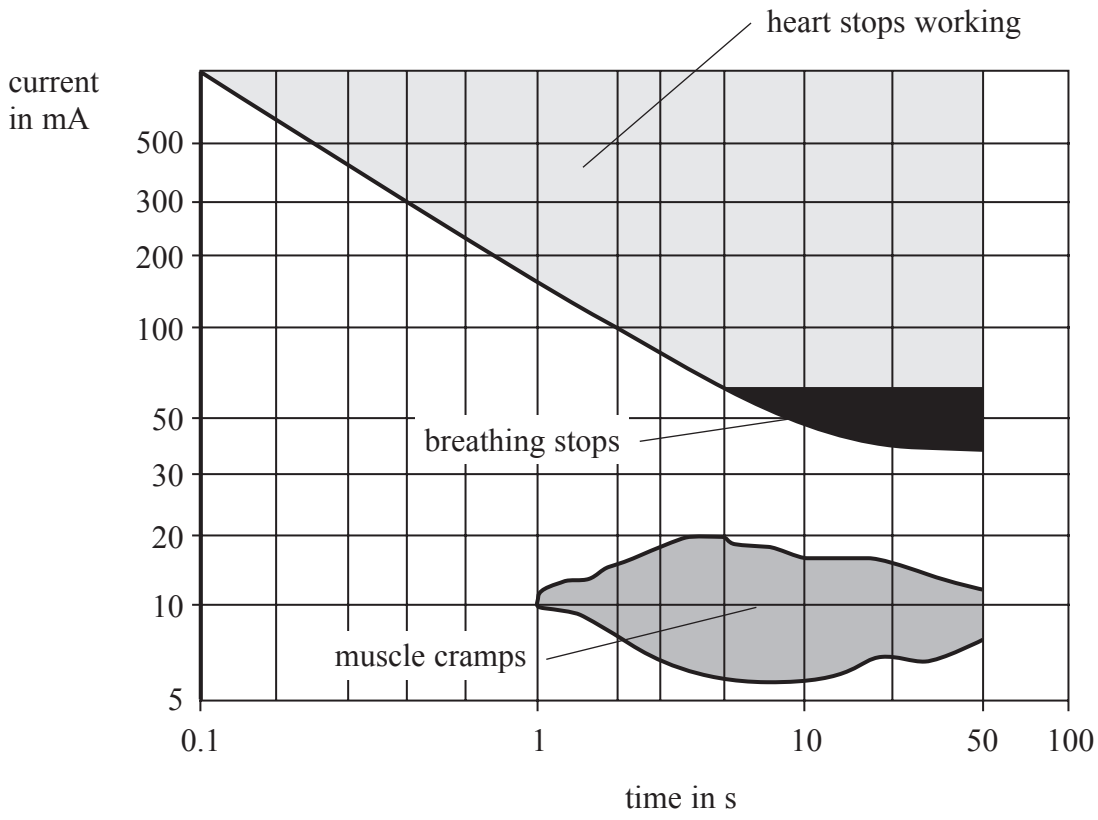
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Use it safely

35. An appliance is connected to the mains supply through a residual current circuit breaker (RCCB).
Which row of the table gives a set of currents that will cause the RCCB to break the circuit?

	current in earth wire (A)	current in neutral wire (A)	current in live wire (A)
A	13	0	13
B	0	13	13
C	13	0	0
D	13	13	13

36. The graph shows how electric shocks affect the human body.
Shocks can have different currents and last for different times.



Which of these shocks would initially cause a victim's breathing to stop?

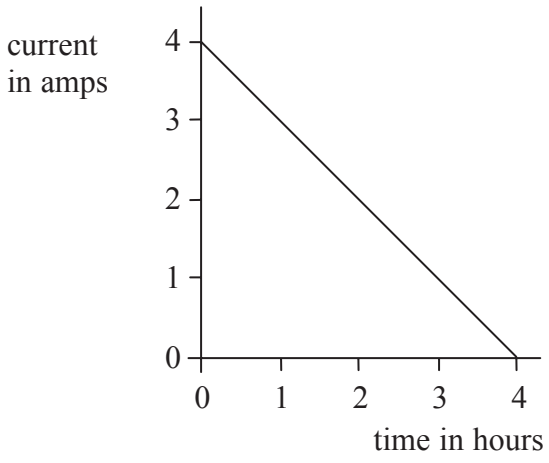
A a current of 30 mA for 10 s
B a current of 50 mA for 20 s
C a current of 300 mA for 1 s
D a current of 500 mA for 20 s

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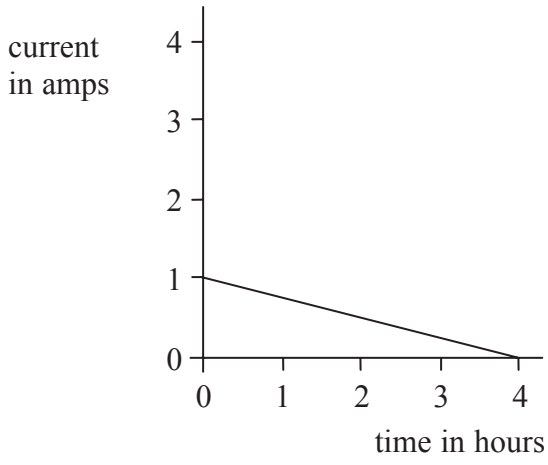
Batteries

37. Four different batteries are fully charged.
Then they are used so that each lasts for four hours.

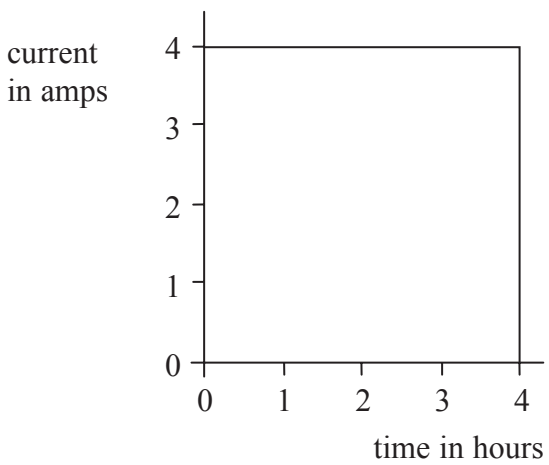
Which of these graphs could be for a battery with a capacity of 4 amp-hours?



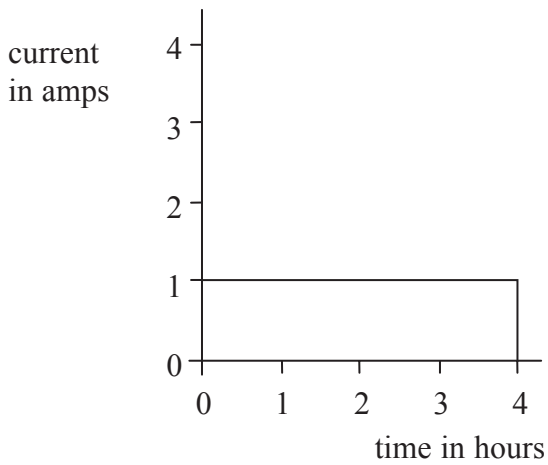
A



B



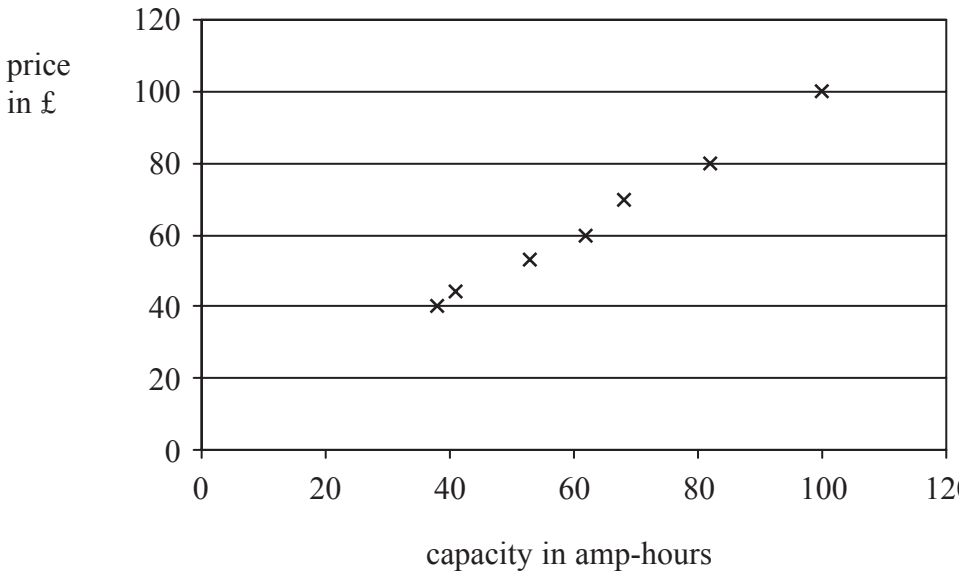
C



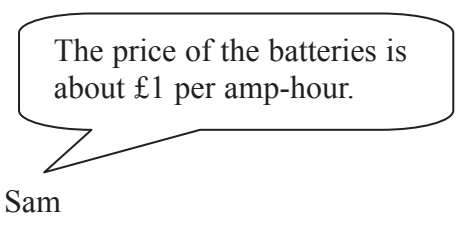
D

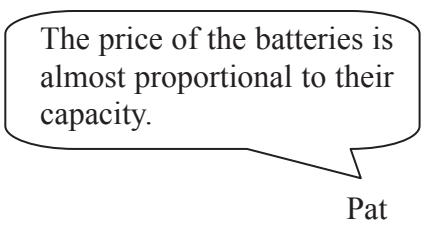
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38. The graph shows the price of car batteries with different capacities.



Sam and Pat discuss the graph.





Who is correct?

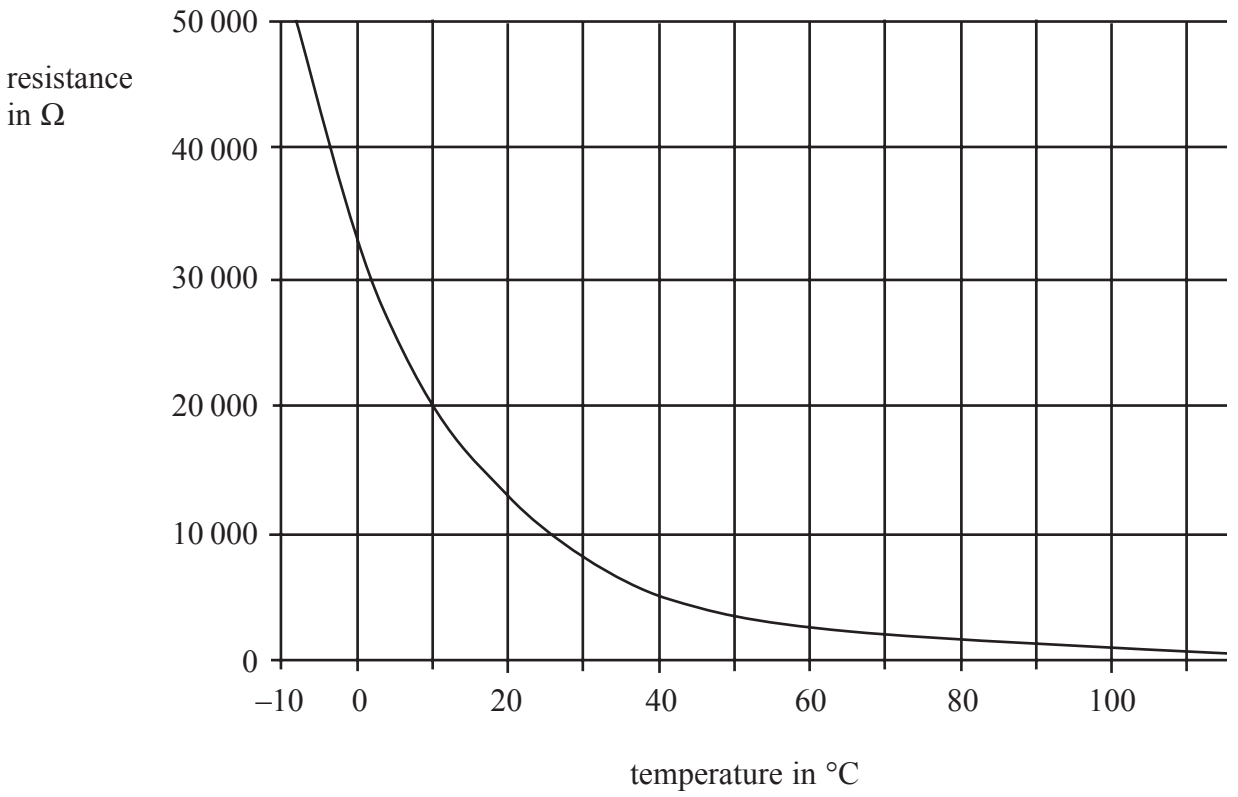
A Sam only
B Pat only
C both Sam and Pat
D neither

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Using a thermistor

Use this information to answer questions 39 and 40.

Sam found this graph of resistance against temperature for a thermistor.



39. $V = I \times R$

A voltage of 4 V is placed across the thermistor.
What is the current when the temperature of the thermistor is 10 °C?

A 0.2 mA
B 0.2 A
C 5000 mA
D 5000 A

40. At a temperature of 10 °C, the rate of change of resistance with temperature, in Ω / °C is about

A –0.0005
B –0.001
C –950
D –2000

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)
November 2010

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November 2010

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5009 Science/ 5045 Physics (P1a)

Unit P1a – 5009/5045	
Topics 9 & 10	
1	D
2	D
3	B
4	D
5	B
6	B
7	D
8	B
9	C
10	D
11	A
12	A
13	C
14	C
15	A
16	A

Unit P1a – 5009/5045	
Topics 9 & 10	
17	C
18	A
19	D
20	C
21	B
22	A
23	B
24	C

Unit P1a – 5009/5045	
Topics 9 & 10	
25	C
26	D
27	D
28	C
29	B
30	C
31	B
32	A
33	B
34	D
35	A
36	B
37	D
38	C
39	A
40	C

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P1a – Topics 9 and 10

Foundation and Higher Tier

Thursday 24 June 2010 – Afternoon

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	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.

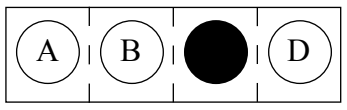
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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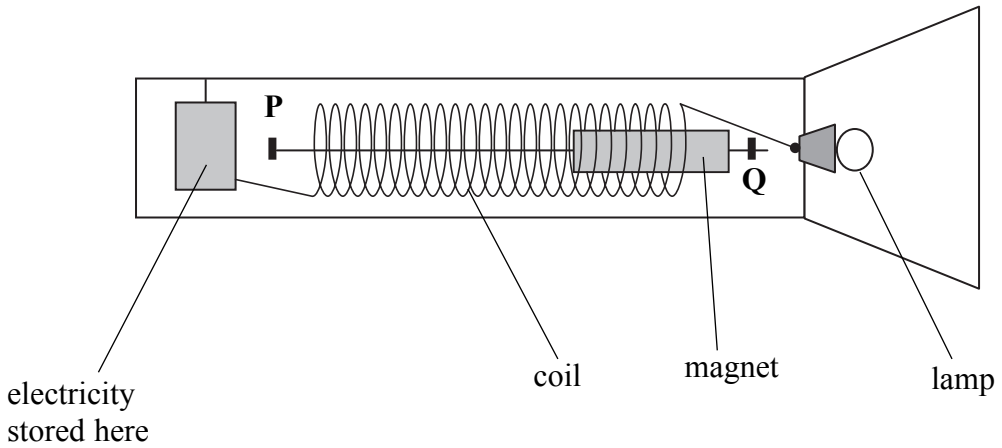
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

John's torch

John's torch contains a magnet which slides from **P** to **Q** inside a coil.
The movement of the magnet produces electricity.



To make it work, the torch has to be shaken.
This induces a voltage across the coil.

1. The coil is made from

A plastic
B glass
C cotton
D metal

2. The size of the induced voltage across the coil depends on

A the temperature of the magnet
B the speed of the magnet
C the colour of the magnet
D the amount of current in the magnet

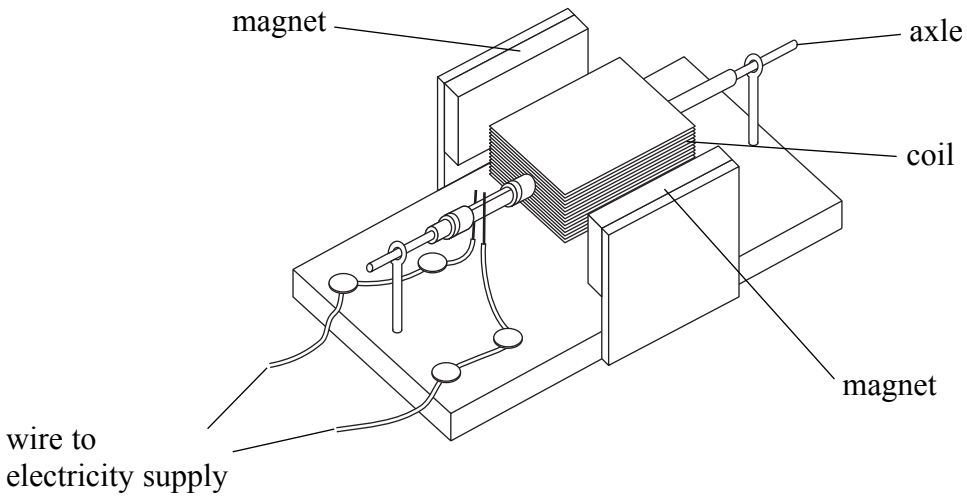
3. The torch does **not** need a fuse because

A the voltage is small
B the lamp produces light
C the torch has a switch
D the torch is earthed

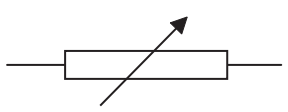
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An electric motor

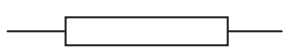
The diagram shows a simple electric motor.



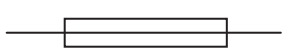
4. The speed of a motor can be controlled by a variable resistor.
Which of these shows the symbol for a variable resistor?



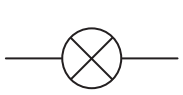
A



B



C



D

5. The current in the wires of the coil is a flow of

A copper atoms
B copper ions
C negative electrons
D positive electrons

6. Motors like this have a low efficiency.
A low efficiency means that

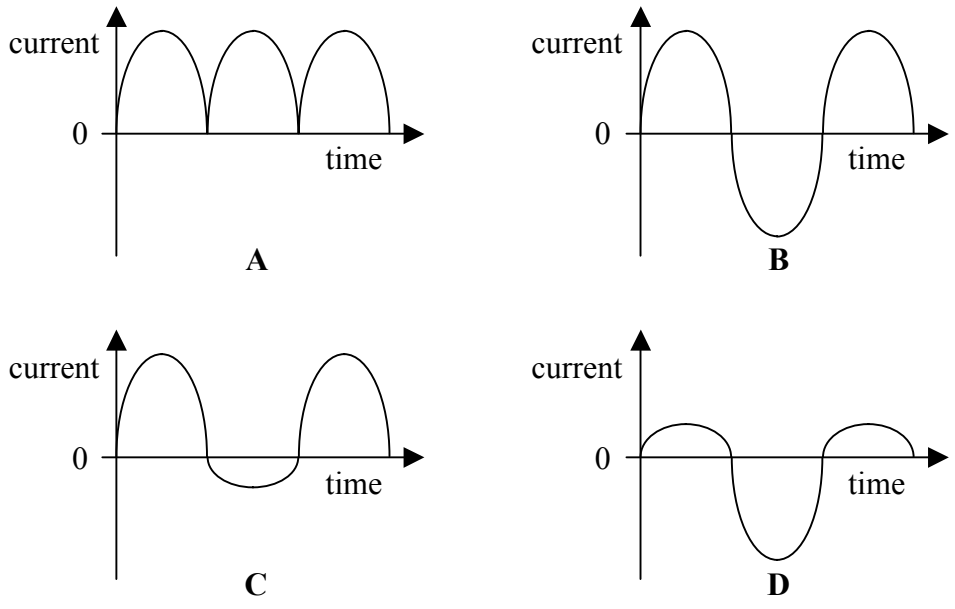
A a lot of time is wasted
B a lot of energy is wasted
C a lot of current is wasted
D a lot of resistance is wasted

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7. The motor is **designed** to transfer electrical energy into

A chemical energy
B light energy
C kinetic energy
D wind energy

8. Which of these is a direct current?



9. Which of these is a **source** of direct current?

A an ammeter
B a solar cell
C a fixed resistor
D an energy-saving lamp

Interschool quiz

Alex makes up some questions for the science section of the quiz.
Here are some of her questions for you to answer.
Please answer them.

10. Sometimes a person is better than a computer at taking readings.
A reason for this is that

A a person can take readings more quickly
B a person can repeat readings more often
C a person can take readings in more places
D a person can decide how many readings to take

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11. The shutter of a digital camera is kept open for different times.
The length of time depends on the brightness.
Which of these controls how long the shutter is kept open?

A a thermistor
B a dynamo
C a light-dependent resistor
D a stopwatch

12. Which of the following have only been possible for about a hundred years?

A measuring temperature
B measuring pulse rate
C X-raying broken bones
D pulling out bad teeth

13. The rate of transfer of electrical energy is the same as

A resistance
B current
C voltage
D power

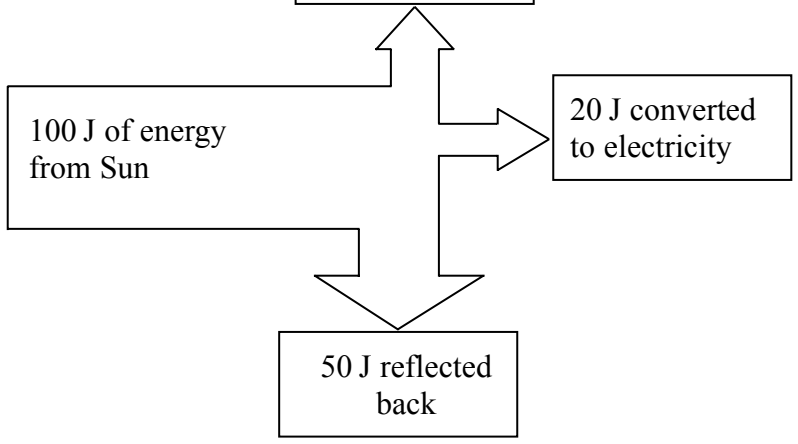
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Solar power

14.

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

Ian uses a solar cell to charge his batteries.
The diagram shows what happens to the energy from the Sun after it strikes the solar cell.



The efficiency of the solar cell is

A 20%
B 30%
C 50%
D 100%

Use this information to answer questions 15 and 16.

Harmful gases are produced when fossil fuels are burnt.
Using one system of solar cells instead will reduce the amount of harmful gases by 1200 kg each year.
During the lifetime of this system this adds up to about 30 000 kg.

