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 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.

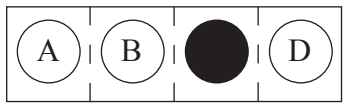
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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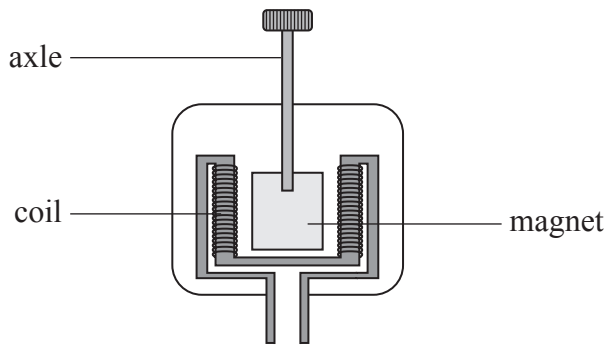
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

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.

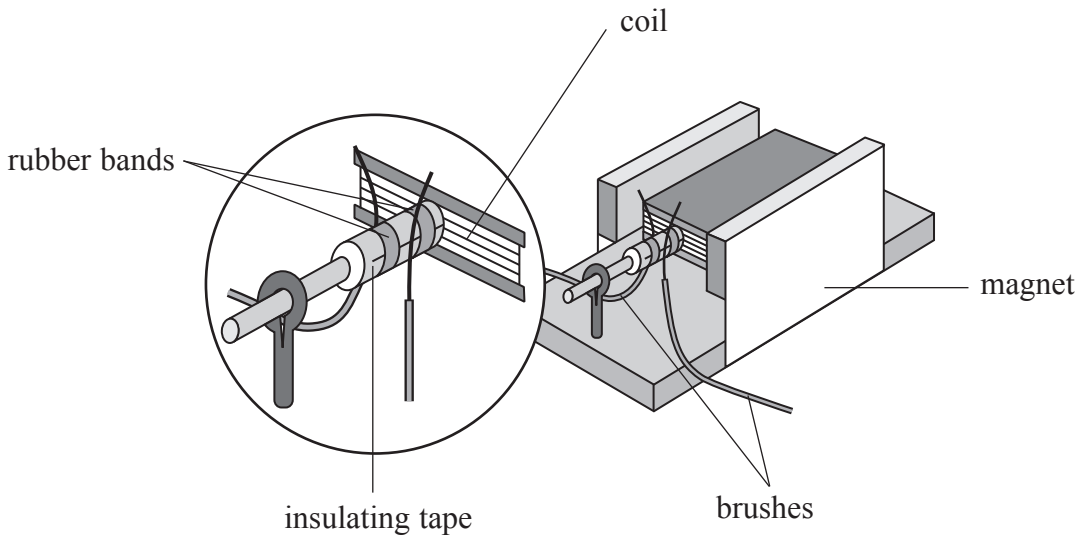


In the dynamo, which of these will increase the size of the voltage generated?

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

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

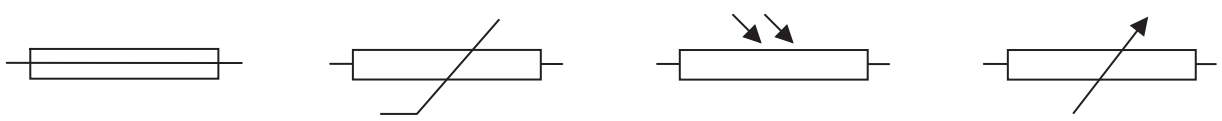
4. The brushes are **designed** to

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**

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

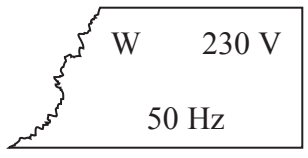
A charge
B energy
C current
D voltage

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

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

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?

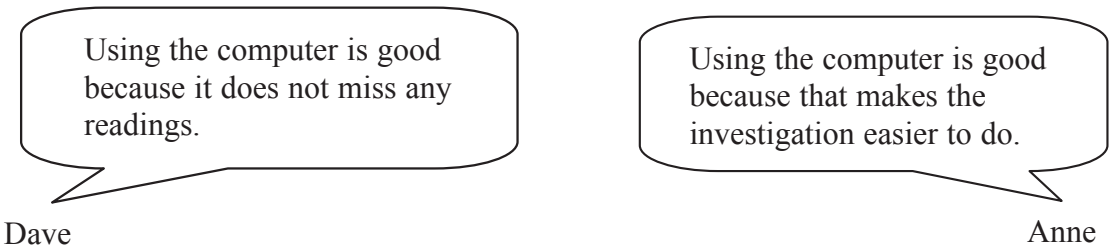
A 3.0 V
B 5.5 V
C 6.5 V
D 12.0 V

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.