15. The lifetime of this system is about

A 0.04 years
B 25 years
C 31 200 years
D 36 000 000 years

16. Which of these is **produced** when fossil fuels burn?

A carbon dioxide
B nitrogen
C oxygen
D natural gas

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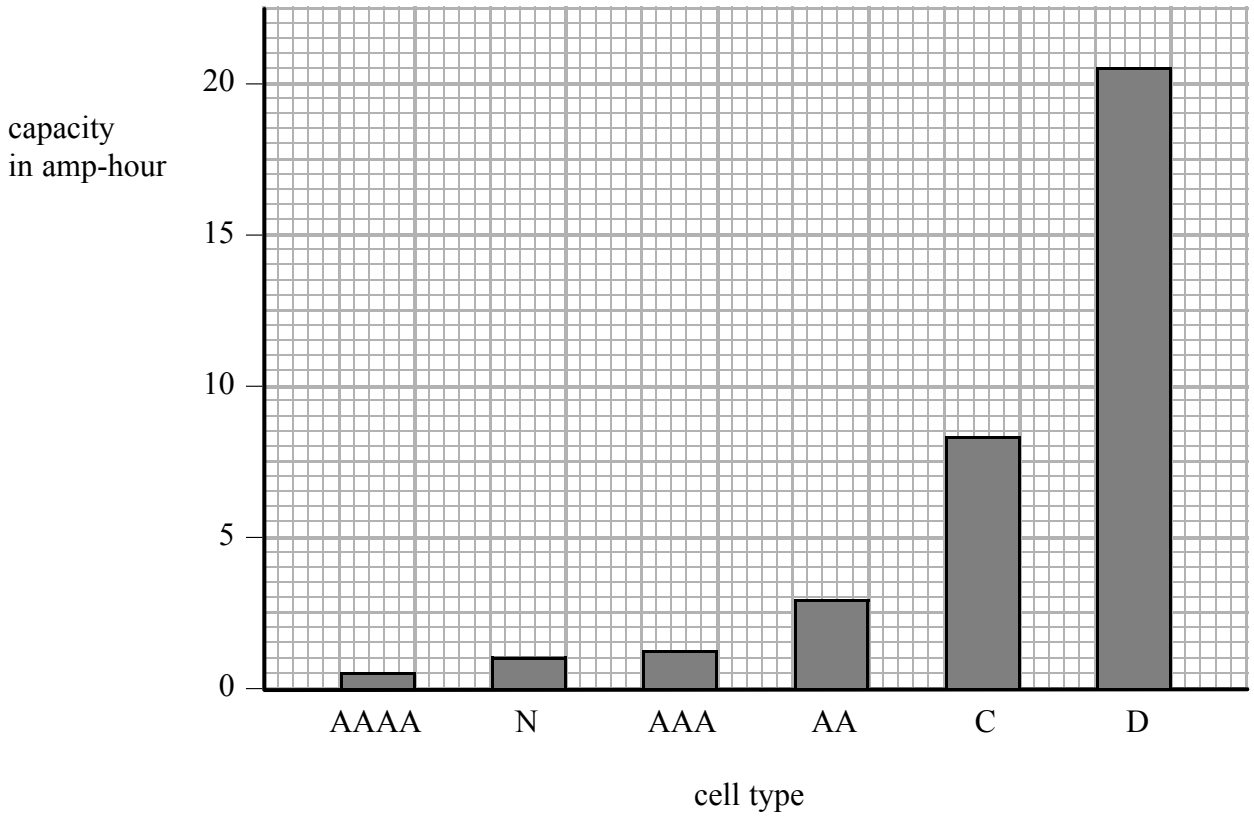
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Capacity of cells

The bar chart below shows several types of cell and the capacity of each.



17. The capacity of a type C cell is

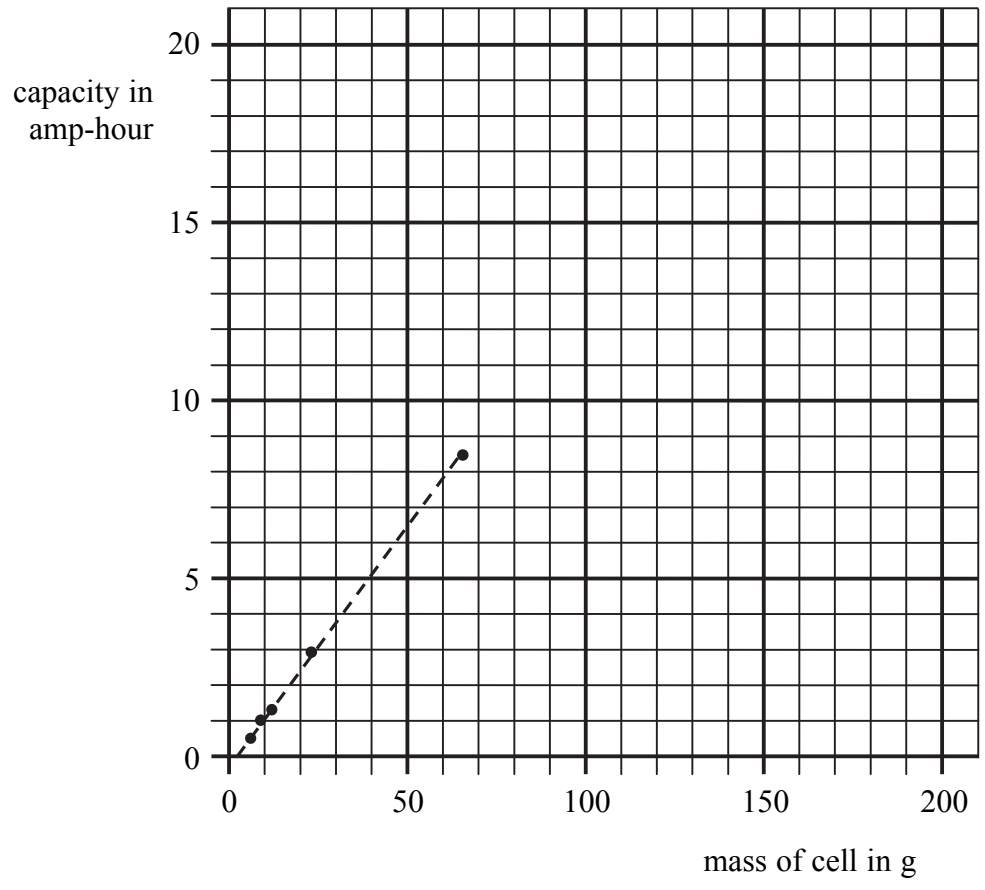
A 0.5 amp-hour
B 1.3 amp-hour
C 2.9 amp-hour
D 8.3 amp-hour

18. A bar chart is the best way of displaying this data about cell type.
This is because the data is

A reliable
B not reliable
C continuous
D discontinuous

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The graph below shows the capacities and masses of the first five types of cell shown in the opposite chart.



19. The mass of a type D cell is probably about

A 115 g
B 130 g
C 155 g
D 180 g

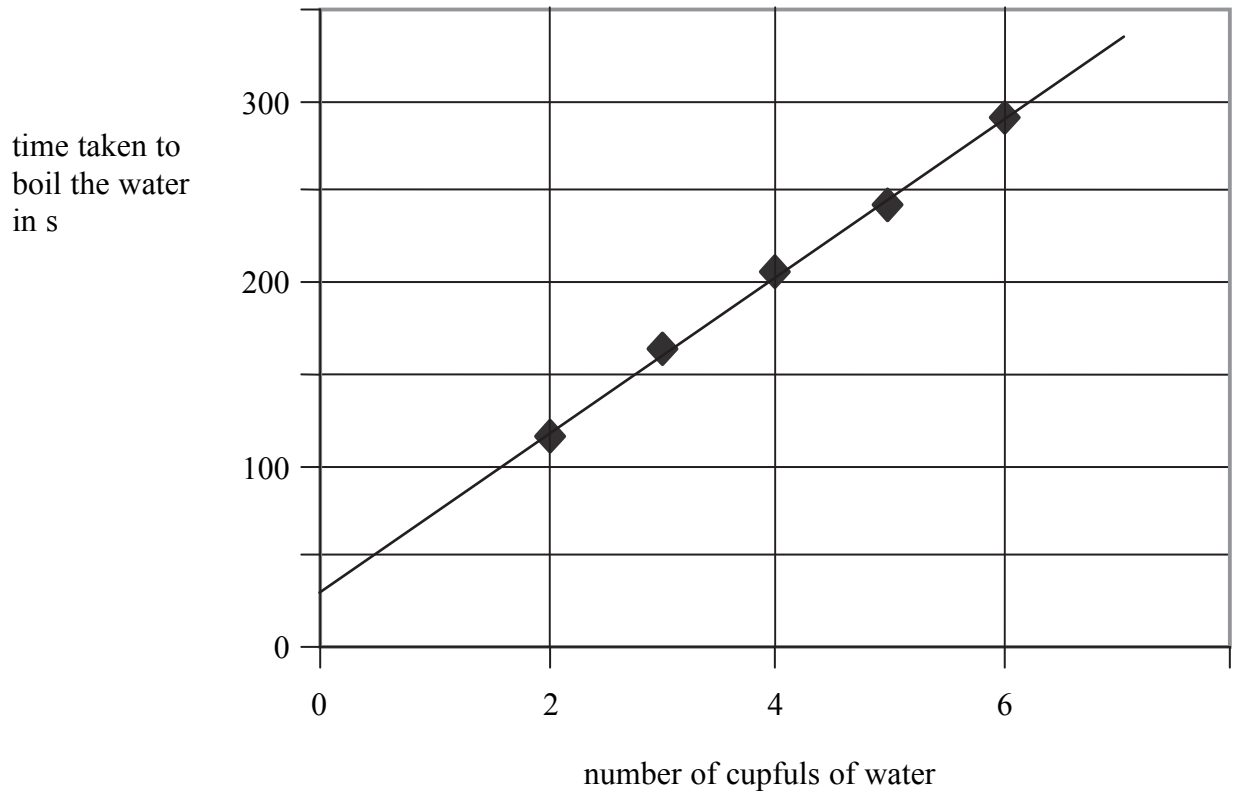
20. Ian noticed that the line of best fit did not pass through the origin of the graph. A reason for this could be that

A the casing of each cell has a small mass
B the capacity of each cell depends on its height
C the chemicals in each cell stop reacting
D the lifetime of each cell is the same

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Anne's kettle

Anne investigates how long it takes her kettle to boil different amounts of cold water.
She displayed her results on her computer.



21. The time it would take to boil 3½ cupfuls of water in Anne's kettle would be about

A 150 s
B 175 s
C 225 s
D 250 s

22.

power = current × voltage

The 230 V mains produces a current of 10 A in Anne's kettle.
What is the power of her kettle?

A 23 W
B 23 kW
C 2300 W
D 2300 kW

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23.

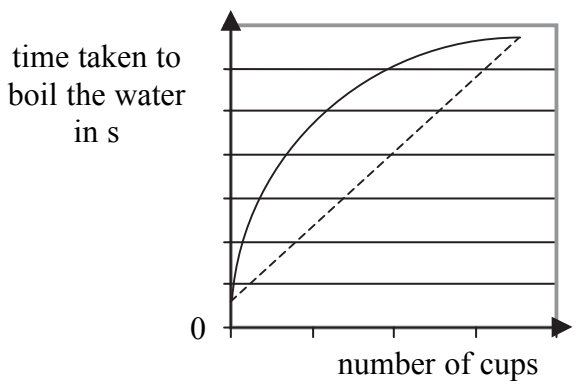
cost = power × time × cost of 1 kWh

The price of electricity is 20p per kWh.
A 3 kW kettle is on for 15 minutes during a day.
How much does this cost?

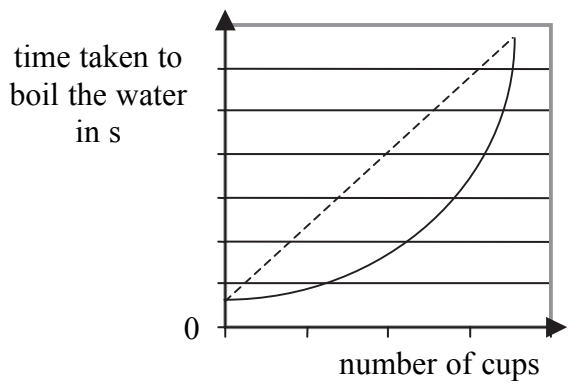
A £0.15
B £0.40
C £2.25
D £9.00

24. Anne put a towel around the kettle and repeated her experiment.
The dotted lines show Anne's original graph for comparison.

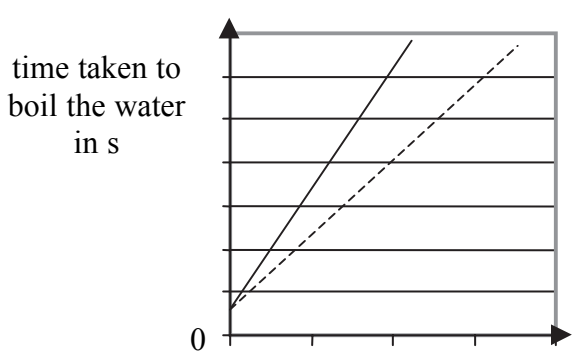
Which of these graphs would show her results with the towel?



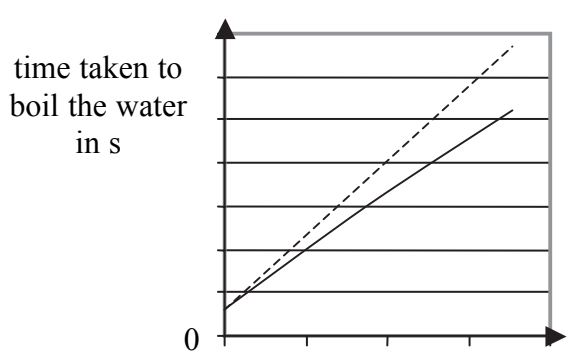
A



B



C



D

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

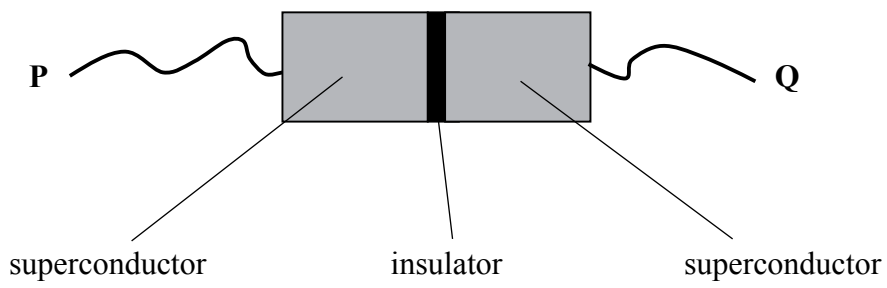
Foundation tier candidates do not answer any more questions after question 24.

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

Superconductivity

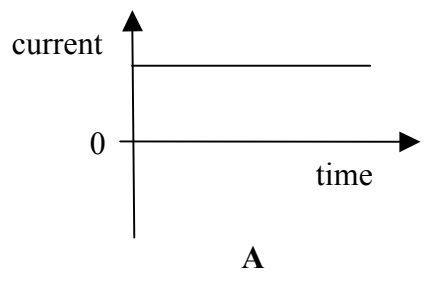
An application of superconductivity is the Josephson junction.
This is made of an insulator in between two superconductors.



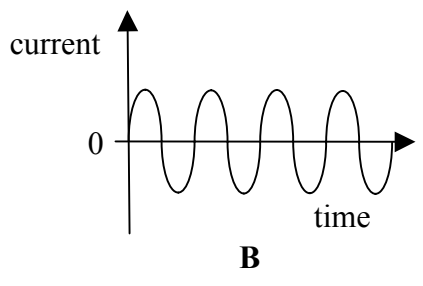
One source on the Internet states that

> - When a d.c. voltage is applied between **P** and **Q**, there is an alternating current between **P** and **Q**.
> - The frequency of the current is directly proportional to the d.c. voltage.

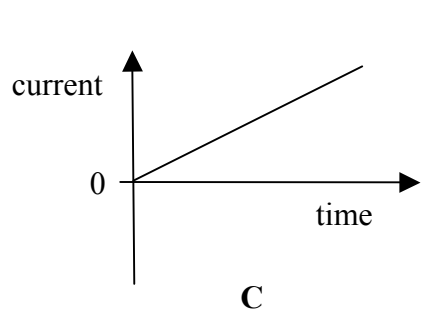
25. Which of these shows the current between **P** and **Q**?



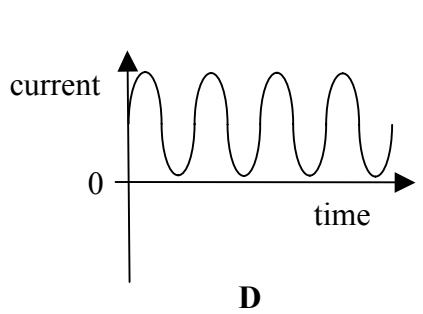
A



B



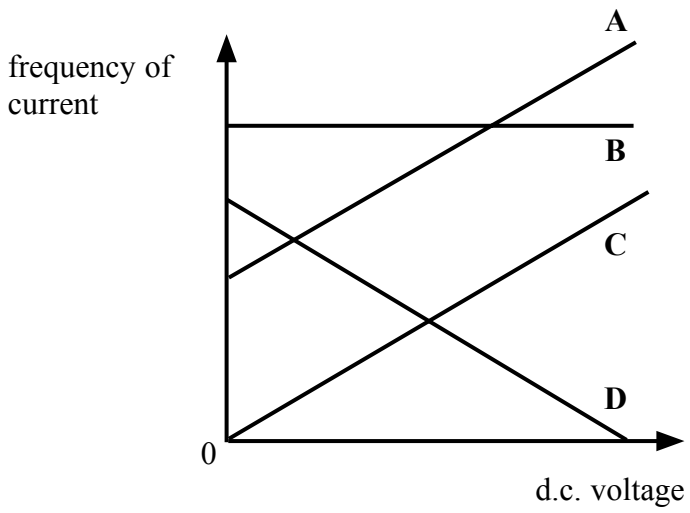
C



D

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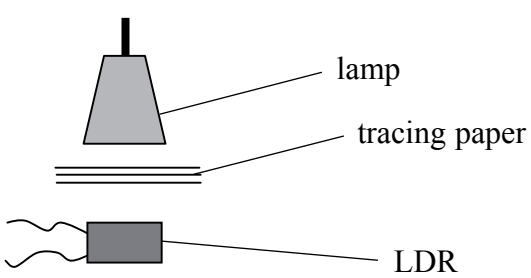
26. Which line on the graph shows how the frequency of the current is related to the d.c. voltage for a Josephson junction?



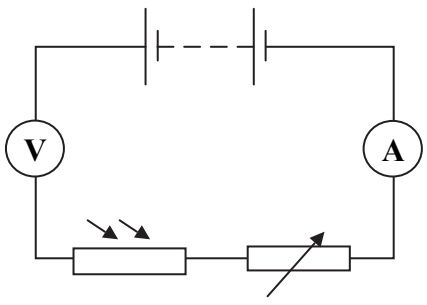
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Investigating light-dependent resistors (LDRs)

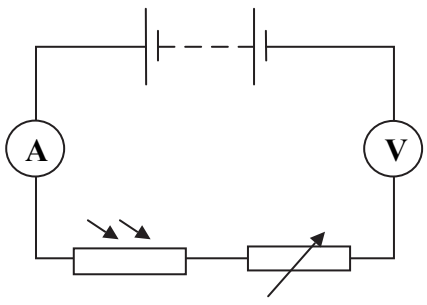
Peter and his group investigate a light-dependent resistor.
They use different numbers of sheets of tracing paper between a lamp and the LDR.



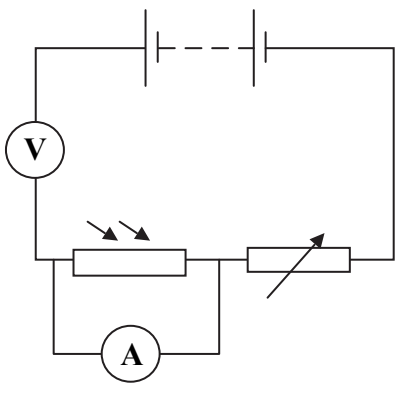
27. Which of these shows the circuit they should use to measure the resistance of the LDR?



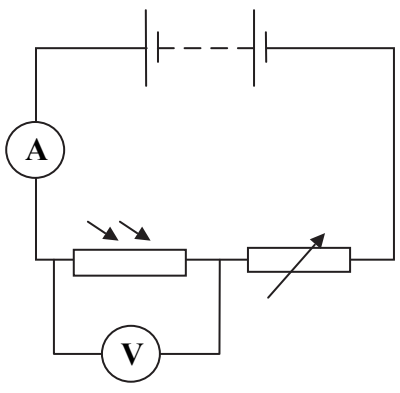
A



B



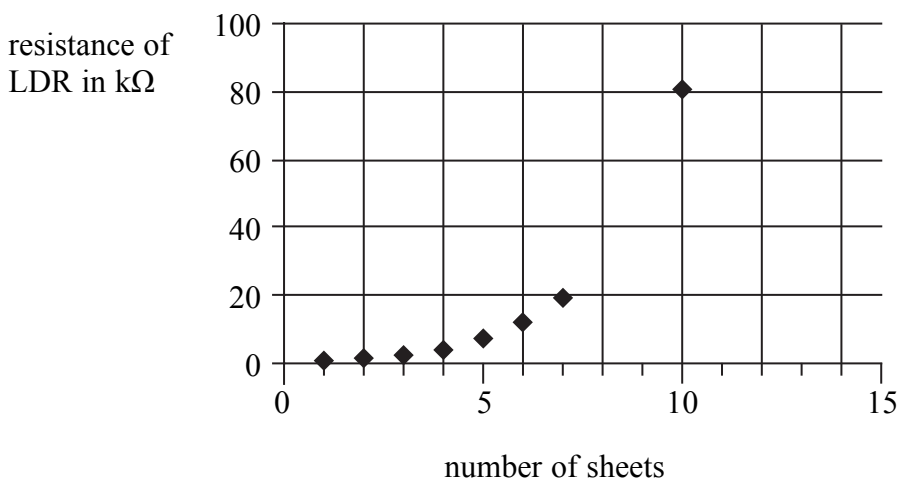
C



D

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Peter plotted the results on the grid below.



28. Peter estimated the value of resistance for 9 sheets of paper to be 52 kΩ.
His friends comment on his results.

Peter's estimate would have been more **valid** if he had drawn a straight line of best fit.

Anne

Peter's value would have been more **reliable** if he had used a straight line to join the points for 7 and 10 sheets.

Bart

Peter could make a more **valid** estimate for 9 sheets if he had found the value of resistance for 8 sheets.

Carl

Peter's value would have been more **reliable** if he had quoted it to more places of decimal.

Dawn

Who is correct?

A Anne
B Bart
C Carl
D Dawn

29. $V = I \times R$

The voltage across the LDR is 12 V.
When Peter used 10 sheets of paper, the current in the LDR was about

A 0.15 mA
B 0.67 mA
C 0.15 A
D 0.67 A

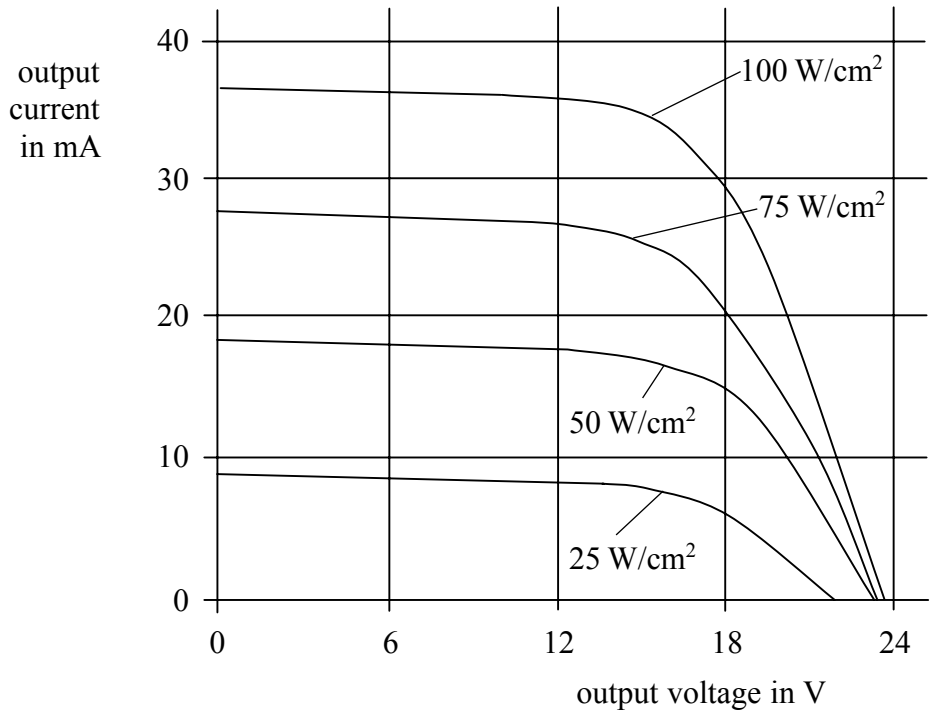
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Electricity at home

30. Paul wants to install a wind-powered generator on his house but his neighbours are objecting.
A good reason for objecting is that the wind-powered generator might

A generate alternating current
B cause a strong magnetic field
C produce noise pollution
D only work when the wind blows

31. The graph shows how output current and output voltage vary for different intensities of light (25 W/cm^2 to 100 W/cm^2) on a solar panel.



Which of these statements is correct for the graph?

A The output current is directly proportional to the output voltage
B The output voltage is nearly proportional to light intensity
C For 50 W/cm^2, the output voltage increases as the output current increases
D At 6 V, the output current is nearly proportional to the light intensity

32. Anne drills a hole in a wall.
She should connect her power drill to the mains through a residual current circuit breaker (RCCB).
An RCCB is designed to

A act slowly to let the fuse ‘blow’
B act quickly when there is an electrical fault
C allow the drill to turn slowly for more power
D be replaced each time it breaks the circuit

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33.

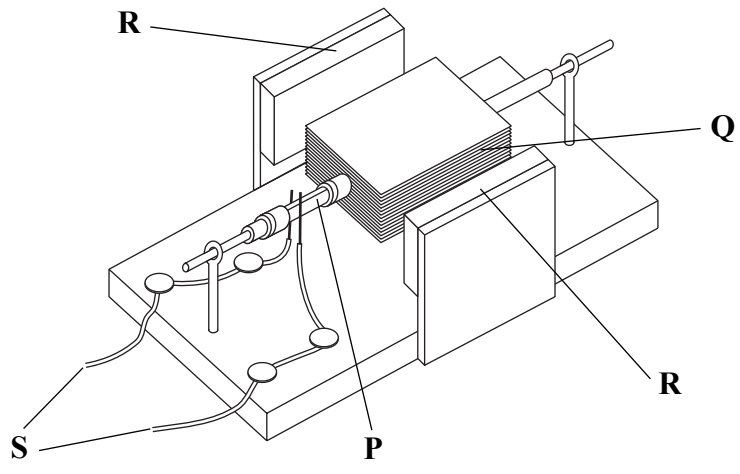
$$\text{efficiency} = \frac{\text{useful output}}{\text{total input}} \times 100\%$$

The electric motor in Anne's drill has an efficiency of 40%.
The drill provides 1000 J of useful energy.

The total energy supplied to the drill is

A 25 J
B 400 J
C 2500 J
D 40 000 J

34. The diagram shows a simple electric motor.



Which two parts provide the turning forces in the motor?

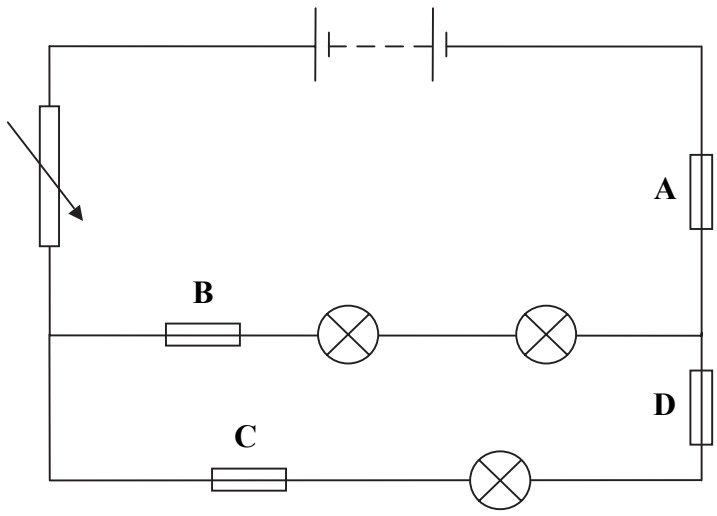
A **P** and **Q**
B **Q** and **S**
C **Q** and **R**
D **P** and **S**

35. Which row of the table correctly compares a fuse and an RCCB?

	a fuse is designed to protect	**an RCCB works by comparing**
A	a person	currents
B	the appliance	voltages
C	a person	voltages
D	the appliance	currents

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36. The diagram shows a circuit containing three identical lamps and four identical fuses.



The resistance of the variable resistor is gradually reduced until one of the fuses ‘blows’.
Which fuse is likely to ‘blow’ first?

37.

power = current × voltage

A night light for a child’s room works from the 230 V mains with a power of 2 W.
The arrangement has a built-in fuse.
The value of the fuse should be

A 50 mA
B 800 mA
C 13 A
D 115 A

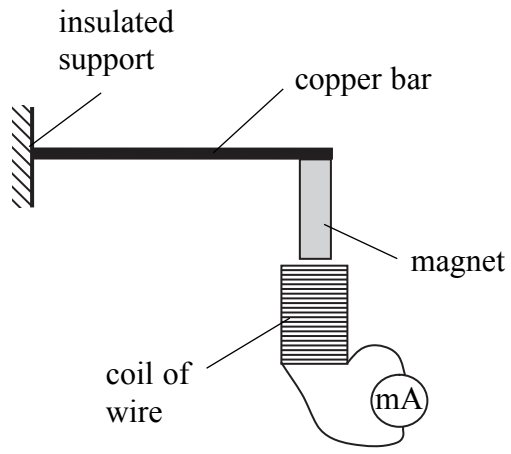
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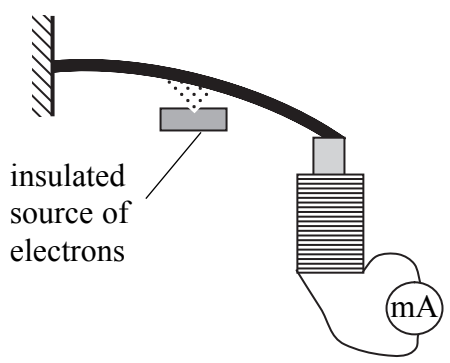
An atomic battery

The diagram shows an arrangement which produces electricity in the coil.

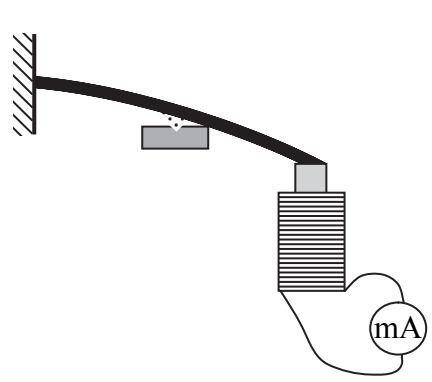
- A copper bar is fixed to an insulated support at one end
- A magnet hangs from the other end



- Electrons from an insulated source strike the copper bar
- The copper bar becomes charged
- The copper bar is attracted towards the source and bends.

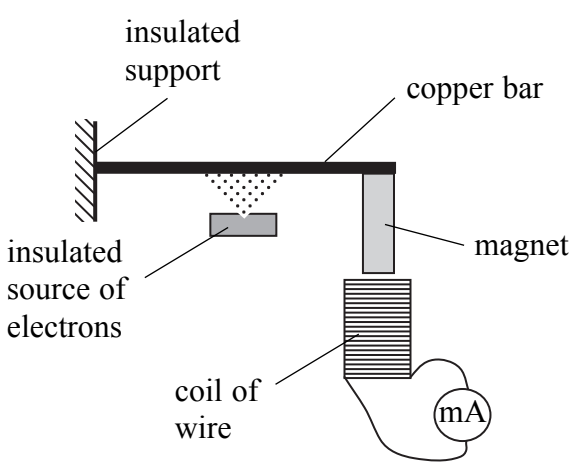


- The magnet moves downwards into the coil.
- Eventually the bar touches the source and discharges.



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- The bar springs back straight again, pulling the magnet out of the coil.

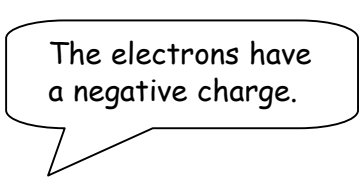


38. The energy changed to electrical energy comes from the

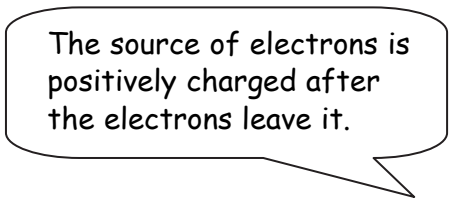
A insulated support
B wire in the coil
C bending of the bar
D source of electrons

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39. The movement of electrons across the space between source and copper bar forms an electric current.
John and Anne discuss these electrons.



John



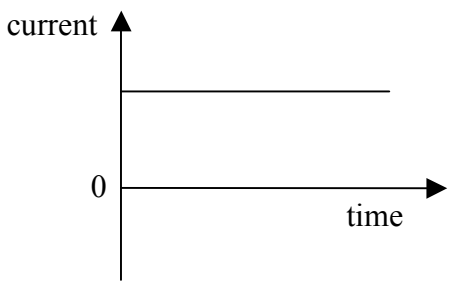
Anne

Who is correct?

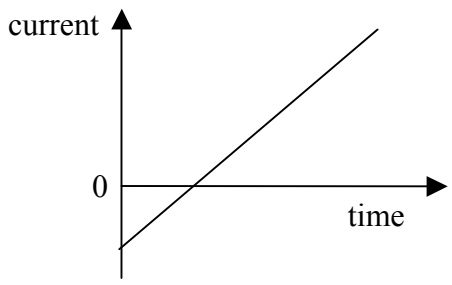
A John only
B Anne only
C both John and Anne
D neither

40. The charge on the bar increases steadily.
The bar slowly bends until it touches the source.
Then it springs back quickly to become straight.

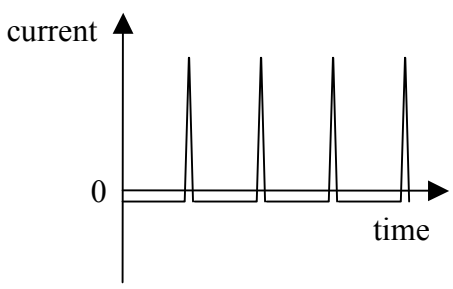
Which of these graphs **best** predicts the current in the meter?



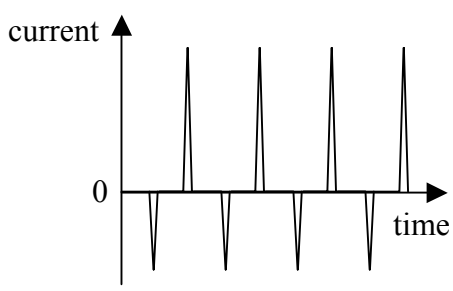
A



B



C



D

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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Summer 2010

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5009 Science/ 5045 Physics (P1a)

Unit P1a – 5009/5045	
Topics 9 & 10	
1	D
2	B
3	A
4	A
5	C
6	B
7	C
8	A
9	B
10	D
11	C
12	C
13	D
14	A
15	B
16	A

Unit P1a – 5009/5045	
Topics 9 & 10	
17	D
18	D
19	C
20	A
21	B
22	C
23	A
24	D

Unit P1a – 5009/5045	
Topics 9 & 10	
25	B
26	C
27	D
28	C
29	A
30	C
31	D
32	B
33	C
34	C
35	D
36	A
37	A
38	D
39	C
40	C

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Foundation and Higher Tier

Friday 5 March 2010 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	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.

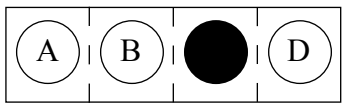
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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

Energy sources

1. Solar cells generate electricity using

A light energy
B fossil fuels
C geothermal energy
D nuclear energy

2. Which of these is a renewable source of energy?

A coal
B wind
C oil
D natural gas

3. Harmful gases are produced when electricity is generated using

A wind power
B solar power
C wave power
D fossil fuels

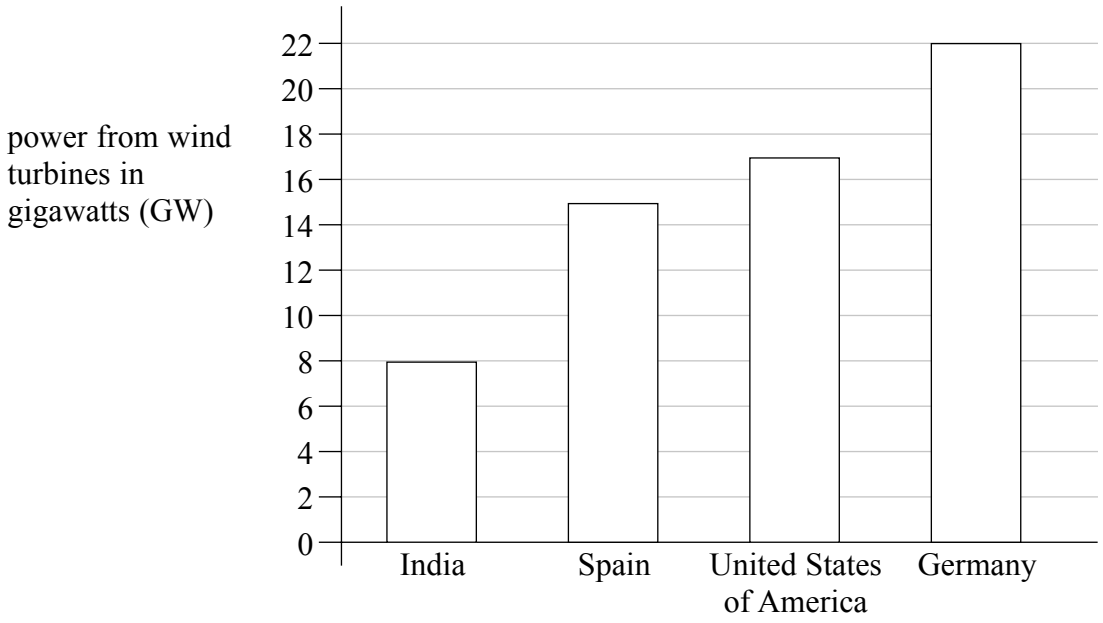
4. In a wind turbine, kinetic energy is transferred to electrical energy in

A a generator
B a battery
C a rechargeable cell
D a motor

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Use this information to answer questions 5 and 6.

The bar chart shows the electrical power from wind turbines in different countries.



5. The power from wind turbines in the United States is

A 8 GW
B 15 GW
C 17 GW
D 22 GW

6. How much **more** power is generated by the wind turbines in Germany than in Spain?

A 37 GW
B 22 GW
C 15 GW
D 7 GW

7. The type of current supplied by a battery is

A alternating current
B direct current
C rotating current
D indirect current

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Investigating battery-powered cars

Some students investigate different makes of 1.5 V battery.
The car travels around a track until the battery runs out.
They test each battery with the same car and track.
They time how long each make of battery lasts.



8. Which of these is the **independent** variable (the variable the students change) in this investigation?

A how long each battery lasts
B the type of car
C the distance the car travels
D the make of battery

Use this information to answer questions 9 and 10.

The students collected the following data about batteries they tested.
The average current was the same for each battery.

make	how long each battery lasts (minutes)	cost (p)
Volta	25	25
Huffa	30	75
Zinclo	35	18
Litho	40	230

9. Which battery has the smallest capacity?

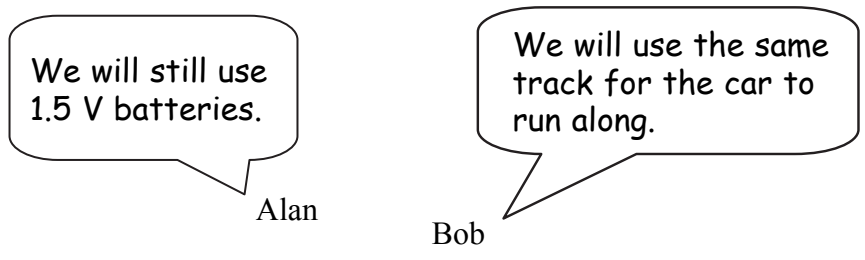
A Volta
B Huffa
C Zinclo
D Litho

10. Litho batteries are

A the most expensive and last the shortest time
B the most expensive and last the longest time
C the least expensive and last the shortest time
D the least expensive and last the longest time

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11. The students plan a second investigation about the capacities of batteries.

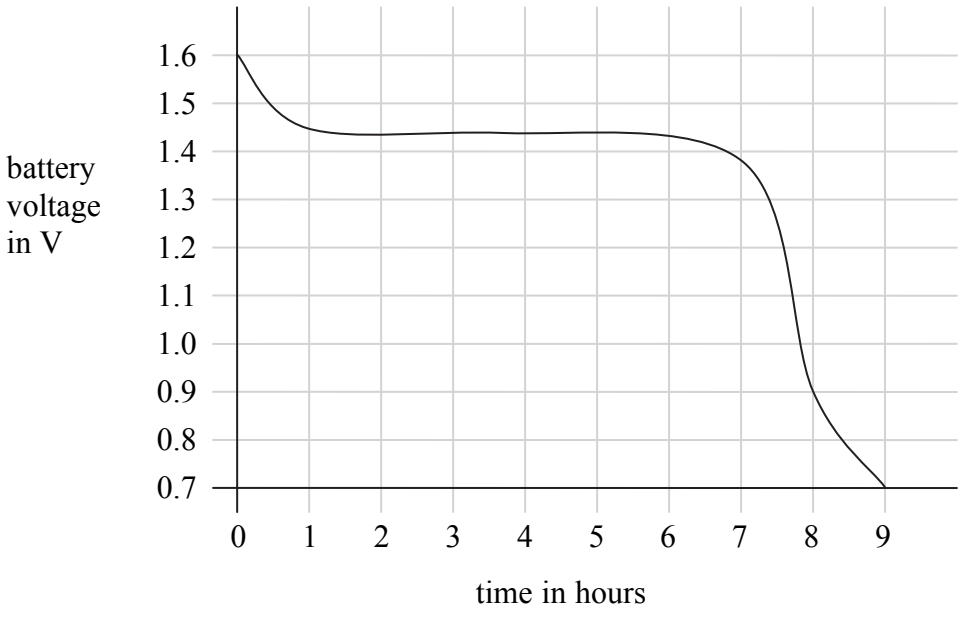


The students want to compare the results of the two investigations.
Whose idea would stop this comparison from being **valid**?

A Alan
B Bob
C Carol
D Donna

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12. The students find this information about one make of battery used in a torch.



The torch will stop working when the battery voltage falls below 0.9 V.
With this battery the torch works for

A 1.6 hours
B 6 hours
C 8 hours
D 9 hours

Physics in the home

13. Which of these is designed to melt when an appliance becomes faulty?

A live wire
B neutral wire
C fuse wire
D earth wire

14. The normal current in an electric heater is 10 A.
A suitable fuse for the heater is labelled

A 3 A
B 5 A
C 13 A
D 30 A

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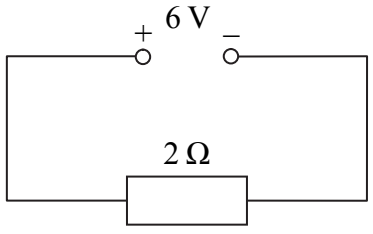
15. Which of these will increase fuel bills?

A changing the loft insulation from 50 mm thickness to 150 mm
B changing the central heating thermostat from 19 °C to 21 °C
C replacing single glazed windows with double glazed windows
D filling cavity walls with insulating material

Comparing resistors

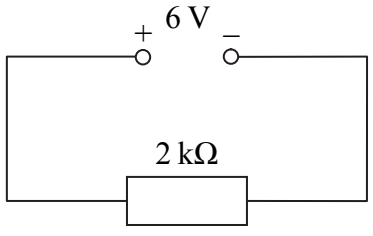
16. Here is circuit **X**:

circuit **X**



In circuit **Y** the resistance is different.

circuit **Y**



The current in circuit **Y** is

A less than in circuit **X**
B more than in circuit **X**
C the same as in circuit **X**
D zero

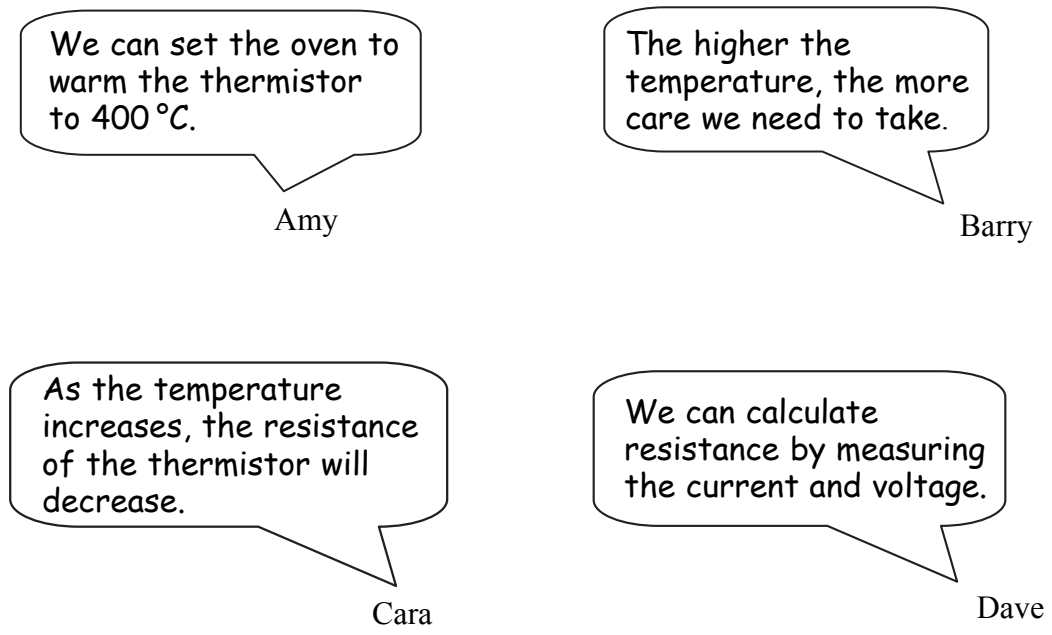
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Investigating thermistors

Amy and her friends investigate how the resistance of a thermistor varies with temperature.
They put the thermistor and its connecting wires inside a small oven.

17. The students discuss their investigation.



Who has made a prediction for the investigation?

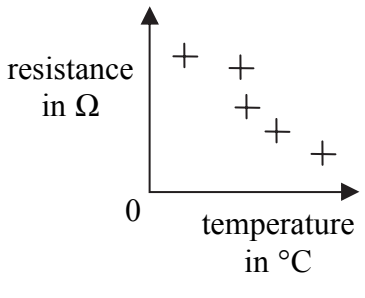
A Amy
B Barry
C Cara
D Dave

18. To measure the current in the thermistor the students should connect

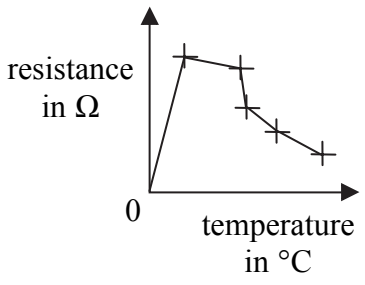
A an ammeter in series with the thermistor
B an ammeter in parallel with the thermistor
C a voltmeter in series with the thermistor
D a voltmeter in parallel with the thermistor

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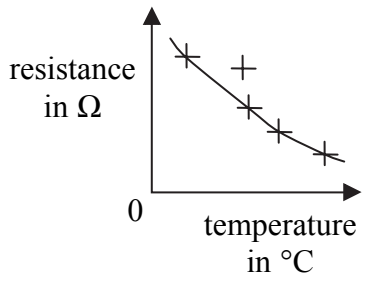
19. The students plot some of their results.



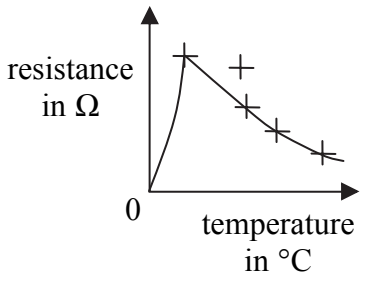
Which of these shows the correct graph for these results?