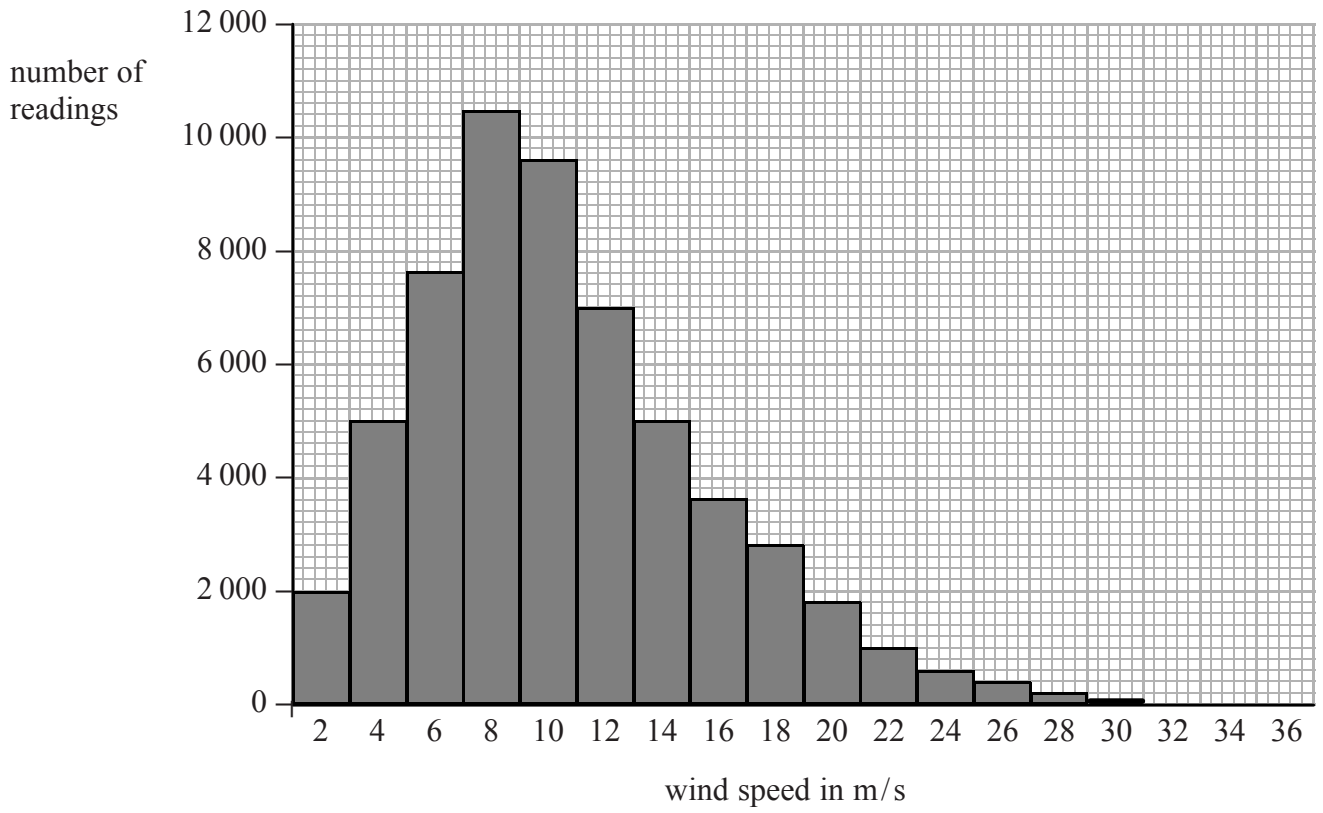
Who is correct?

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

19. The chart shows Dave's results.

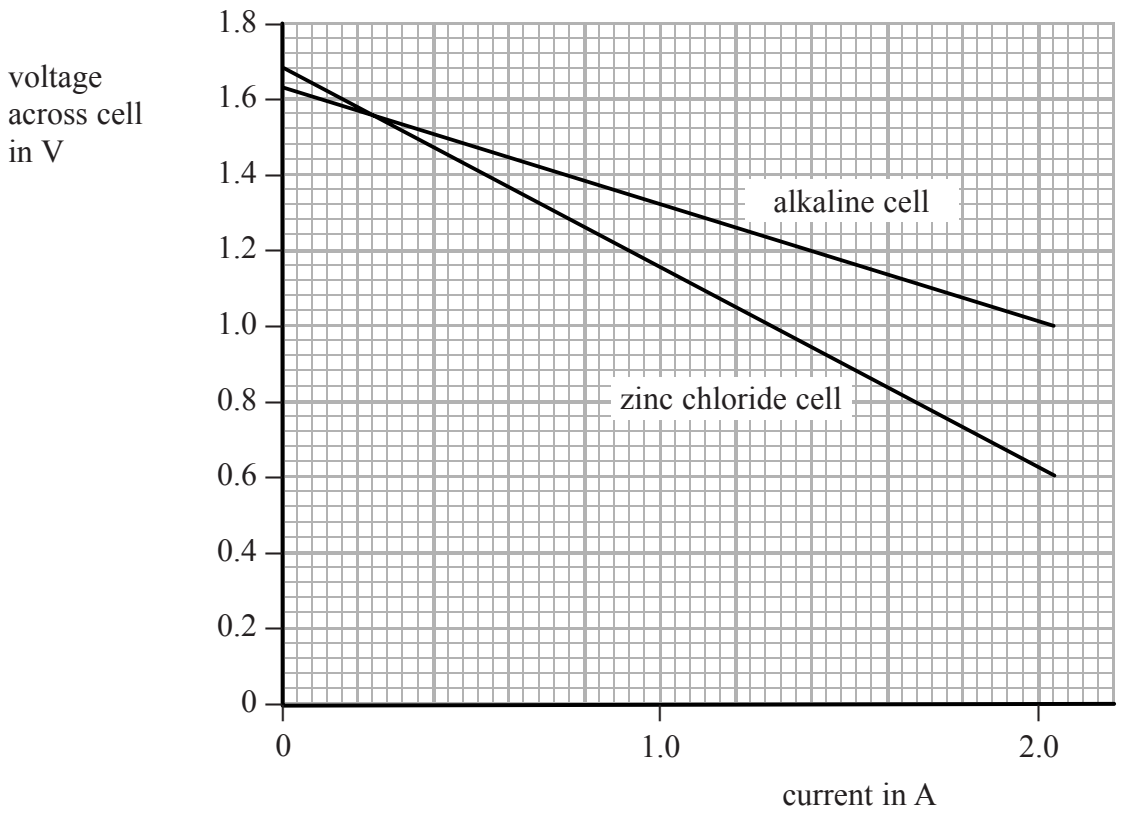


Dave said that the wind speed was 34 m/s sometimes.
This is not shown on the graph because

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

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.