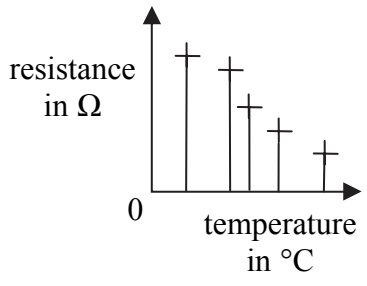
A



B



C



D

20. $V = I \times R$

The students found that, at one temperature,

- the resistance of the thermistor was 200 Ω
- the current in the thermistor was 0.1 A

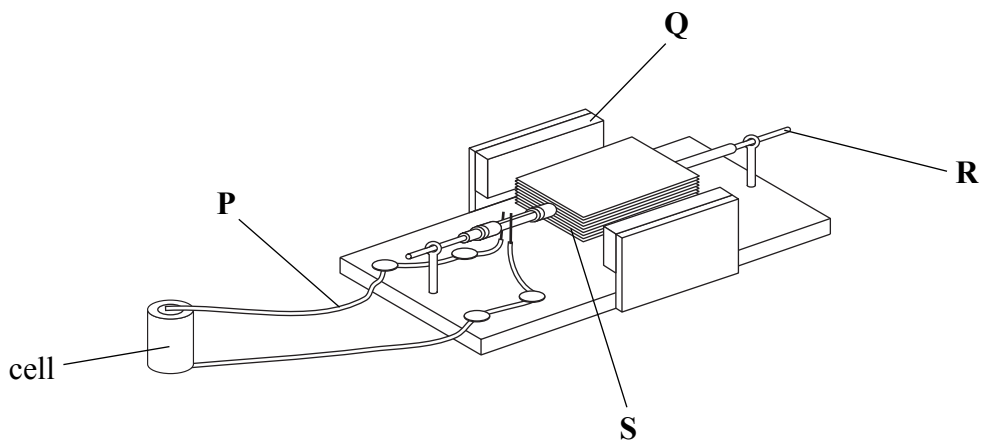
What was the voltage across the thermistor?

A 0.02 V
B 2 V
C 20 V
D 2000 V

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Electric motors

21. The diagram shows a simple d.c. electric motor.



Which part produces a magnetic field that changes?

A **P**
B **Q**
C **R**
D **S**

22.

power = current × voltage

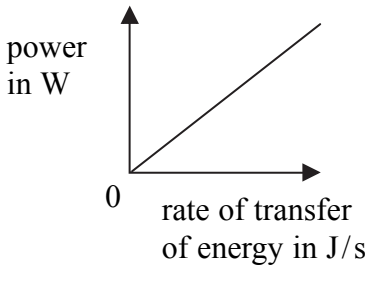
The current in an electric motor is 0.5 A.
The voltage across the motor is 10 V.

What is the input power of the motor?

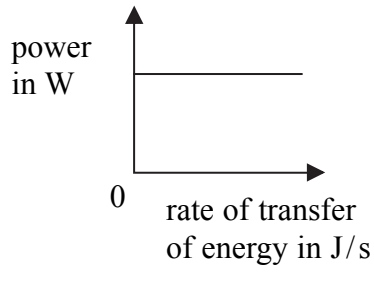
A 0.05 W
B 5 W
C 20 W
D 50 W

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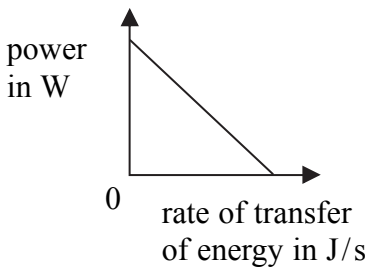
23. Which of these shows how power is related to rate of transfer of energy?



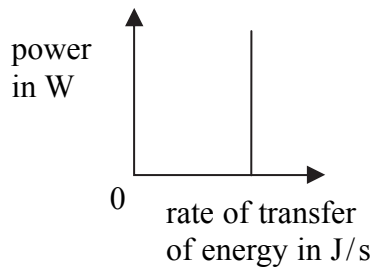
A



B



C



D

24.

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

An electric motor is supplied with 3000 J of electrical energy.
600 J of this energy are wasted as heat and sound.

The efficiency of the motor is

A 1.25%
B 5%
C 20%
D 80%

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

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

Renewable energy

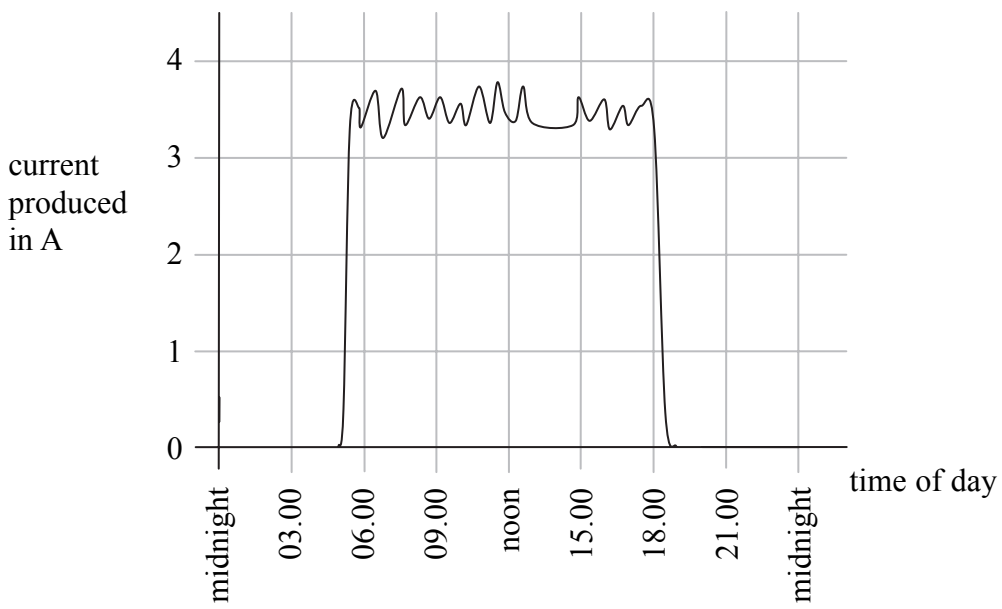
Darren lives on a remote farm.
He has four different electricity generators.
They use

- wind energy
- water energy
- solar energy
- diesel fuel

25. Which of these is a **disadvantage** of using the diesel fuel generator compared to the others?

A It is reliable
B It can produce electricity at any time
C It produces harmful gases
D There is plenty of diesel fuel

26. The graph shows the current produced by the solar generator during one day.

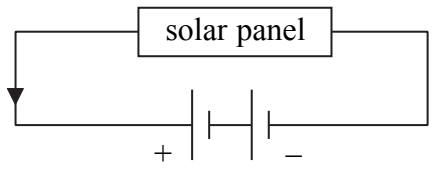


For about how many hours is the current more than 3 A?

A 5 hours
B 11 hours
C 13 hours
D 18 hours

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27. Darren uses a solar panel to charge a battery.
Here is the charging circuit.
The arrow shows the direction of the current when the battery is being charged.



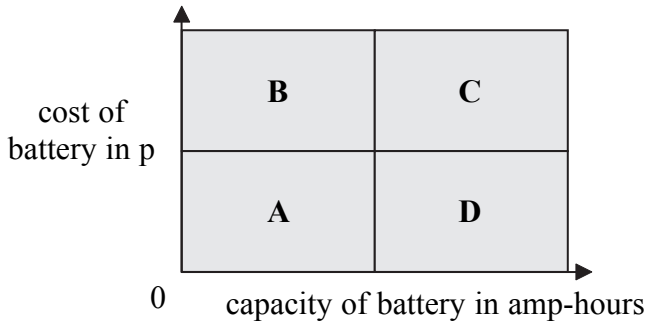
The current in the wires is a flow of

A negative electrons into the positive terminal of the battery
B negative electrons out of the positive terminal of the battery
C positive electrons into the positive terminal of the battery
D positive electrons out of the positive terminal of the battery

28. The battery has a capacity of 60 amp-hours.
When fully charged it can supply a current of 3 A for

A 0.05 hours
B 20 hours
C 60 hours
D 180 hours

29. Darren has a chart with data about cost and capacity of rechargeable batteries.
Which area of the chart is for the cheapest batteries with the largest capacities?



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30. Darren uses a light dependent resistor (LDR) in a circuit to switch on a light at night.
Which row of the table is correct for the LDR as the light level decreases?

	resistance of the LDR	**current in the LDR**
A	increases	decreases
B	increases	increases
C	decreases	decreases
D	decreases	increases

Physics in the home

31. Some students compare the rate of energy transfer through the same area of four different insulating materials.
Which row of the table shows results for the best insulating material?

	energy transferred per second (J/s)	**thickness of material (cm)**
A	80	10
B	60	10
C	80	4
D	60	4

32.

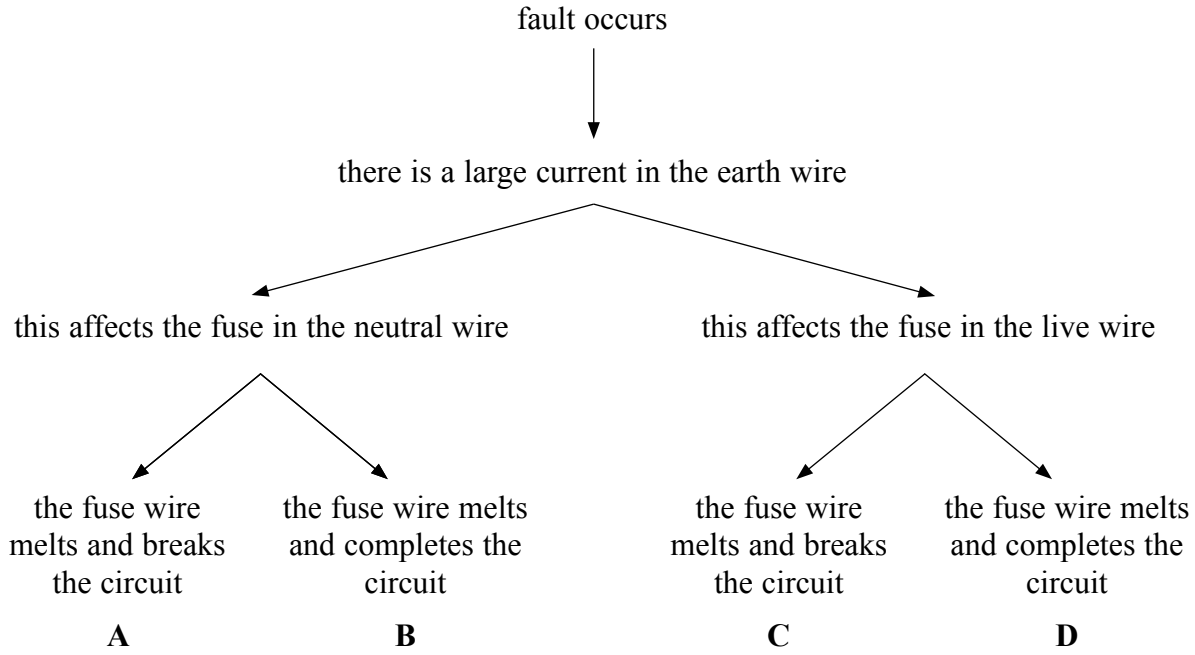
cost = power × time × cost of 1 kWh

The power of an oven is 4 kW.
The cost of 1 kWh is 12 p.
For how long can the oven be used for 96 p?

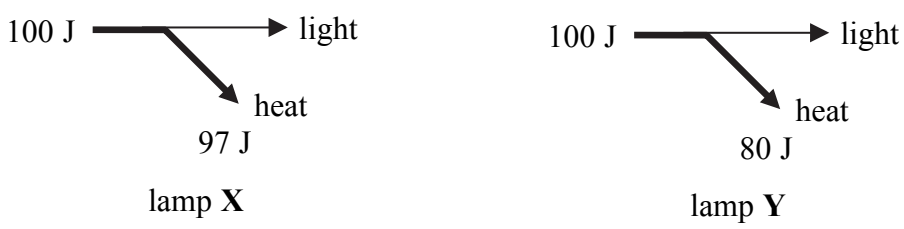
A 2 hours
B 8 hours
C 24 hours
D 32 hours

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33. Which of these is correct for the action of a fuse when a fault occurs in an oven?



34. The diagrams show the energy transfers in two different types of lamp.



Which row of the table is correct for the lamps?

	lamp X is	**lamp Y is**
A	more efficient	a filament lamp
B	more efficient	an energy-saving lamp
C	less efficient	a filament lamp
D	less efficient	an energy-saving lamp

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Technology

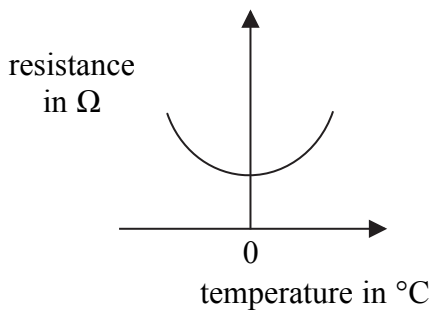
35. Maglev trains can achieve higher speeds than conventional trains.

One reason for this is that Maglev trains

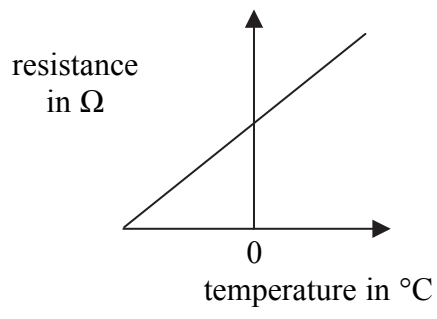


A have zero friction
B are magnetically levitated
C are weightless
D operate at low temperatures

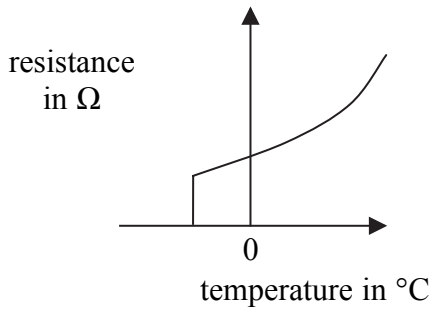
36. Which of these graphs is for a superconductor?



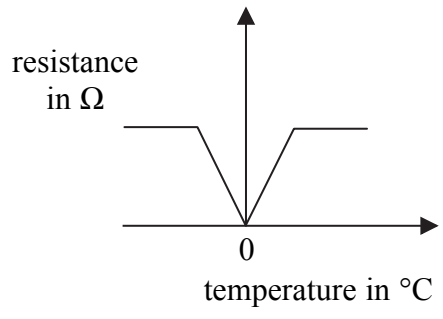
A



B



C



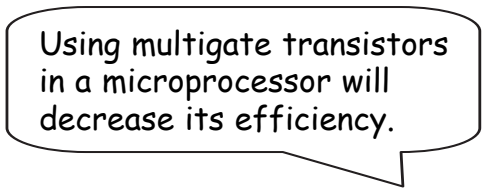
D

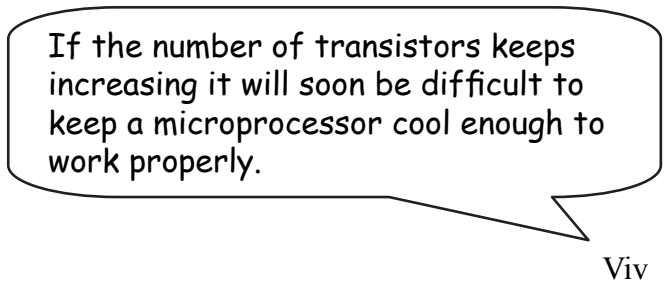
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37. Here is some information from a report on microprocessors.

> The number of transistors that can be put onto a piece of silicon doubles every 2 years.
> In 1996 a microprocessor contained over 4 million transistors.
> Each transistor produces a small amount of heat as it operates.
> Scientists have designed multigate transistors which waste less energy.
> If microprocessors become too hot, they stop working properly.

Two students discuss these statements.

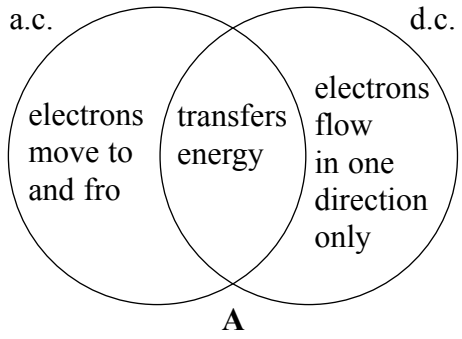




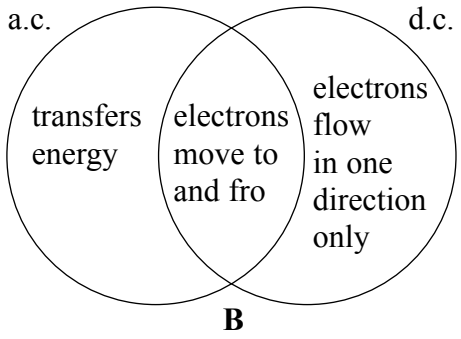
Who is correct?

A Tom only
B Viv only
C both Tom and Viv
D neither

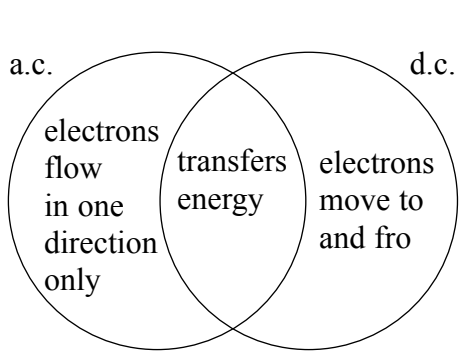
38. Which of these diagrams correctly compares alternating current (a.c.) and direct current (d.c.)?



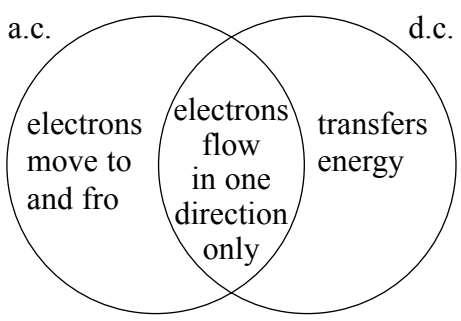
A



B



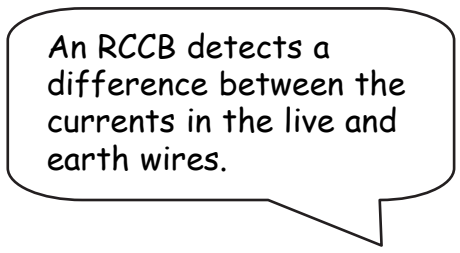
C

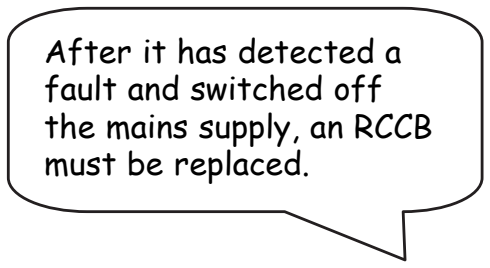


D

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39. Two students discuss residual current circuit breakers (RCCBs).

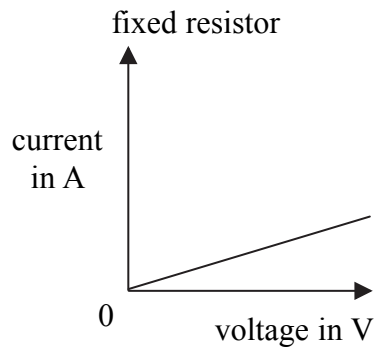


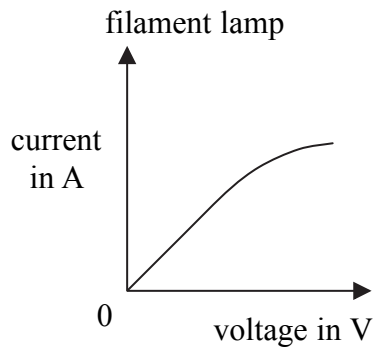


Who is correct?

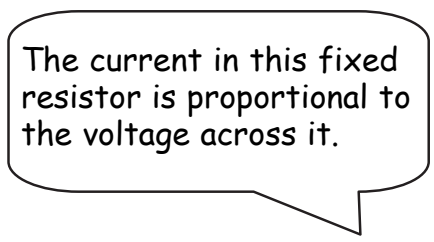
A Reza only
B Tara only
C both Reza and Tara
D neither

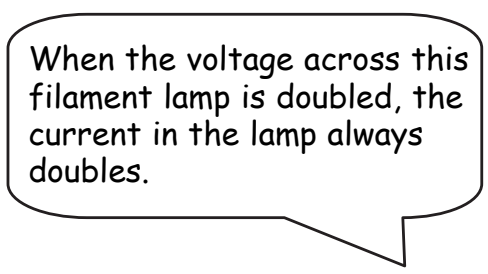
40. Two students investigate the resistance of a fixed resistor and a filament lamp.
Here are some of their results.





The students discuss their results.





Who is correct?

A Sally only
B Vinoja only
C both Sally and Vinoja
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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5009 Science/ 5045 Physics (P1a)

Unit P1a – 5009/5045	
Topics 9 & 10	
1	A
2	B
3	D
4	A
5	C
6	D
7	B
8	D
9	A
10	B
11	D
12	C
13	C
14	C
15	B
16	A

Unit P1a – 5009/5045	
Topics 9 & 10	
17	C
18	A
19	B
20	C
21	D
22	B
23	A
24	D

Unit P1a – 5009/5045	
Topics 9 & 10	
25	C
26	C
27	B
28	B
29	D
30	A
31	D
32	A
33	C
34	D
35	B
36	C
37	B
38	A
39	D
40	A

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Science (5009)

Physics (5045)

P1a – Topics 9 and 10

Foundation and Higher Tier

Friday 20 November 2009 – 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.

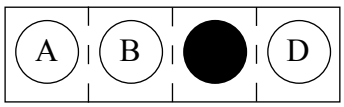
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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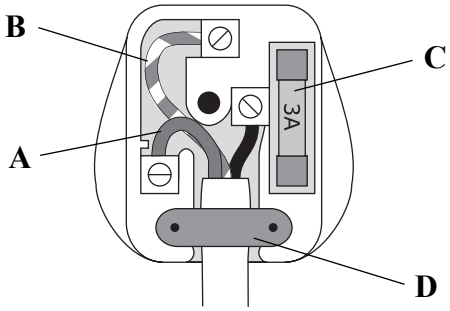
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Physics in the home

Martin has bought a new television and DVD player.



1. The diagram shows the inside of the mains plug of the DVD player.



Which is the fuse?

2. The wire connected to the metal case of the DVD player is called

A the earth wire
B the neutral wire
C the live wire
D the fuse wire

3. Martin's new television is more efficient than his old one.
This means that the new television

A wastes less energy as heat
B wastes more energy as heat
C uses a lower voltage
D does not need a fuse

4. The power rating of Martin's new television is 120 W.
This means that in one second the new television will use

A 120 J of energy
B 120 V of energy
C 120 A of energy
D 120 Ω of energy

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Battery power

5. Which of these does **not** have a battery for power?

A a washing machine
B a mobile phone
C an MP3 player
D a TV remote control

6. Some people use rechargeable batteries instead of non-rechargeable ones.
One advantage of rechargeable batteries is that

A they never need to be replaced
B they supply free energy
C they can be used more than once
D they never run out of charge

7. The current from a battery is

A alternating
B positive
C neutral
D direct

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Use this information to answer questions 8 to 10.

Remi is choosing a non-rechargeable battery for his camera.
Here is some information about suitable batteries.

type	capacity in mAh	cost in £
Apex	600	4
Bettabat	200	5
Cell4U	2700	7
Durabat	1400	10

8. Which battery will keep his camera working for the longest time?

A Apex
B Bettabat
C Cell4U
D Durabat

9. Remi's camera will work for 1 hour with a Bettabat battery.
With an Apex battery, it would last

A 0.3 hours
B 3 hours
C 6 hours
D 12 hours

10. Remi tries each of the batteries listed in the table in his camera.
Which of these is correct?

A the cheapest battery will last longest
B the cheapest battery will run out quickest
C the most expensive battery will last longest
D there is no pattern linking capacity and cost

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Solar power

This information about solar panels is from a website.

> A solar panel system can be used to generate electricity for the home.
> Prices for these systems vary, depending on the power output.
> A system costs about £6000 for each kW of power generated.

11. How much does it cost for a system that can generate 3 kW?

A about £ 2000
B about £ 6000
C about £12000
D about £18000

12. Which of these is an advantage of using solar panels to generate electricity for the home?

A They only work in daylight
B They are expensive to install
C They are shiny and good reflectors of light
D They do not produce any harmful gases

13. The useful energy change in the solar panel is

A light energy → electrical energy
B light energy → kinetic energy
C electrical energy → light energy
D kinetic energy → electrical energy

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Generating electricity

Trevor has a wind-up radio which contains a generator.



One minute of winding will power the radio for 20 minutes.
The electric current to charge the battery in the radio is produced by the generator.