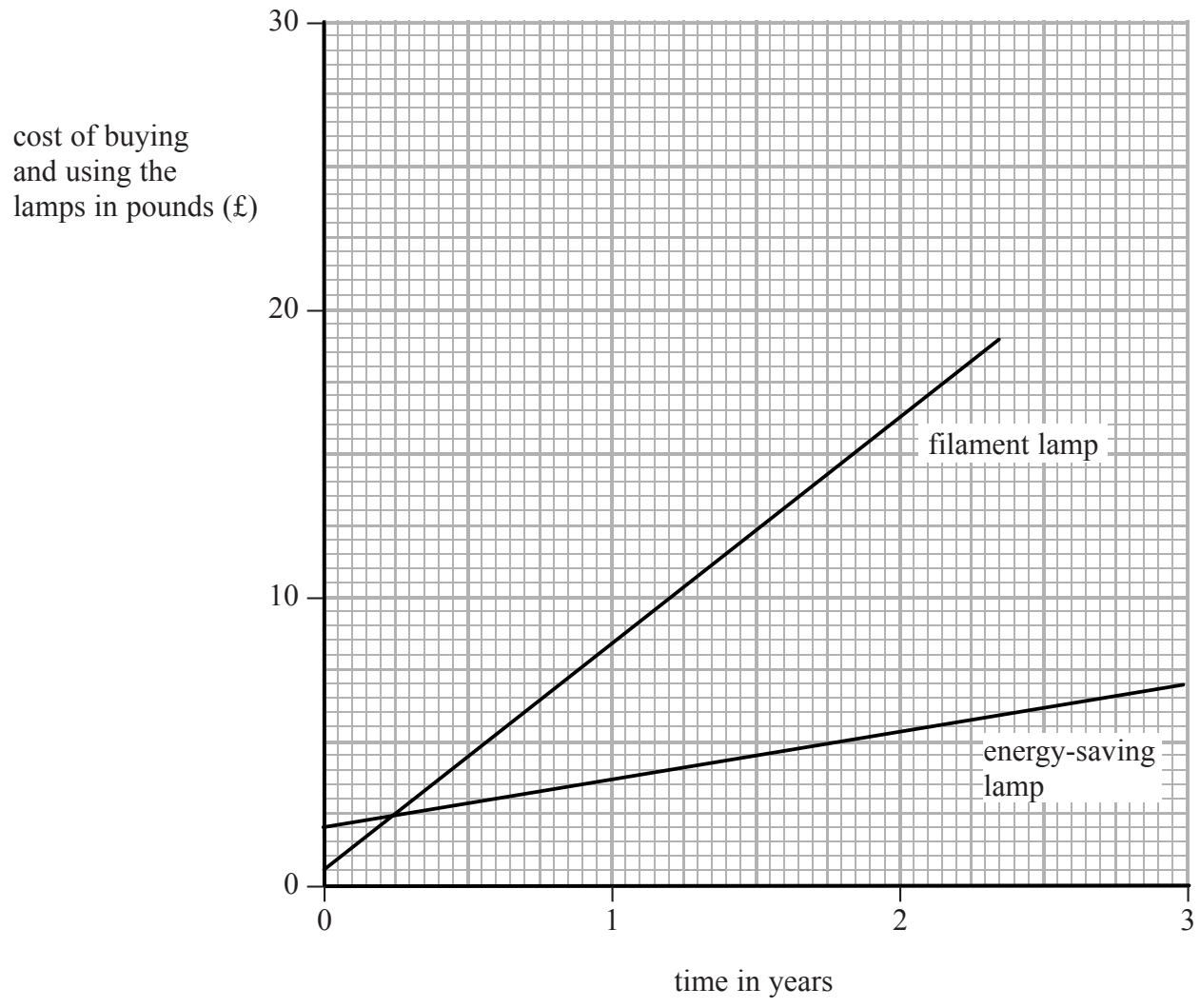
Which of these is correct for the range of currents shown?

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

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

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

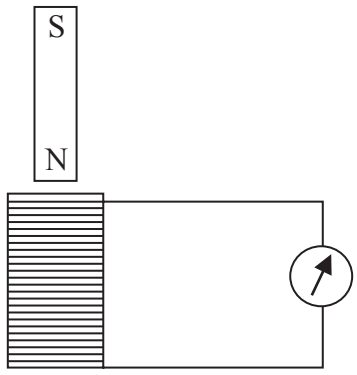
Foundation tier candidates do not answer any more questions after question 24.

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

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

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

Investigating electrical devices

31.

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

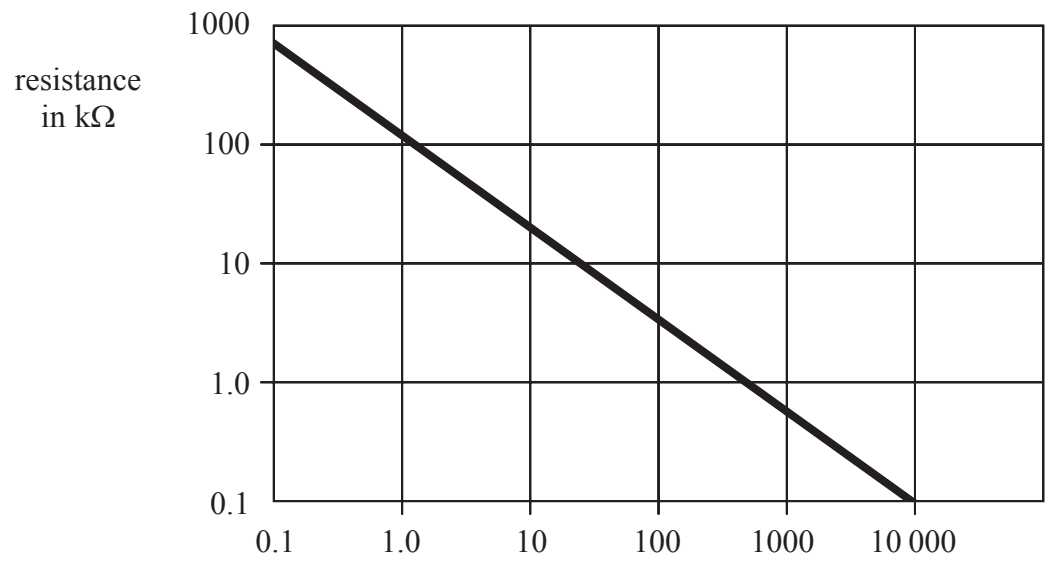
John finds that the efficiency of a solar cell is 24%.
When it supplies 1.2 W of electricity, how much solar energy falls on the cell in each second?