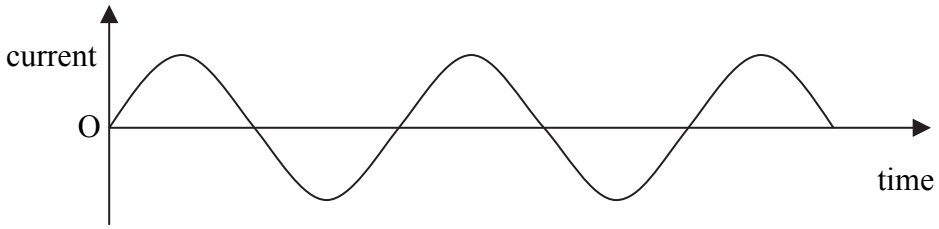
14. The generator produces a current because

A a chemical reaction takes place in a coil of wire
B light energy releases electrons in a coil of wire
C a magnet moves near a coil of wire
D an insulator rubs against a coil of wire

15. Which of these is a reason for using a wind-up radio instead of a battery-powered radio?

A Batteries are cheap and easy to replace
B Batteries use old fashioned technology
C Wind-up radios are more expensive than similar battery-powered radios
D Wind-up radios cost nothing to run

16. The graph shows a current in part of the radio.



This type of current is

A indirect
B alternating
C direct
D static

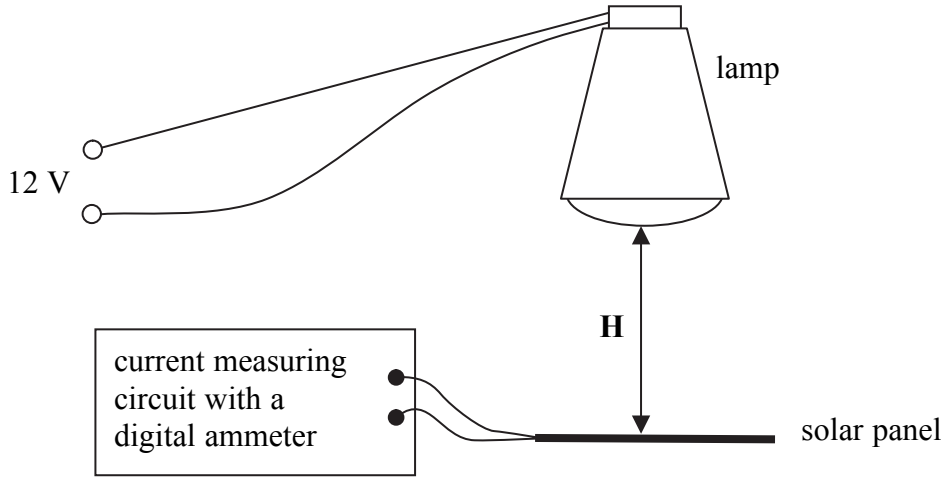
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Investigating solar panels

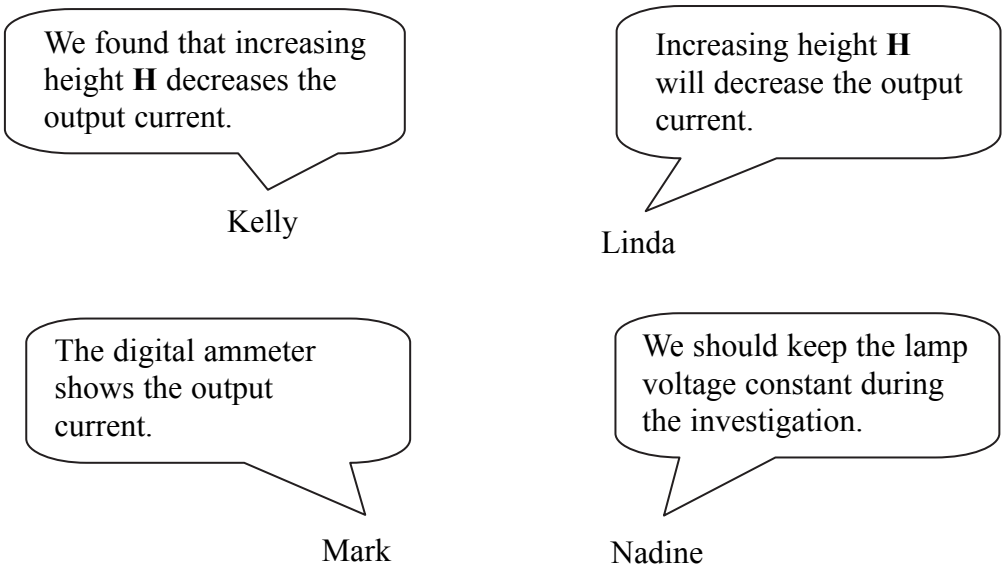
Use this information to answer questions 17 to 20.

Kelly and her friends investigate how the brightness of light affects the output current from a solar panel.



The students raise or lower the lamp to vary the brightness of light reaching the solar panel. This changes the height **H**.

17. The students discuss their investigation.



Who has made a prediction for the investigation?

A Kelly
B Linda
C Mark
D Nadine

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18. In this investigation, the dependent variable is

A the height **H**
B the output current from the solar panel
C the voltage across the lamp
D the brightness of the lamp

19. These are the students' readings of output current for one value of **H**.

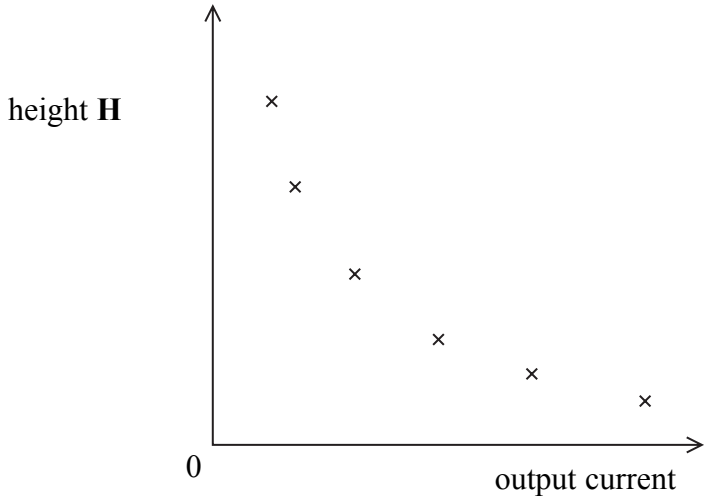
31 mA 34 mA 31 mA 4 mA

The average current the students should use for their graph is

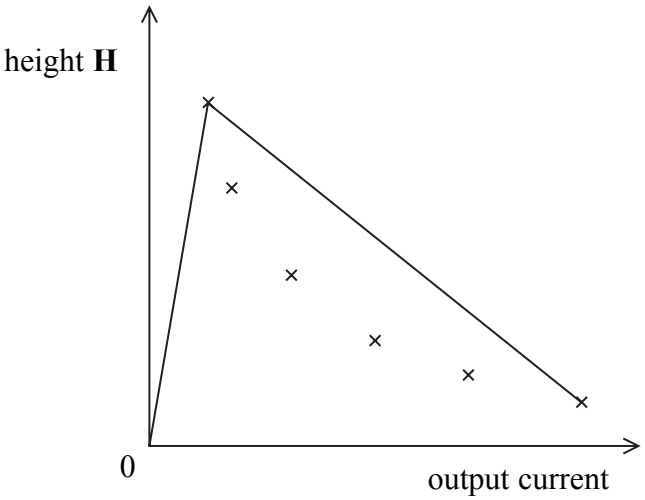
A 34 mA
B 32 mA
C 25 mA
D 24 mA

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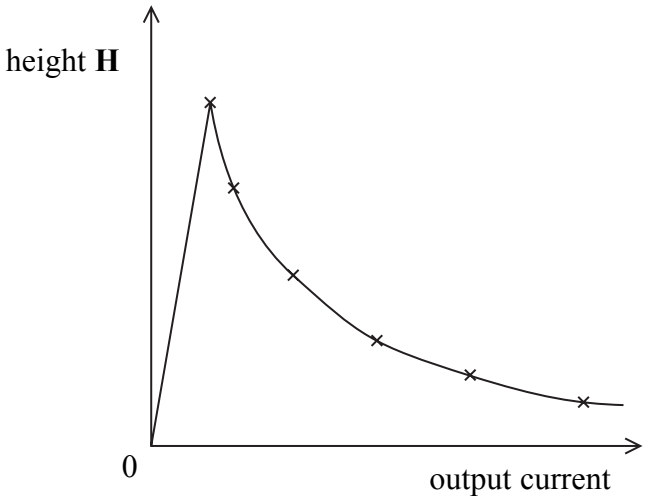
20. Kelly plotted a graph like this



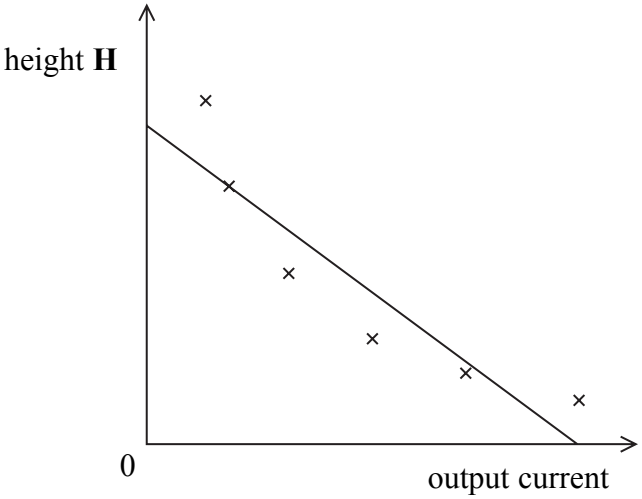
Which of these shows the line of best fit that Kelly should draw?



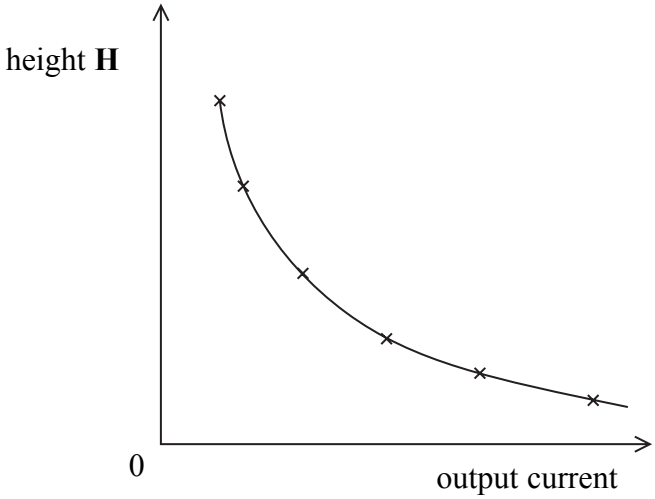
A



B



C

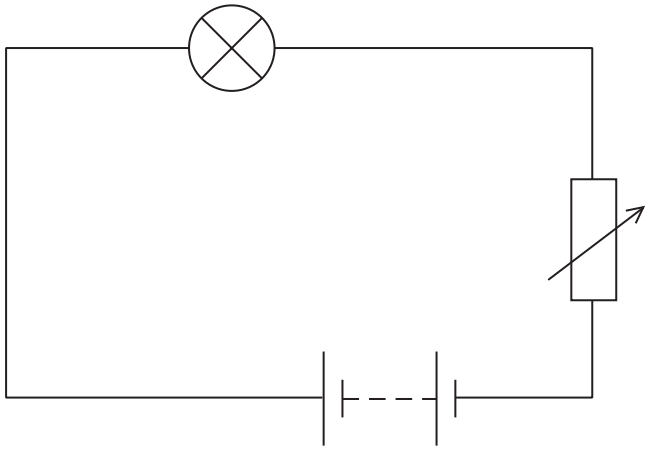


D

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Electric circuits

Dave investigates the current in a lamp.
Here is part of his circuit.



Dave uses the variable resistor to change the current.

21. Dave wants to measure the current in the lamp.
He should connect

A a voltmeter in series with the lamp
B a voltmeter in parallel with the lamp
C an ammeter in series with the lamp
D an ammeter in parallel with the lamp

22. Which row of the table is correct for Dave's circuit?

	brightness of the lamp	**resistance of the variable resistor**	**current in the lamp**
A	brighter	larger	higher
B	dimmer	larger	lower
C	brighter	smaller	lower
D	dimmer	smaller	higher

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23.

power = current × voltage

Dave sets the voltage across the lamp to 10 V.
The current in the lamp is 2 A.
What is the power output of the lamp?

A 0.2 W
B 5 W
C 12 W
D 20 W

24.

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

The lamp transfers 100 J of electrical energy into

- 98 J of thermal energy
- 2 J of light energy

What is the efficiency of the lamp?

A 0.98%
B 2.00%
C 49.0%
D 98.0%

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

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

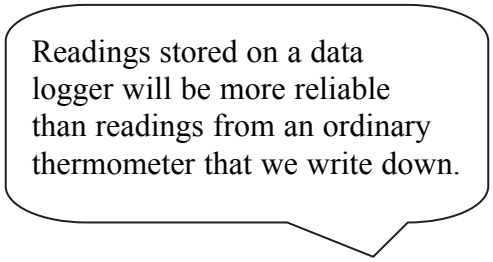
Measuring temperature

Alice and Bev investigate the cooling of some liquids.
Instead of using an ordinary thermometer, they use a temperature probe connected to a data logger.

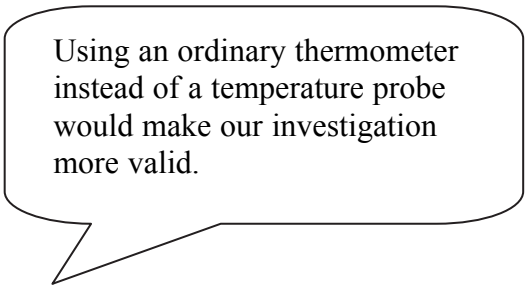
25. Which of these is designed to give large changes in resistance for small changes in temperature?

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

26. The students discuss their choice of thermometer.



Alice



Bev

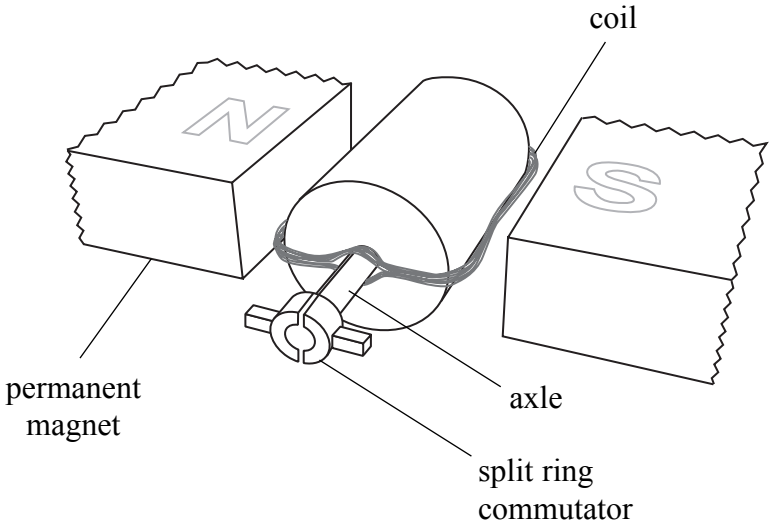
Who is correct?

A Alice only
B Bev only
C both Alice and Bev
D neither

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Electric motors

Reza researches electric motors.
The diagram shows a simple electric motor.



27. Which row of the table is correct for the commutator?

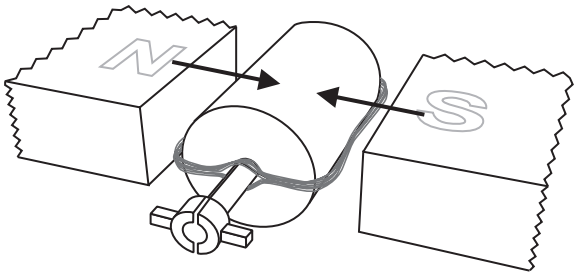
	as the coil spins the commutator	**effect on the coil**
A	reverses the current in the coil every half turn	keeps the turning effect on the coil in the same direction
B	reverses the poles of the permanent magnet	keeps the turning effect on the coil in the same direction
C	reverses the poles of the permanent magnet	reverses the turning effect on the coil every half turn
D	reverses the current in the coil every half turn	reverses the turning effect on the coil every half turn

28. Reza wants his motor to go faster.
He makes some changes.
For which row of the table will **both** changes make the motor go faster?

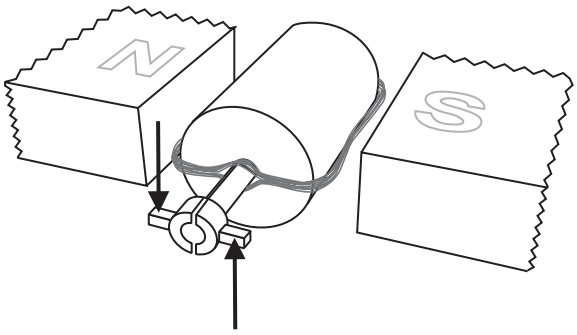
	number of turns on the coil	**strength of the magnets**
A	decrease	increase
B	decrease	decrease
C	increase	increase
D	increase	decrease

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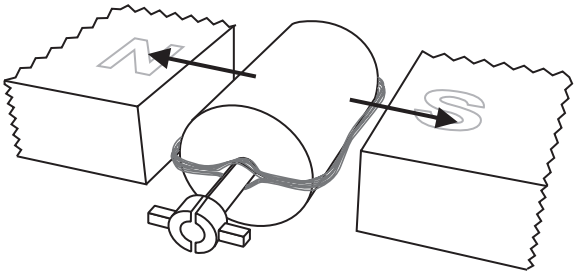
29. Which diagram correctly shows the forces that make a coil of an electric motor spin?



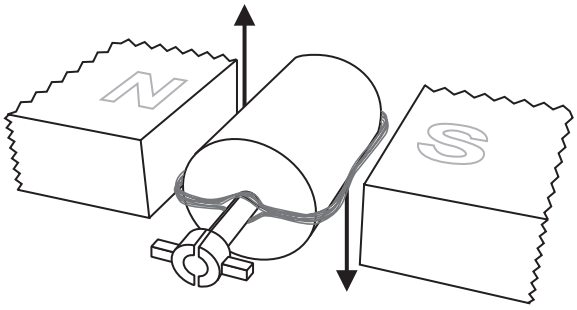
A



B



C

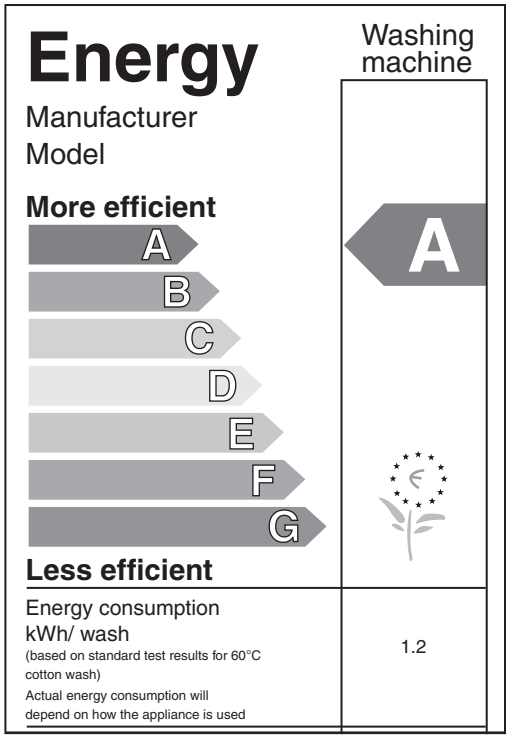


D

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Domestic electricity

Kallum has bought a new washing machine.
This label gives information about Kallum's new washing machine.



30. Kallum's washing machine is given an A for efficiency.
A machine with G for efficiency

A uses less energy per wash
B uses the same energy per wash
C uses more energy per wash
D can do two washes for the same energy

31.

cost = power × time × cost of 1 kWh

Kallum's washing machine uses 1.2 kWh of electrical energy per wash.
Each 1 kWh of electrical energy costs 10p.
How many washes can be done for £6.00?

A 12 washes
B 50 washes
C 60 washes
D 72 washes

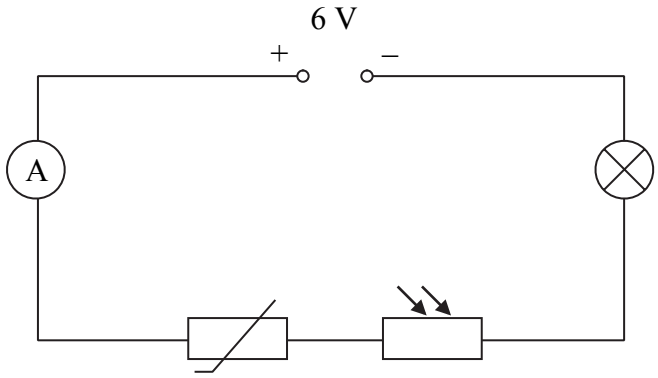
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32. Kallum's washing machine is protected by a residual current circuit breaker (RCCB). An RCCB works by detecting a difference between

A the voltages in the live and neutral wires
B the voltages in the live and earth wires
C the currents in the live and neutral wires
D the currents in the live and earth wires

Electric circuits

33. Peter sets up this circuit.

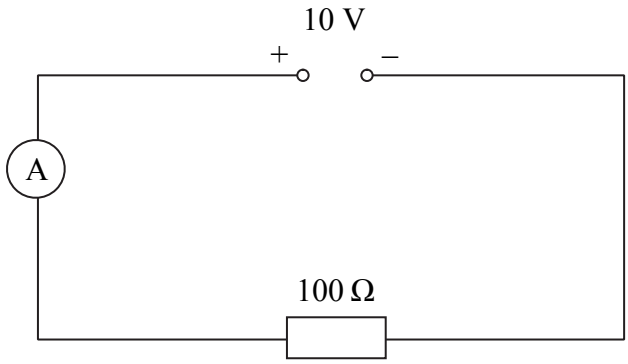


Which row of the table will produce the lowest current in the lamp?

	temperature of thermistor (°C)	light shining on LDR (units of brightness)
A	100	0
B	0	0
C	100	10
D	0	10

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34. Alan measures the current from the battery in this circuit.



The current is 0.1 A.
Alan adds a 1000 Ω resistor in parallel with the 100 Ω resistor.
The current from the battery will now be

A about ten times smaller
B slightly smaller
C the same
D slightly larger

35.

power = current × voltage

Jody uses an electric screwdriver.
Its average power is 24 W.
The battery for the screwdriver is labelled

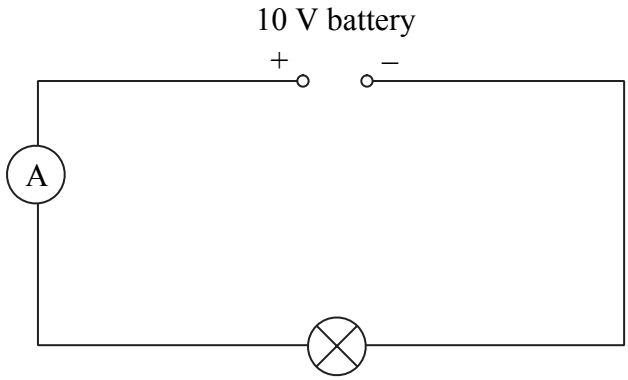
12 V
1.2 amp-hours

How long can a fully charged battery keep the screwdriver working?

A 14.4 hours
B 10.0 hours
C 2.4 hours
D 0.6 hours

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36. Four students discuss this circuit.



The current in the lamp consists of negative charges moving from the negative battery terminal towards the positive battery terminal.

Andy

The current in the lamp is a mixture of positive and negative ions.

Brandon

The current in the lamp consists of negative charges moving towards the positive battery terminal and positive charges moving towards the negative battery terminal.

Charlie

The lamp lights up when two different flows of charges crash into each other.