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

32.

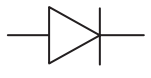
$V = I \times R$

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.

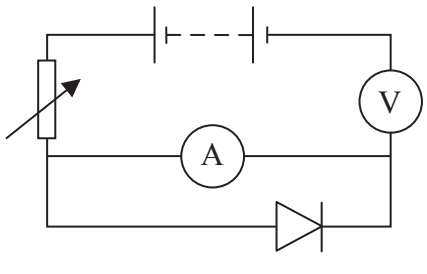


There is a current of 0.02 mA in the light-dependent resistor when the voltage across it is 2 V.
The brightness for this would be about

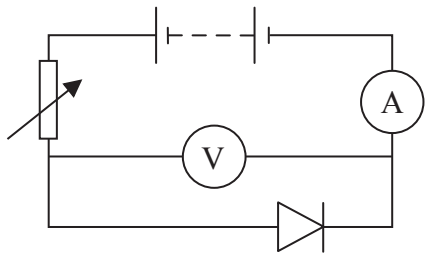
A 1.0 lux
B 10 lux
C 100 lux
D 1000 lux

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

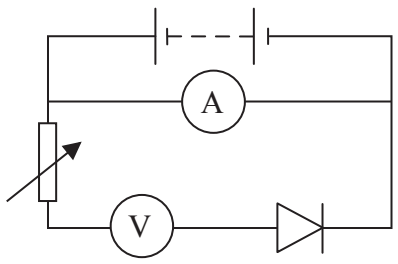
Which of these circuits should Roger set up to find the resistance of the diode?



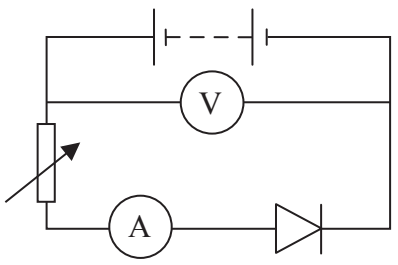
A



B

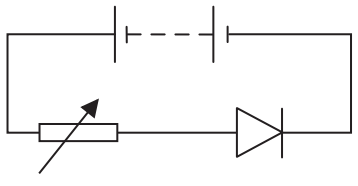


C

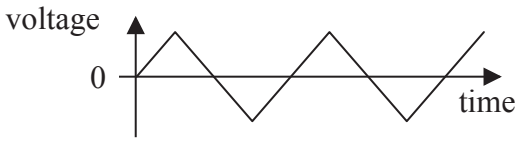


D

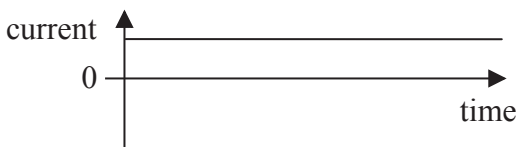
34. A diode affects the current in a circuit.
There **is a current** in the circuit when the battery is connected as shown.



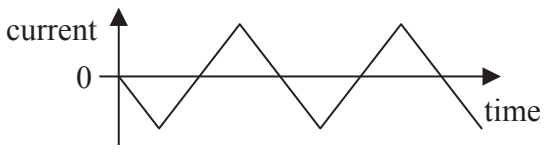
There **is no current** in the circuit when the battery is reversed.
Roger replaces the battery with a device which provides a voltage like this.



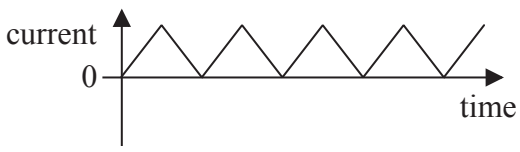
Which of these graphs could show the current that is now in the circuit?



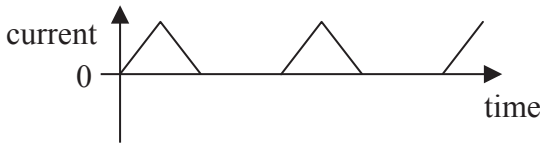
A



B



C



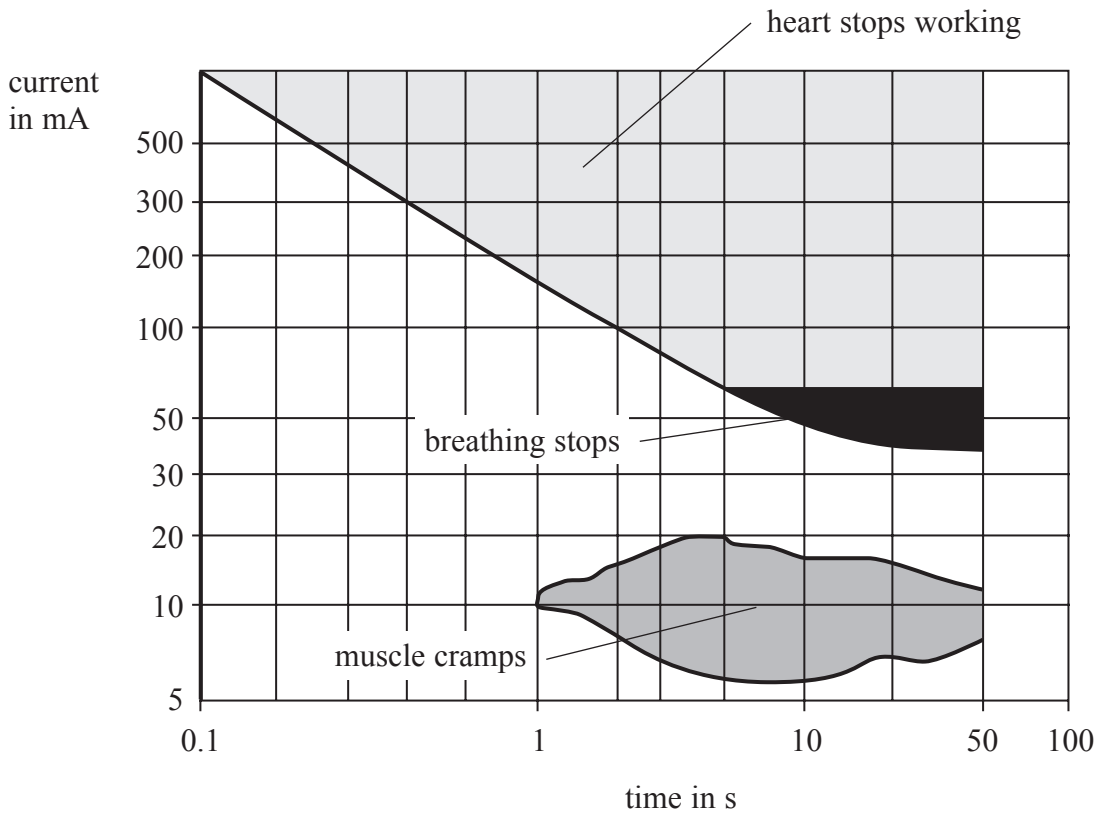
D

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.



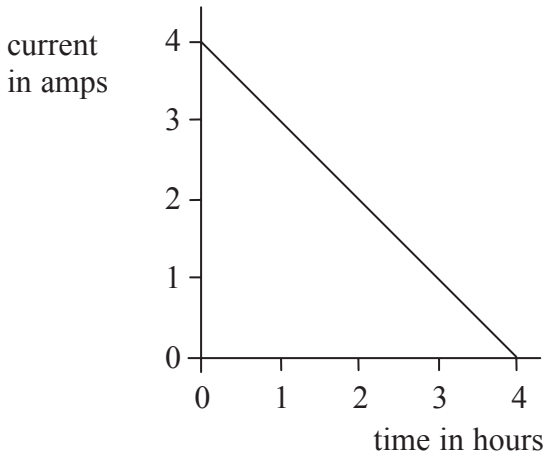
Which of these shocks would initially cause a victim's breathing to stop?