Denzil

The correct statement is made by

A Andy
B Brandon
C Charlie
D Denzil

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Investigating resistance

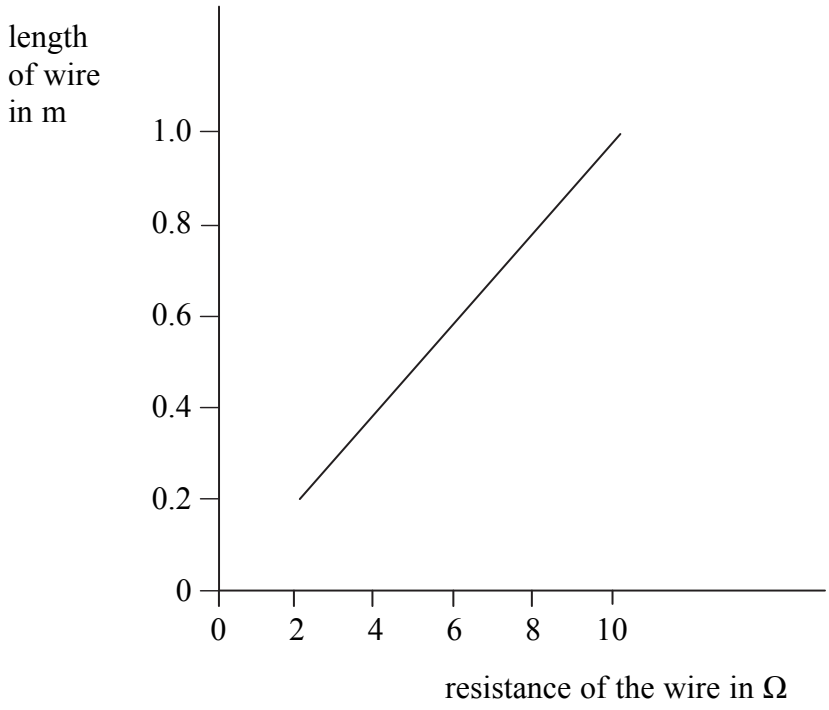
Tom and his friends measure the resistances of different lengths of wire.

37. $V = I \times R$

Which row of the table gives a correct set of readings for the experiment?

	voltage across the wire (V)	current in the wire (A)	resistance of the wire (Ω)
A	1.2	0.2	6.0
B	1.2	0.2	2.4
C	1.2	0.2	0.24
D	1.2	0.2	0.17

38. The students produced this graph from their readings for a different wire.

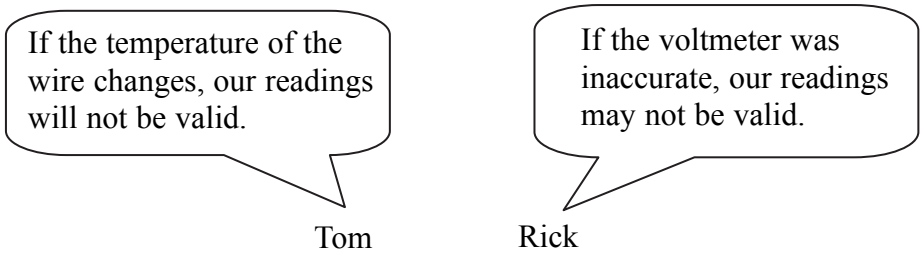


The graph shows that

A the resistance of the wire halves when its length doubles
B the current in the wire is proportional to the voltage across the wire
C the resistance of the wire is proportional to its length
D a thin wire has more resistance than a thick one

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39. Tom and Rick discuss the investigation.



Who is correct?

A Tom
B Rick
C both Tom and Rick
D neither

40. Tom makes this hypothesis.

'The resistance of a wire depends on the thickness of the wire.'

Which row of the table is correct for a valid test of this hypothesis?

	a control variable	**the independent variable**	**the dependent variable**
A	resistance of wire	length of wire	thickness of wire
B	resistance of wire	thickness of wire	length of wire
C	length of wire	resistance of wire	thickness of wire
D	length of wire	thickness of wire	resistance of wire

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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November 2009

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5009 Science/ 5045 Physics (P1a)

Unit P1a – 5009/5045	
Topics 9 & 10	
1	C
2	A
3	A
4	A
5	A
6	C
7	D
8	C
9	B
10	D
11	D
12	D
13	A
14	C
15	D
16	B

Unit P1a – 5009/5045	
Topics 9 & 10	
17	B
18	B
19	B
20	D
21	C
22	B
23	D
24	B

Unit P1a – 5009/5045	
Topics 9 & 10	
25	A
26	A
27	A
28	C
29	D
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32	C
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34	D
35	D
36	A
37	A
38	C
39	C
40	D

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P1a – Topics 9 and 10

Foundation and Higher Tier

Friday 19 June 2009 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	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.

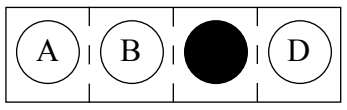
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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

Making electricity

1. Which of these produces electrical energy?

A a voltmeter
B an ammeter
C a dynamo
D a motor

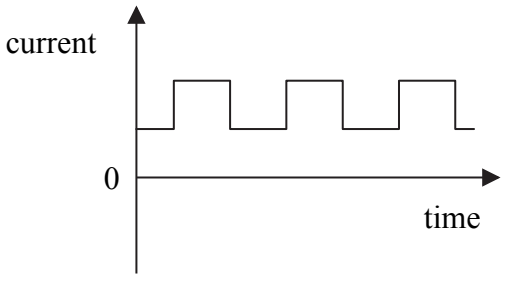
2. A voltage is produced when a coil is moved near

A a magnet
B a piece of copper
C a piece of plastic
D a piece of gold

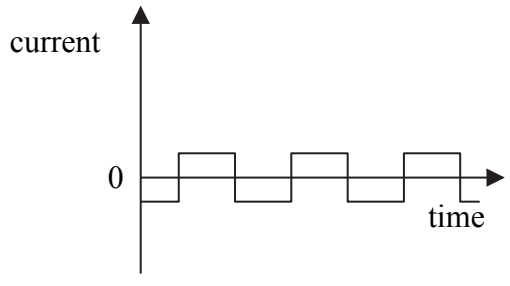
3. The size of the voltage produced in question 2 depends on

A the temperature of the coil
B the speed of movement of the coil
C the colour of the insulation on the wire
D the type of insulation on the wire

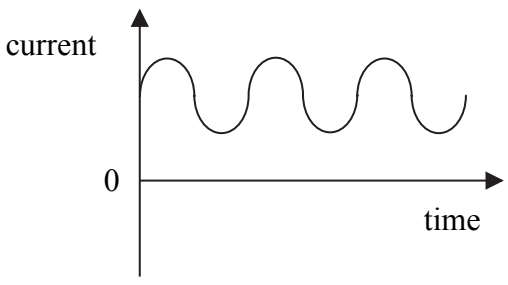
4. Which of these shows an **alternating** current?



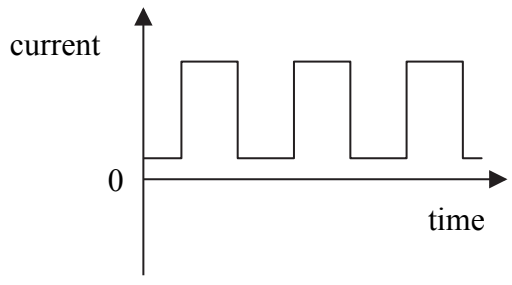
A



B



C



D

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5. Which of these has a **capacity** measured in amp-hours?

A a battery
B a dynamo
C a generator
D a solar cell

6. Which of these gives a continuous and steady supply of electricity?

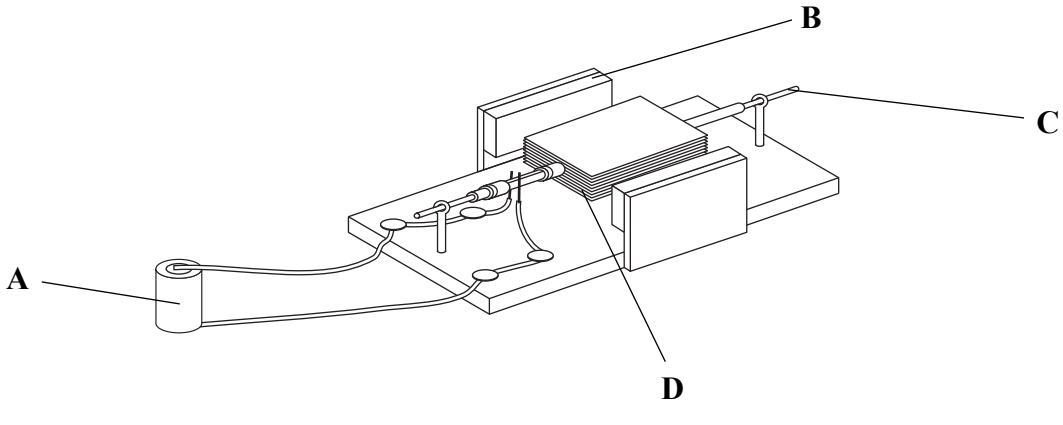
A a wind farm
B a tidal barrage
C a nuclear reactor
D an array of solar cells

Science at home

7. Low energy light bulbs are more efficient than ordinary light bulbs because

A they waste less energy
B they cost less to buy
C they need to be replaced more often
D they use a lower voltage

8. John has made a model electric motor.
Which part of this motor produces a permanent magnetic field?

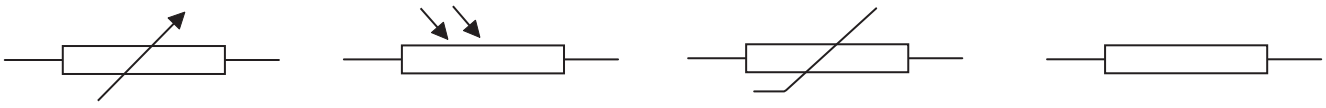


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9. The electric current in the wire of an electric motor is a flow of

A positive protons
B negative protons
C positive electrons
D negative electrons

10. John wants his lights to switch on at night.
Which of these has a resistance that changes as it becomes dark?



A **B** **C** **D**

11. Glass fibre is used for loft insulation because the glass fibre

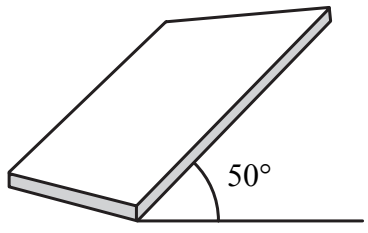
A is an electrical insulator
B improves ventilation
C reduces heat loss
D absorbs damp

12. John receives a dangerous electric shock when he touches some electrical equipment.
The equipment is probably touching

A a mains earth wire
B a mains live wire
C the positive terminal of a 9 V alkaline battery
D the positive terminal of a 12 V car battery

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13. John arranges a solar cell of area 200 cm^2 at an angle of 50° to the horizontal.



He wants to investigate how the current produced by the cell depends on this angle.
Which row of the table describes another solar cell which will provide evidence to help his investigation?

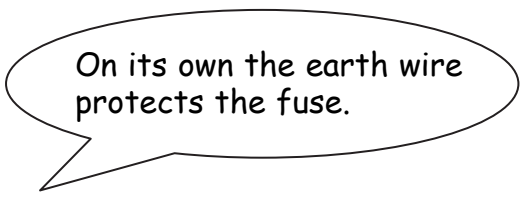
	area of solar cell (cm^2)	angle to the horizontal (°)
A	100	50
B	200	50
C	100	60
D	200	60

Use a fuse

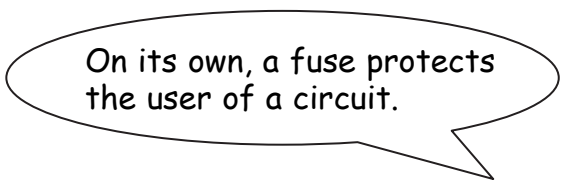
14. A fuse works by

A boiling when the current is too low
B boiling when the current is too high
C melting when the current is too low
D melting when the current is too high

15. John and Anne discuss the purpose of a fuse.



John



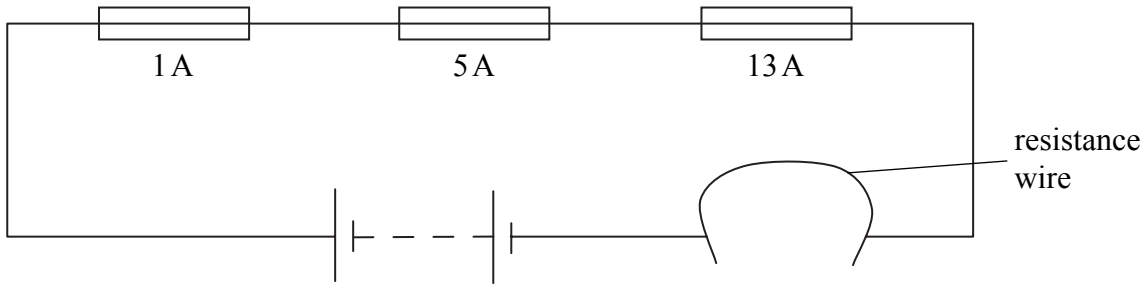
Anne

Who is correct?

A John only
B Anne only
C both John and Anne
D neither

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16. The diagram shows a circuit containing three fuses.



The length of resistance wire is changed to increase the current.
Which of these currents is the lowest that will break the circuit?

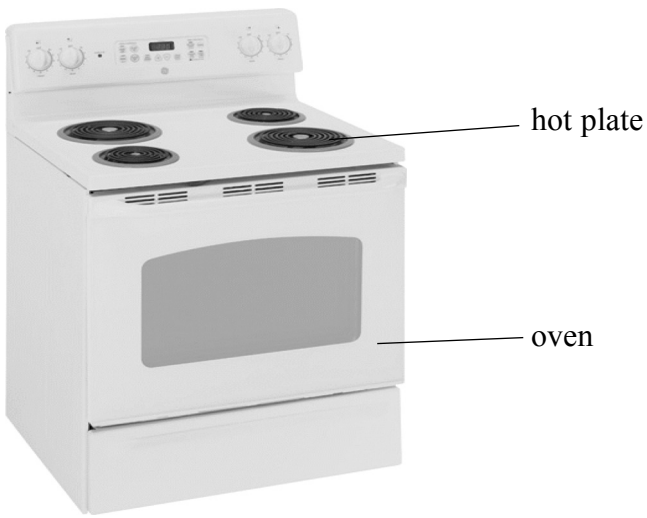
A 0.5 A
B 2.0 A
C 7.0 A
D 19 A

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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.

John's cooker

John has an electric cooker.
It has four hotplates and an oven.
Each hotplate has its own heating element.



17. The metal case of the cooker should be connected to the

A earth wire
B live wire
C neutral wire
D fuse wire

18. The power of each heating element is the amount of energy transferred

A in each second
B by each coulomb
C for each volt
D by each amp

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19.

power = current × voltage

There is a current of 2 A when one heating element is connected to the 230 V mains supply.
The power developed in this heating element is

A (230 ÷ 2) W
B (230 – 2) W
C (230 + 2) W
D (230 × 2) W

20.

cost = power × time × cost of 1 kWh

One kWh of electricity costs 20 p.
The power of the oven is 4 kW.
The cost of using the oven for 2 hours is

A 40 p
B 160 p
C 320 p
D 640 p

Patti investigates torch cells

Patti investigates how the voltage across a cell changes with the current in the circuit.

21. At five different times, Patti measures the current for the same value of voltage.
These are her readings:

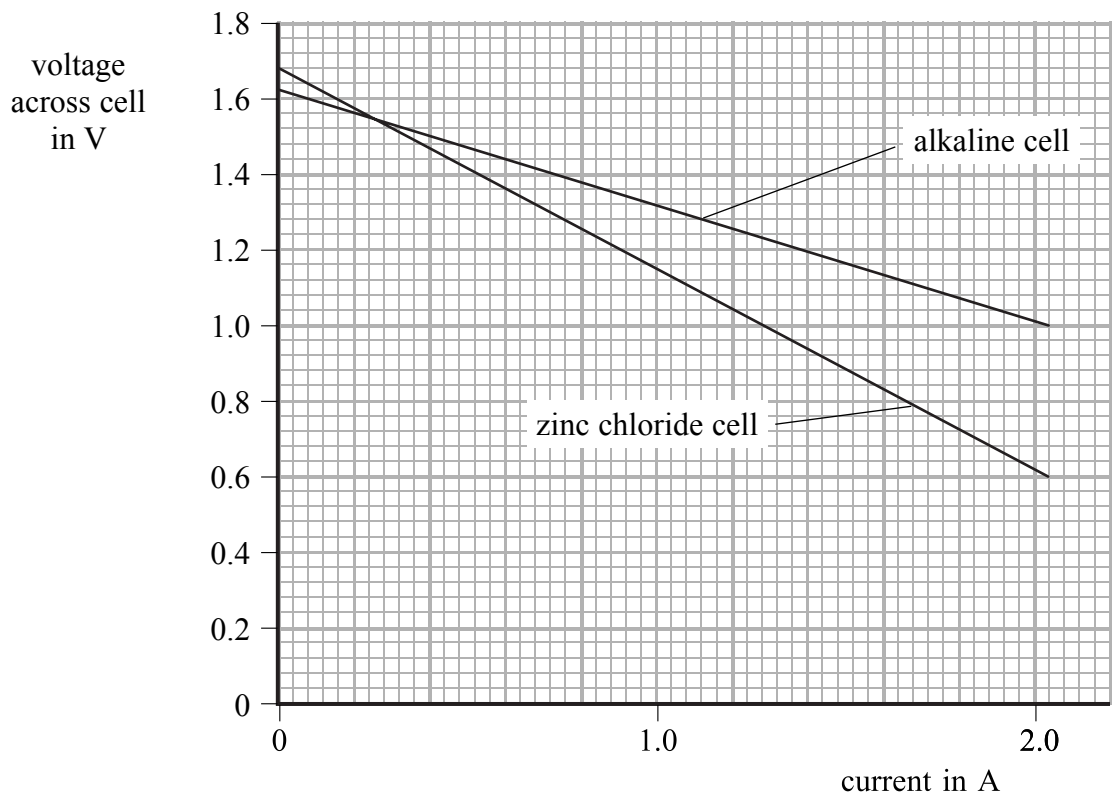
4.0 A 4.1 A 4.0 A 4.0 A 4.1 A

Her teacher knows that the real value of the current should be 5.0 A for this voltage.
Which row of the table is correct for Patti's readings?

	Are Patti's readings reliable?	**Are Patti's readings valid?**
A	yes	yes
B	no	yes
C	yes	no
D	no	no

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22. Patti drew this graph of her results for two different cells.



For the range of currents shown, which of these comparisons is correct?

A The range of voltages for the alkaline cell is larger
B The range of currents in the zinc chloride cell is larger
C The voltage for zero current is higher for the alkaline cell
D The voltage of the alkaline cell does not change as much

23. The capacity of the alkaline cell is 3.0 amp-hours.
This means the cell will supply

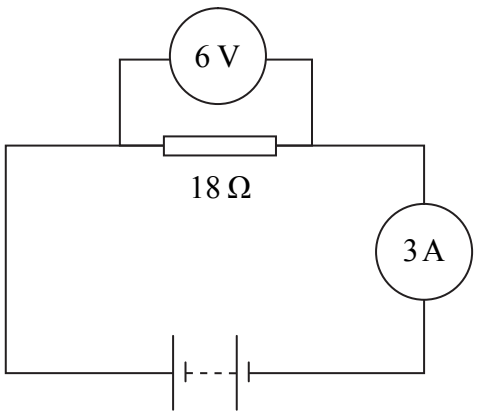
A 0 amps for 3 hours
B 1 amp for 3 hours
C 3 amps for 3 hours
D 6 amps for 2 hours

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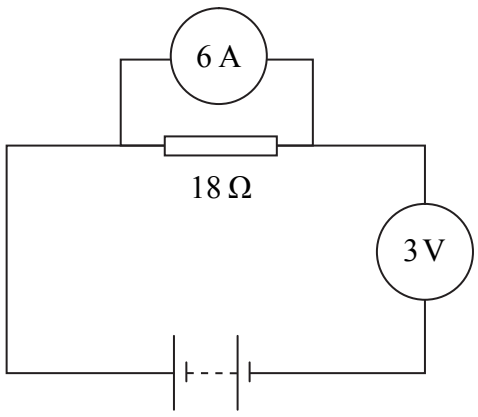
24.

$V = I \times R$

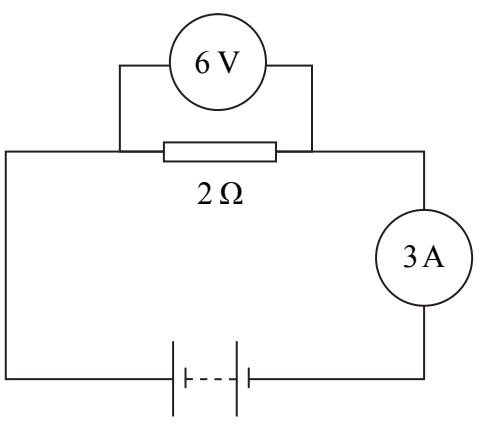
Which set of meter readings in these circuits is correct?



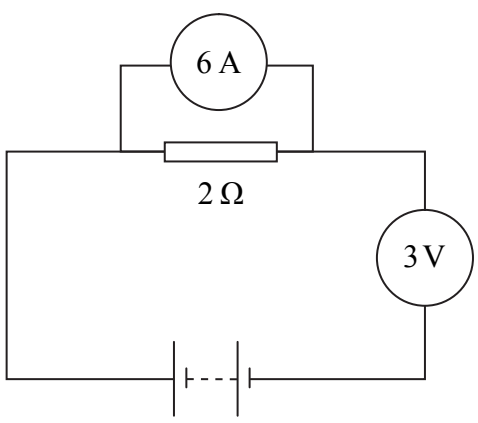
A



B



C



D

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

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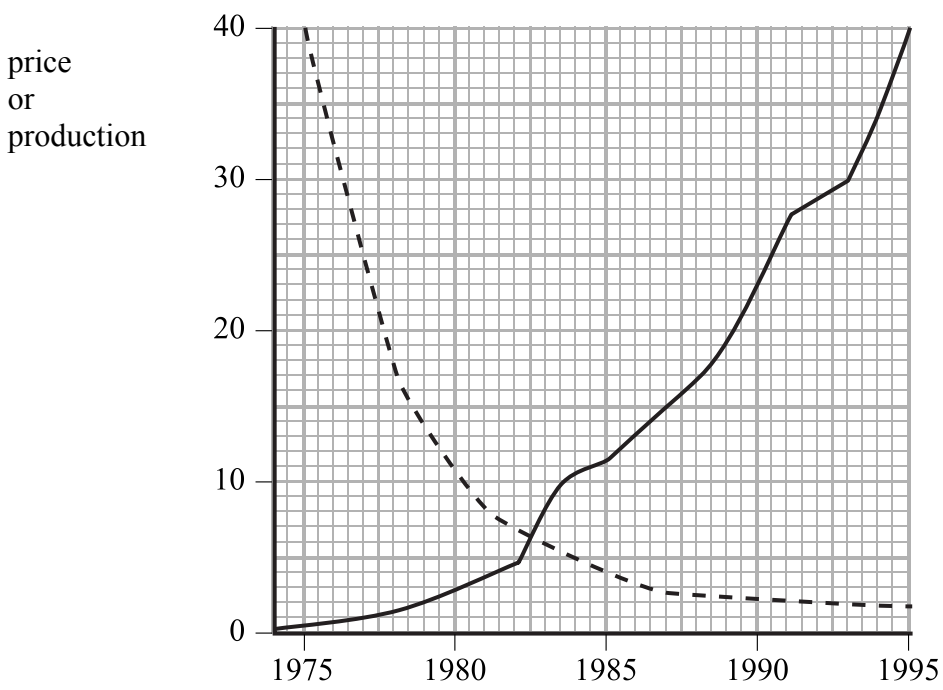
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Use this information to answer questions 25 to 27.