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

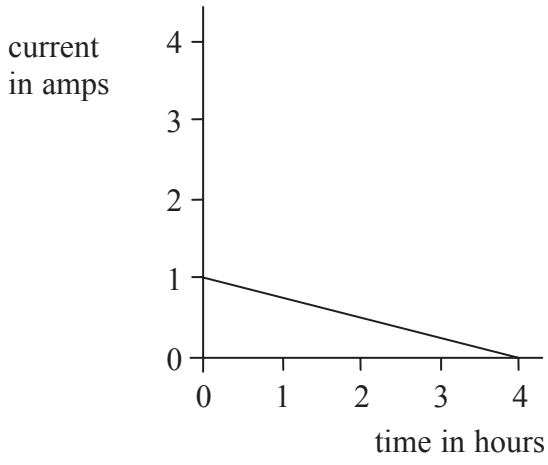
Batteries

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

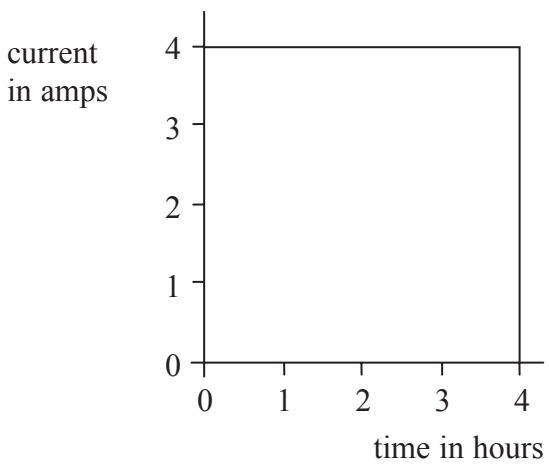
Which of these graphs could be for a battery with a capacity of 4 amp-hours?



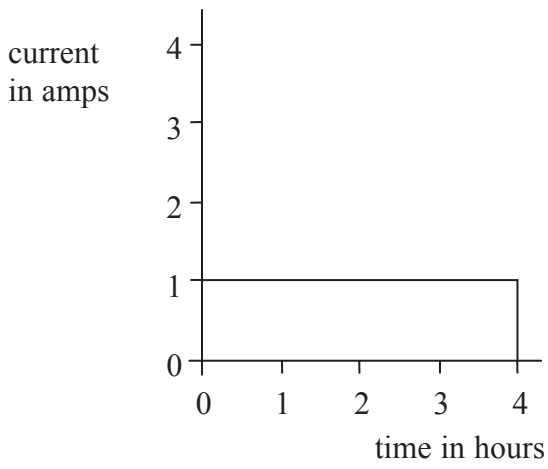
A



B

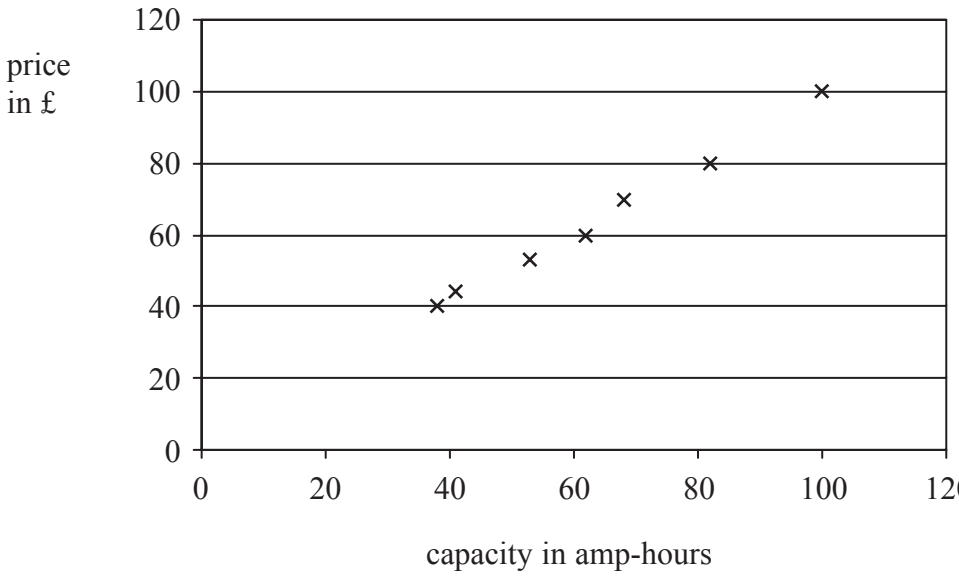


C

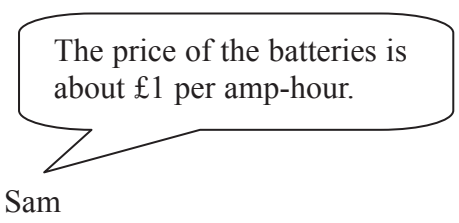


D

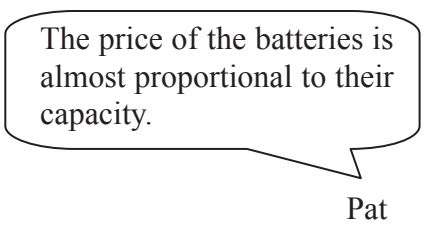
38. The graph shows the price of car batteries with different capacities.



Sam and Pat discuss the graph.



Sam



Pat

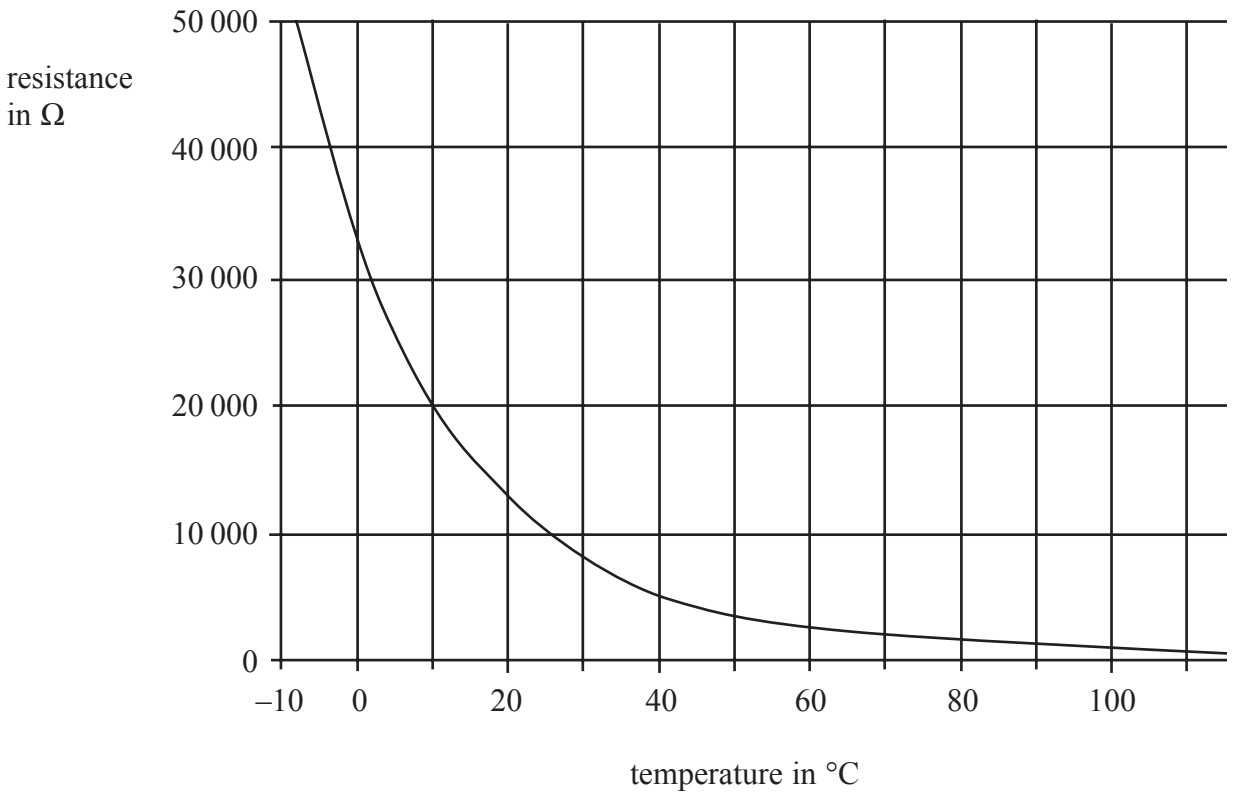
Who is correct?

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

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