The graphs show how the price and production of solar cells changed between 1974 and 1995.

key	– – – – – price in £/W ———— production in MW/year



25. Which row of the table is correct for 1995?

	the price was	**the production was**
A	highest	largest
B	lowest	smallest
C	highest	smallest
D	lowest	largest

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26. The graphs show that

A the price in 1993 was about 30 MW/year
B the production was about 15 MW/year in 1987
C the price in 1980 was less than £10 per watt
D the production of solar power was more than 25 MW/year in 1990

27. Which of these is correct for the data shown in the graph?

A the price fell by £25/W between 1975 and 1977
B the rate of fall in price in 1976 was about £30/MW/year
C the price per watt fell by less than £5 between 1990 and 1995
D the production of solar cells rose by 15 MW/year between 1982 and 1987

Superconductivity

28. Superconductors help to make Maglev trains work.
The word 'Maglev' comes from

A magical level
B magnetic level
C magical levitation
D magnetic levitation

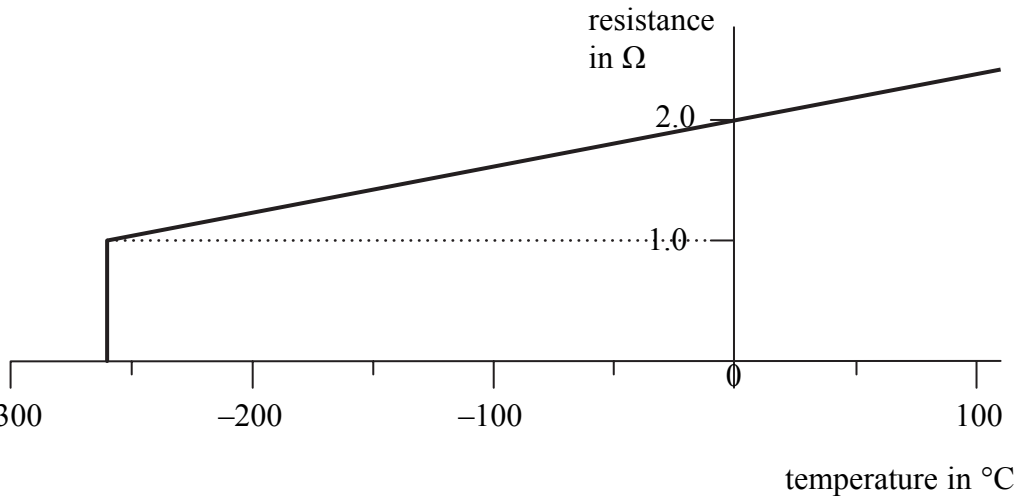
29. Which row of the table is correct for the superconductor when a Maglev train is working?

	the temperature is	**the current is**
A	very high	very high
B	very low	very high
C	very low	very low
D	very high	very low

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Use this information to answer questions 30 and 31.

The graph shows how the resistance of a piece of wire changes with temperature.



30. The material becomes superconducting at

A –260 °C
B 0 °C
C 1.0 °C
D 2.0 °C

31. $V = I \times R$

The voltage across the wire at a temperature of 0 °C is 8.0 V.
What is the current?

A 0 A
B 0.25 A
C 4.0 A
D 16.0 A

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Avoid a shock

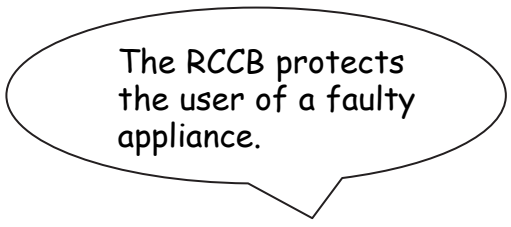
32. A residual current circuit breaker (RCCB) is designed to break the circuit when the currents are different

A in the live wire and the neutral wire
B in the neutral wire and the earth wire
C in the earth wire and the fuse wire
D in the fuse wire and the live wire

33. John and Anne discuss the use of an RCCB.



John



Anne

Who is correct?

A John only
B Anne only
C both John and Anne
D neither

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Renewable sources of energy

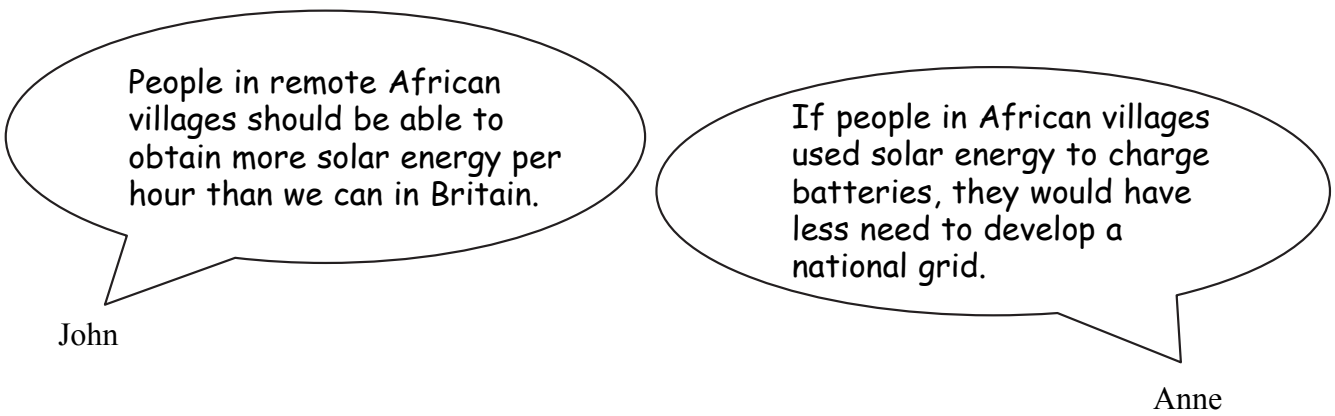
John and Anne research renewable energy sources.
The table shows the percentage of power produced from some renewable sources in 2005 and in 2006.

renewable source	2005	2006
bio-power	21.9%	23.2%
geo-power	2.9%	3.1%
wind power	4.6%	5.3%
solar power	7.5%	8.1%

34. Which of these is another source of renewable energy?

A wave power
B natural gas power
C coal power
D oil power

35. John and Anne discuss the use of solar energy.

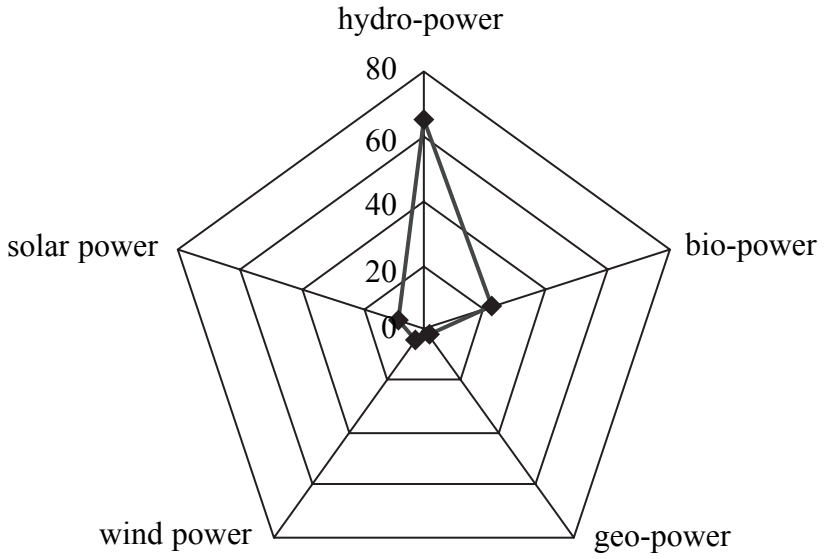


Who is correct?

A John only
B Anne only
C both John and Anne
D neither

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36. John also finds a value for hydro-power for 2005.
He tries to produce a bar chart of all the data for 2005 using his computer.
He presses the wrong display button and this is what appears:



He remembers that about 22% of the power comes from bio-power.
Which of the following is the best estimate for the percentage of the power that comes from hydro-power?

A 56%
B 65%
C 73%
D 80%

37. John tries to find values for the amount of renewable energy produced before 1985.
He cannot find the information on the Internet.
He mentions this to Anne.

Before 1985, nobody **used** any renewable energy sources.

John

Before 1985, there were no renewable energy sources **available**.

Anne

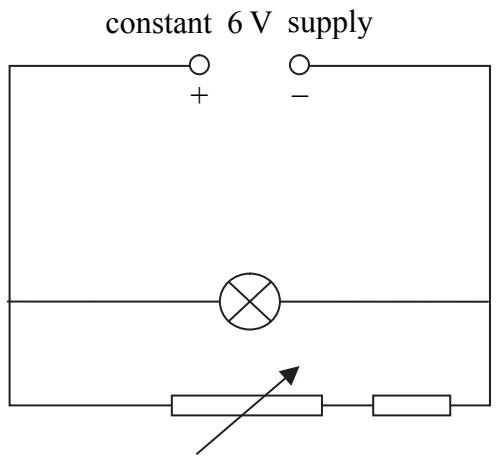
Who is correct?

A John only
B Anne only
C both John and Anne
D neither

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Use this information to answer questions 38 and 39.

The diagram shows a parallel circuit containing a power supply.



38. Which row of the table shows the directions of the current and of the electron movement in the lamp?

	direction of the current in the lamp	**direction of electron movement in the lamp**
A	←	→
B	→	→
C	←	←
D	→	←

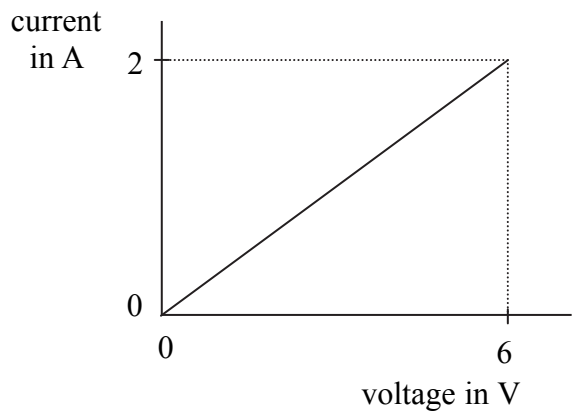
39. Here is a thought experiment.
Imagine that the resistance of the variable resistor is increased to a very high value.
What would happen to the current in the lamp?

A It would fall to zero
B It would fall a little
C It would stay the same
D It would increase

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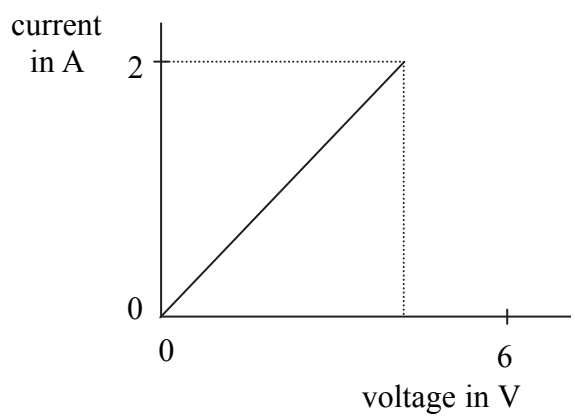
40. John chose an unlabelled component from a box marked "thermistors and light dependent resistors".
He set up a circuit and did an experiment in a laboratory.
He drew this graph of the results.

first laboratory



He took the same set-up into a second laboratory and did the experiment again.
This graph shows the results.

second laboratory



Which set of conditions would be certain to produce the second graph?

	temperature in second laboratory	light in second laboratory
A	higher	brighter
B	higher	dimmer
C	lower	brighter
D	lower	dimmer

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Science 5009 / Physics 5045 (P1a)

Unit P1a - 5009/5045	
Topics 9 & 10	
1	C
2	A
3	B
4	B
5	A
6	C
7	A
8	B
9	D
10	B
11	C
12	B
13	D
14	D
15	D
16	B

Unit P1a - 5009/5045	
Topics 9 & 10	
17	A
18	A
19	D
20	B
21	C
22	D
23	B
24	C

Unit P1a - 5009/5045	
Topics 9 & 10	
25	D
26	B
27	C
28	D
29	B
30	A
31	C
32	A
33	B
34	A
35	C
36	B
37	D
38	D
39	C
40	A

Science 5010 / Physics 5046 (P1b)

Unit P1b - 5010	
Topics 11 & 12	
1	A
2	D
3	B
4	B
5	B
6	A
7	A
8	C
9	D
10	D
11	C
12	A
13	B
14	C
15	C
16	D

Unit P1b - 5010	
Topics 11 & 12	
17	B
18	D
19	B
20	A
21	A
22	C
23	D
24	B

Unit P1b - 5010	
Topics 11 & 12	
25	A
26	C
27	D
28	B
29	D
30	A
31	C
32	B
33	B
34	C
35	A
36	A
37	C
38	D
39	B
40	D

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 6 March 2009 – 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.

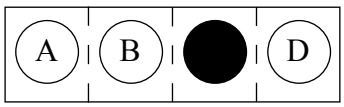
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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

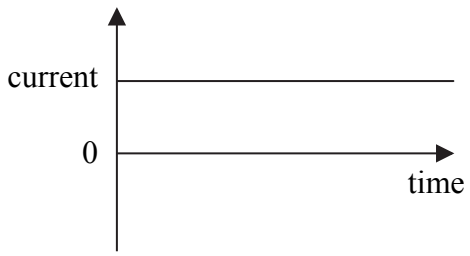
Sources of electric current

Alison investigates different sources of electric current.

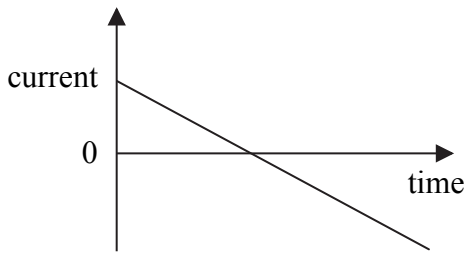
1. She finds that solar cells supply

A direct current
B alternating current
C static current
D rotating current

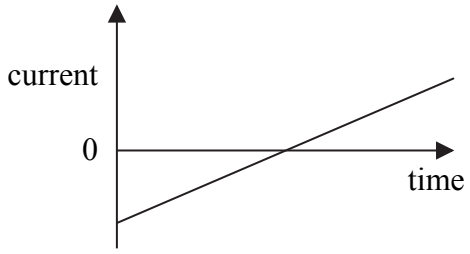
2. Which of these could show the current from a battery?



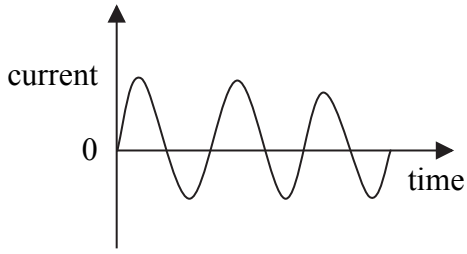
A



B



C



D

3. Alison finds that in a solar cell the electrical energy is transferred from

A chemical energy
B potential energy
C light energy
D wind energy

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4. Alison reads that solar cells are more reliable than wind turbines.
This is because

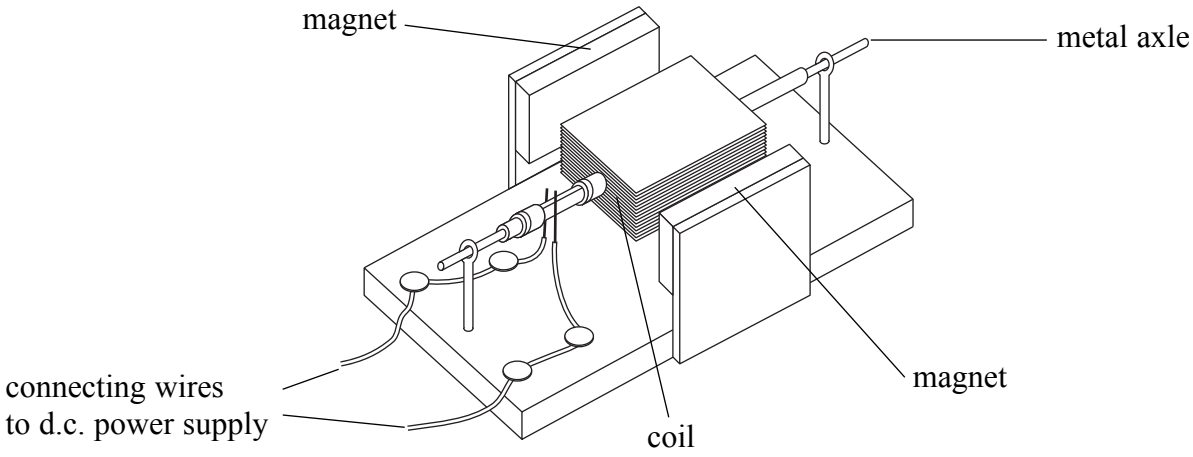
A solar cells are more expensive
B solar cells do not work at night
C solar cells do not use fossil fuels
D solar cells have no moving parts

Electric motors

5. An electric motor is **designed** to transfer electrical energy into

A chemical energy
B kinetic energy
C thermal (heat) energy
D sound energy

6. The diagram shows a simple electric motor.



The direction in which the coil spins can be reversed by

A removing one of the magnets
B decreasing the voltage from the power supply
C replacing the metal axle with a wooden one
D changing the direction of the current in the connecting wires

7. The power of an electric motor is 20 W.
This means that in each second the motor can transfer

A 20 J of electrical energy
B 20 A of electric current
C 20 V of electrical voltage
D 20 Ω of electrical resistance

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Comparing batteries

Shruti wants to buy a new battery for her digital camera.
She finds this information about batteries that will fit her camera.

name	rechargeable?	number of pictures before battery discharges	cost of battery (p)
permacell	no	800	125
maxilife	no	600	80
charge up	yes	500	420
ecovolt	yes	400	250

8. Shruti decides to buy an ecovolt battery.
One advantage of the ecovolt battery is

A the ecovolt lets you take fewest pictures before it runs out
B the ecovolt is at the bottom of the table
C the ecovolt is the cheapest battery
D the ecovolt is the cheaper rechargeable battery

9. How many pictures can Shruti take with the cheaper **non-**rechargeable battery?

A 800
B 600
C 500
D 400

10. A fully charged battery runs down in 4 hours.
It supplies an average current of 0.5 A.
The capacity of the battery is

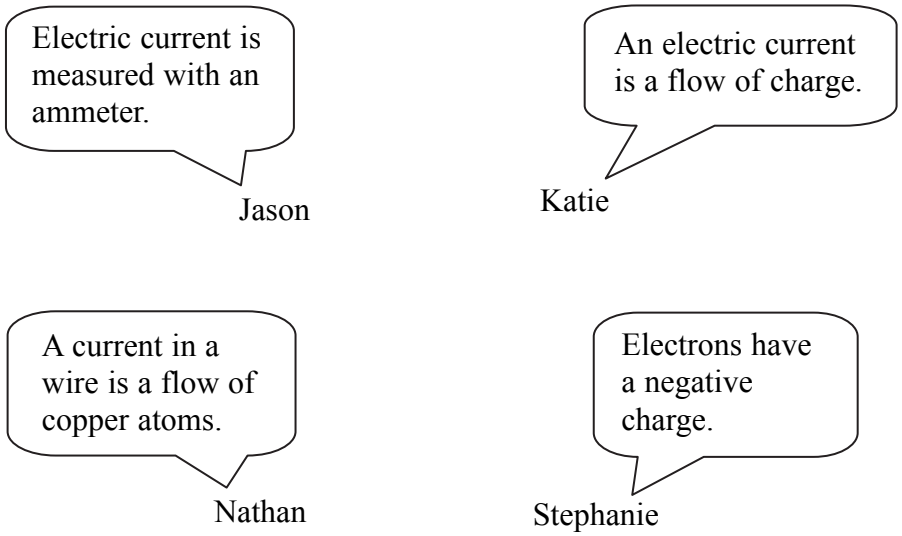
A 0.5 amps
B 2 amp-hours
C 4 hours
D 8 amp-hours

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Electric current

Jason and his friends are investigating electric current.

11. They discuss electric current.
Only three make correct statements.

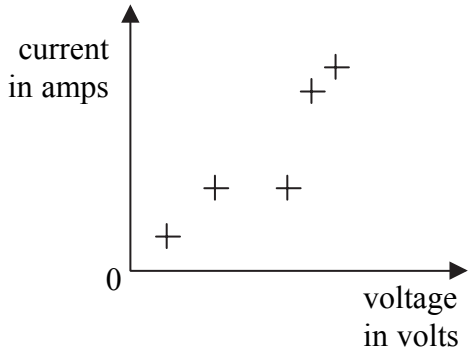


Who is **not** correct?

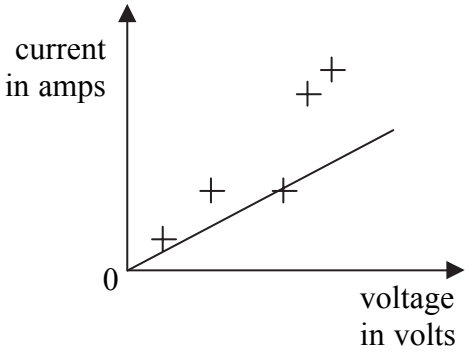
A Jason
B Katie
C Nathan
D Stephanie

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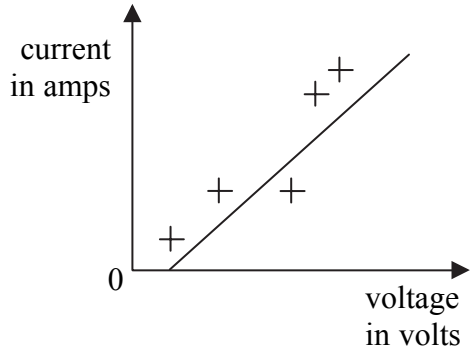
12. Jason and his friends change the voltage in a circuit and measure the current.
Jason plots their results on a graph.



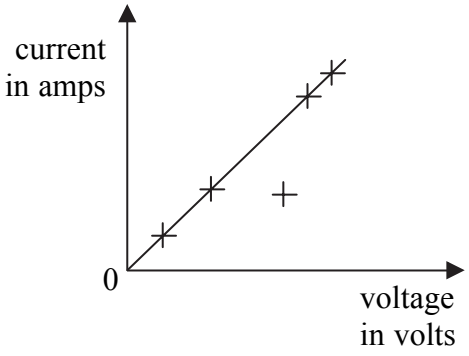
Which of these shows the line of best fit Jason should draw?



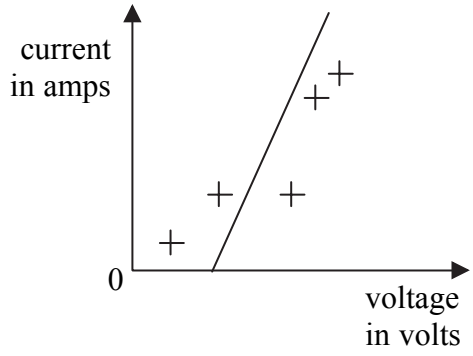
A



B



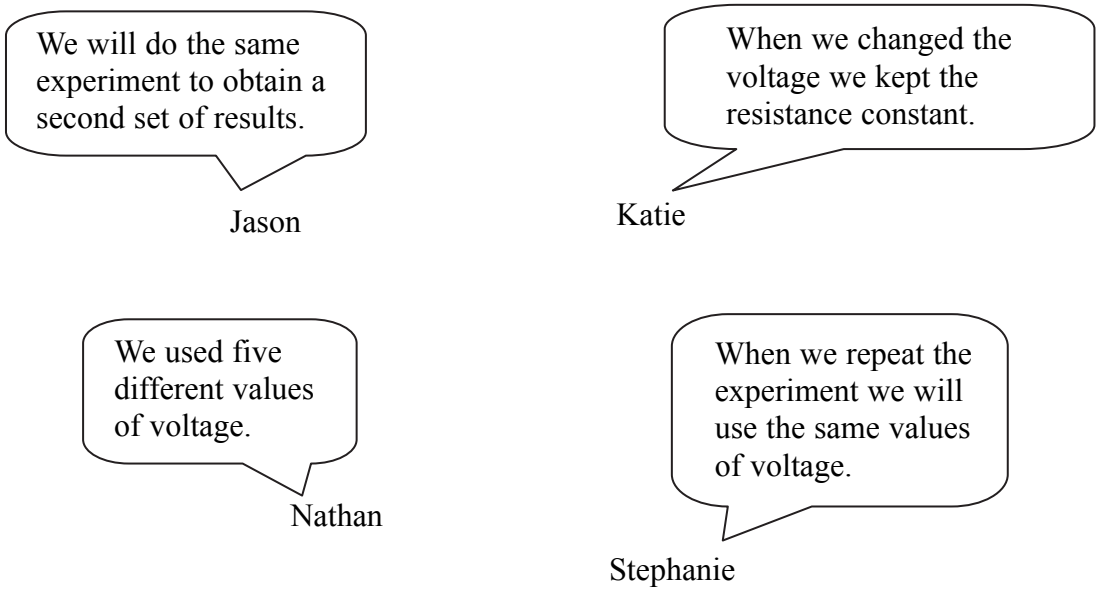
C



D

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13. Jason and his friends discuss the experiment.



Who has talked about a control variable?

A Jason
B Katie
C Nathan
D Stephanie

14. Which of these is **not** a result of increasing processing speeds using microchips?

A increasing use of mobile phones
B increasing cost of fossil fuels
C increasing use of satellite communications
D development of more powerful computers

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Household electricity

15. In a mains circuit the fuse should be placed in

A the live wire
B the neutral wire
C the earth wire
D both earth and live wires

16. The following statements describe the action of a fuse.

1 there is a large current in the fuse
2 the circuit is broken
3 a fault occurs
4 the fuse melts

The correct order of statements is

A	3	1	2	4
B	3	4	1	2
C	3	1	4	2
D	3	4	2	1

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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.

Power, cost and efficiency

Mia and Barry are researching household appliances.

17. power = current × voltage

The mains voltage is 230 V.
The current in Mia's microwave oven is 2 A.
The power of her microwave oven is

A 115 kW
B 460 kW
C 115 W
D 460 W

18. An energy saving lamp is more efficient than a filament lamp.
The energy saving lamp is more efficient because

A it takes more current than a filament lamp
B it produces more thermal energy than a filament lamp
C a higher percentage of electrical energy is transferred into thermal energy
D a lower percentage of electrical energy is transferred into thermal energy

19. cost = power in kW × time in hours × cost of 1 kWh

An 8 kW shower is used for 30 minutes each day.
One kWh of electrical energy costs 10p.
The cost of using the shower for 7 days is

A 40p
B £2.80
C £5.60
D £11.20

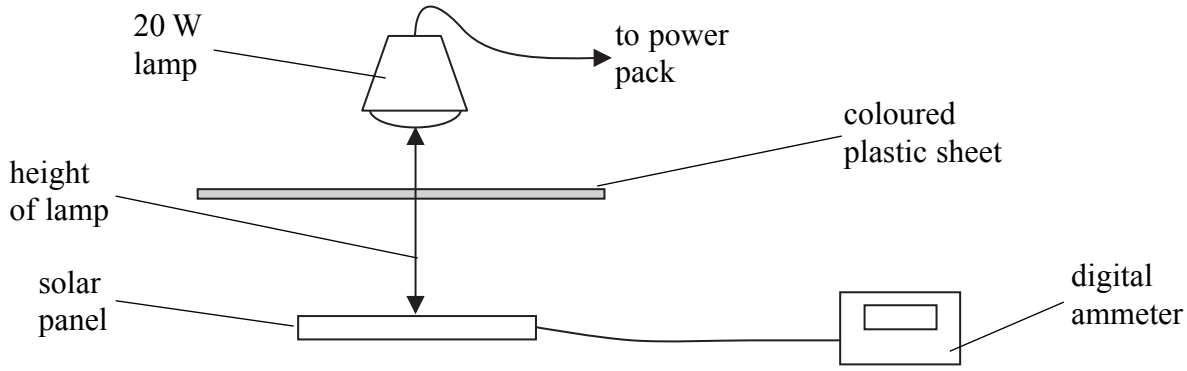
20. Barry uses a 100 W filament lamp.
The energy cost is £15 each year.
He decides to use a 20 W energy-saving lamp instead.
The new energy cost is

A £0.75
B £3
C £7.50
D £30

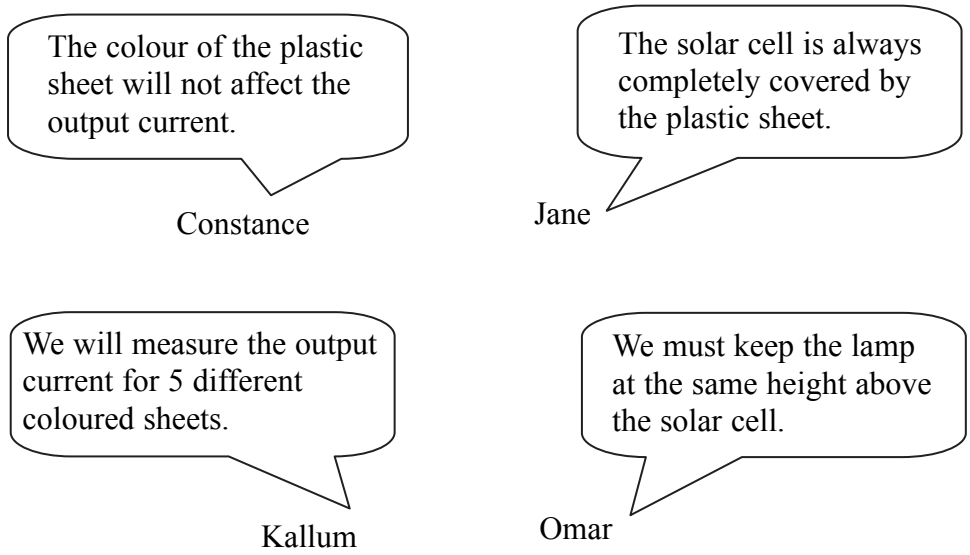
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Investigating solar cells

Omar and his friends are investigating how the colour of the light shining on a solar panel affects the output current.
They will put different coloured plastic sheets between a lamp and the solar panel.



21. The students discuss their investigation.



Who has made a prediction?

A Constance
B Jane
C Kallum
D Omar

22. In this investigation, the independent variable is

A the height of the lamp
B the power of the lamp
C the colour of the plastic sheet used
D the output current from the solar panel

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23. These are the students' results for the output current for a green plastic sheet.

27 mA 24 mA 5 mA 24 mA

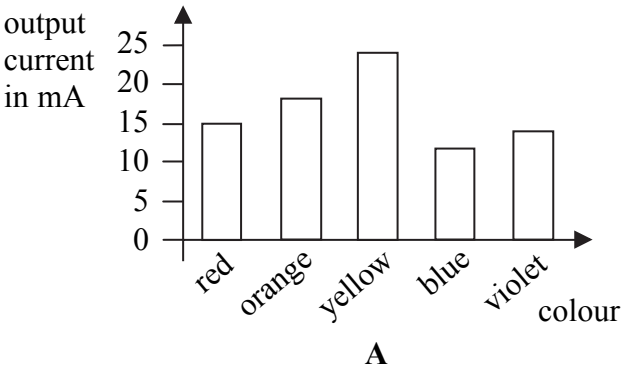
The value the students should use to plot on a graph is

A 5 mA
B 20 mA
C 25 mA
D 27 mA

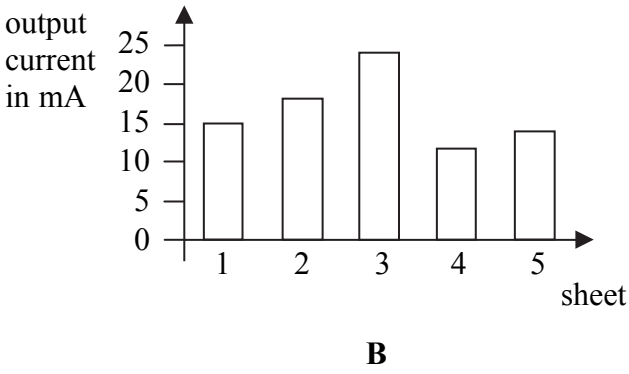
24. These are some of the results the students obtained.

sheet	output current (mA)
red	15
orange	18
yellow	24
blue	12
violet	14

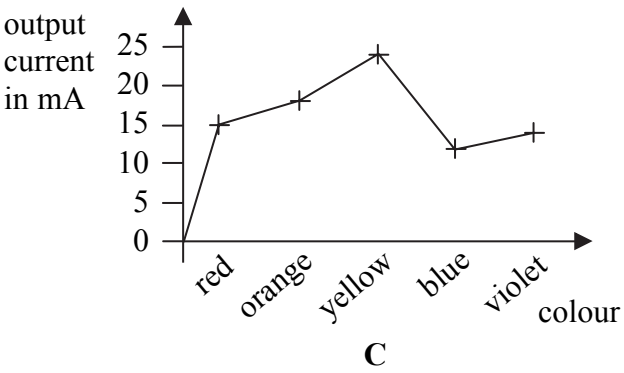
Which of these graphs is the best way of showing these results?



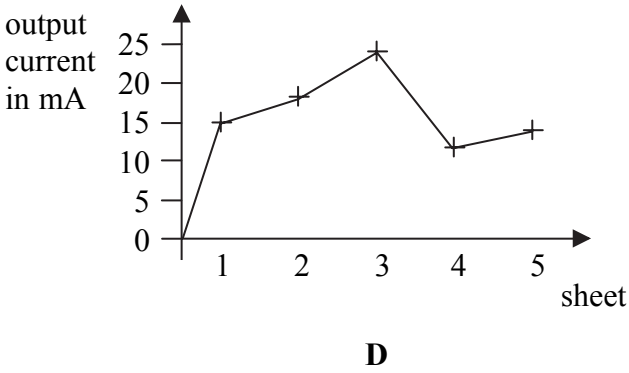
A



B



C



D

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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

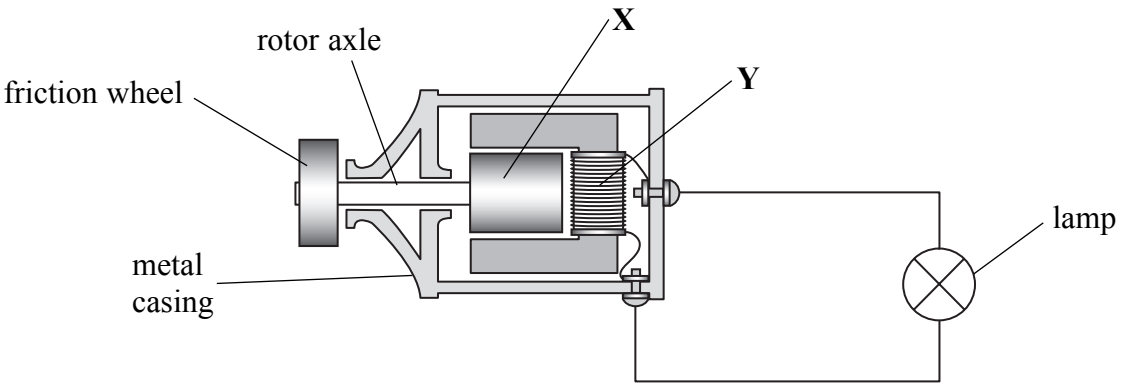
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Generating electricity

Use this information about bicycle dynamos to answer questions 25 to 30.

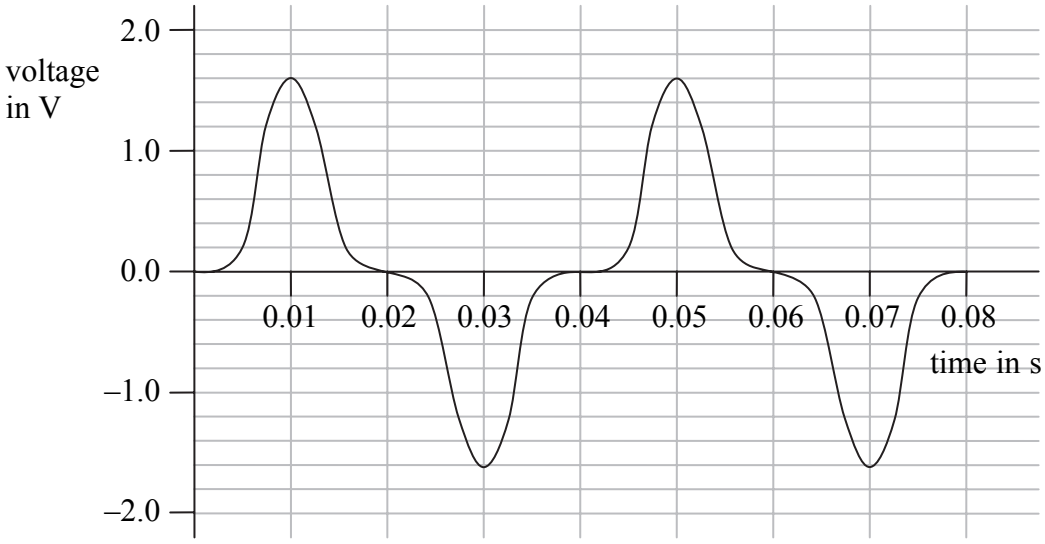
Josh and Micah are investigating dynamos.



25. Which row of the table is correct for **X** and **Y** in the dynamo?

	X is a	**Y is a**
A	coil of wire	magnet
B	coil of wire	coil of wire
C	magnet	magnet
D	magnet	coil of wire

26. The graph shows the output voltage of the dynamo as the friction wheel is turned steadily.



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The maximum output voltage of this dynamo is about

A 0.08 V
B 1.3 V
C 1.6 V
D 2.6 V

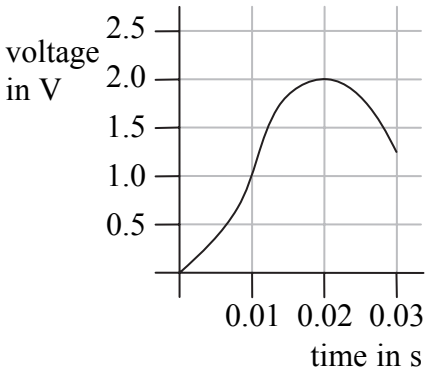
27. Which row of the table is correct for the current in the lamp?

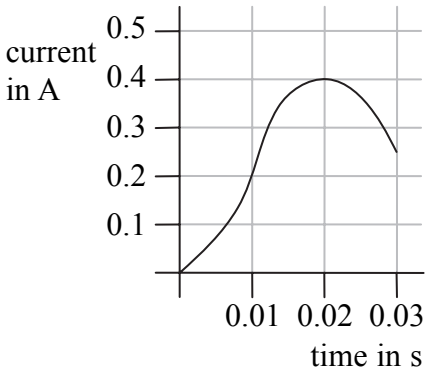
	moving charges are	**the charges in the lamp move like this**
A	electrons	↓
B	electrons	↑
C	electrons	↕
D	copper atoms	↕

28.

power = current × voltage

The graphs show the current in and voltage across a lamp using a different dynamo.





When the time is 0.02 s the output **power** of this dynamo is

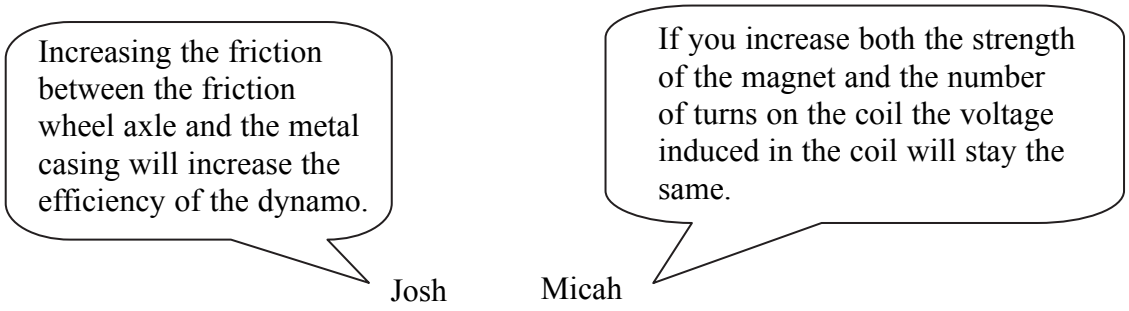
A 0.4 A
B 0.8 W
C 2 V
D 5 W

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29. The diagram of a bicycle dynamo on page 12 shows a friction wheel.
Which row of the table is correct if the friction wheel turns faster?

	output voltage is	**output voltage changes from positive to negative**
A	lower	less often
B	higher	less often
C	higher	more often
D	lower	more often

30. Josh and Micah discuss the voltage induced in the coil of the bicycle dynamo.



Who is correct?

A Josh only
B Micah only
C both Josh and Micah
D neither

Electricity in hospitals

Susan and Fatima are visiting the X-ray department of a hospital.

31.

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

An X-ray machine has an efficiency of 1%.
The energy of the X-rays produced by the machine is 400 J.
The X-ray machine needs an energy input of

A 4 J
B 400 J
C 4 000 J
D 40 000 J

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32. Susan sees a different type of X-ray machine which uses 2 000 J of electrical energy in 0.5 s. The power input of this machine is

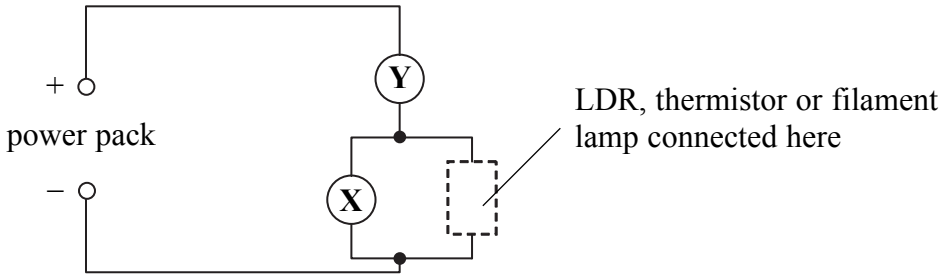
A 1 000 W
B 4 000 W
C 10 000 W
D 40 000 W

33. Fatima learns that the electrical circuits in the department are fitted with residual current circuit breakers (RCCBs).
Which row of the table is correct for an RCCB?

	an RCCB detects differences between	**compared to a fuse an RCCB**
A	currents in the live and neutral wires	disconnects an appliance faster
B	currents in the live and earth wires	disconnects an appliance faster
C	currents in the live and neutral wires	is cheaper to replace
D	currents in the live and earth wires	is cheaper to replace

Investigating resistors

Jo and her science group set up this circuit to find the resistances of a light-dependent resistor (LDR), a thermistor and a filament lamp.



34. Which row of the table is correct for meters **X** and **Y**?

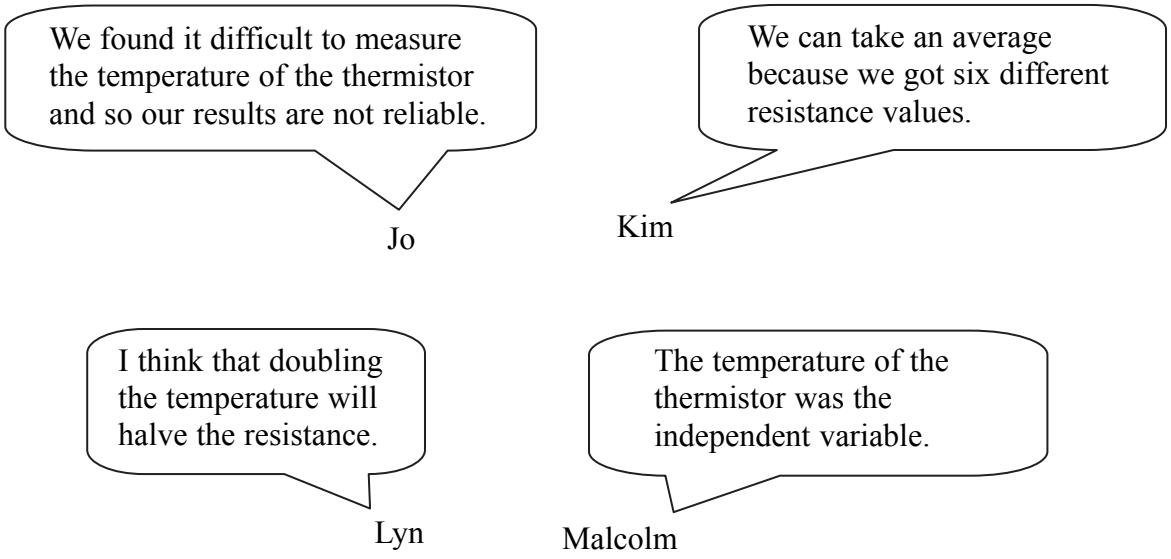
	meter X	**meter Y**
A	ammeter	ammeter
B	ammeter	voltmeter
C	voltmeter	ammeter
D	voltmeter	voltmeter

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35. Jo's group use an LDR in the circuit.
They find the resistance as they change the brightness of the light shining on the LDR.
Which row of the table is correct when the LDR is in the dark?

	resistance of LDR	**current in LDR**
A	low	low
B	high	low
C	low	high
D	high	high

36. Jo's group uses the thermistor in the circuit and finds its resistance at different temperatures.
They discuss the experiment.



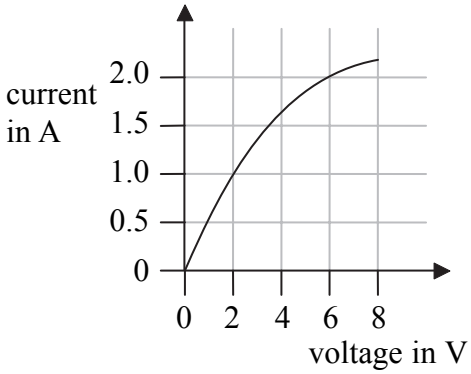
Who has made an evaluation of the investigation?

A Jo
B Kim
C Lyn
D Malcolm

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Use this information to answer questions 37 and 38.

Jo's group then investigate a filament lamp.
The graph shows how the current in a filament lamp varies with voltage.



37. $V = I \times R$

The resistance of the filament lamp at 6 V is

A 2 Ω
B 3 Ω
C 8 Ω
D 12 Ω

38. Which of these is correct for the graph?

A The resistance of the lamp increases at higher voltages
B The resistance of the lamp decreases at higher voltages
C The current in the lamp decreases at higher voltages
D I is directly proportional to V for all values of voltage

39. Jo and Kim discuss using a data-logger to collect data and a computer to display the results from their lamp investigation.

Using a data-logger and a computer will make our investigation more valid.

Jo

Using a more powerful computer will improve the accuracy of our measurements.

Kim

Who is correct?

A Jo only
B Kim only
C both Jo and Kim
D neither

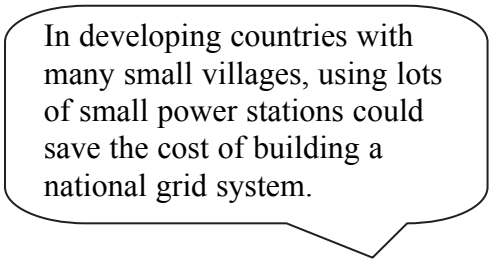
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Solar power

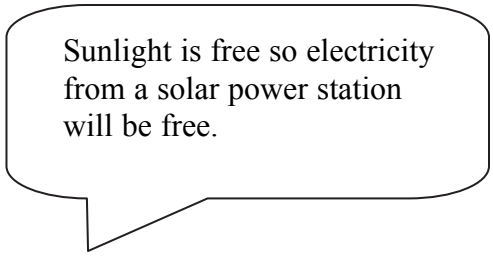
40. An advertisement for some new solar panels claims:

> The solar panels will generate electricity at a price comparable to coal-fired power stations.
> We are aiming to make solar power stations up to 10 MW in size.

Peter and Rashid discuss this.



Peter



Rashid

Who is correct?

A Peter only
B Rashid only
C both Peter and Rashid
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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5009 / 5045 (P1a)

Unit P1a – 5009/5045	
Topics 9 & 10	
1	A
2	A
3	C
4	D
5	B
6	D
7	A
8	D
9	B
10	B
11	C
12	C
13	B
14	B
15	A
16	C

Unit P1a – 5009/5045	
Topics 9 & 10	
17	D
18	D
19	B
20	B
21	A
22	C
23	C
24	A

Unit P1a – 5009/5045	
Topics 9 & 10	
25	D
26	C
27	C
28	B
29	C
30	D
31	D
32	B
33	A
34	C
35	B
36	A
37	B
38	A
39	D
40	A

5010 / 5046 (P1b)

Unit P1b - 5010	
Topics 11 & 12	
1	B
2	D
3	D
4	D
5	C
6	A
7	B
8	B
9	D
10	D
11	A
12	B
13	A
14	B
15	C
16	A

Unit P1b - 5010	
Topics 11 & 12	
17	D
18	A
19	B
20	C
21	B
22	D
23	A
24	C

Unit P1b - 5010	
Topics 11 & 12	
25	A
26	B
27	A
28	B
29	D
30	D
31	B
32	D
33	A
34	C
35	D
36	A
37	C
38	B
39	A
40	B