

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.

Printer's Log. No.

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*Turn over*

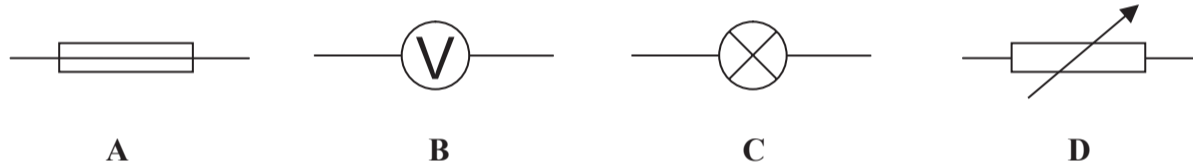
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Questions 1 to 16 must be answered by Foundation tier candidates only.  
Higher tier candidates start at question 17.

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?



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

### 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

**Ohm's law**

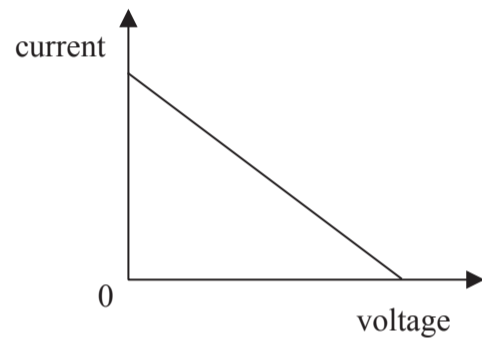
**10.** In the equation

$$V = I \times R$$

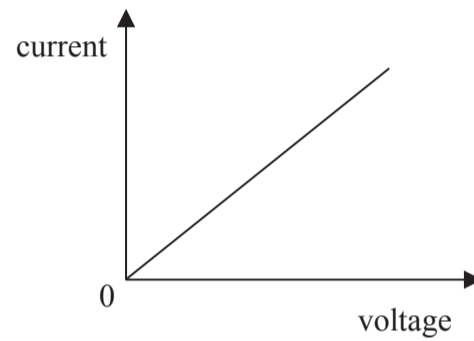
$I$  is the

- A** power
- B** energy
- C** voltage
- D** current

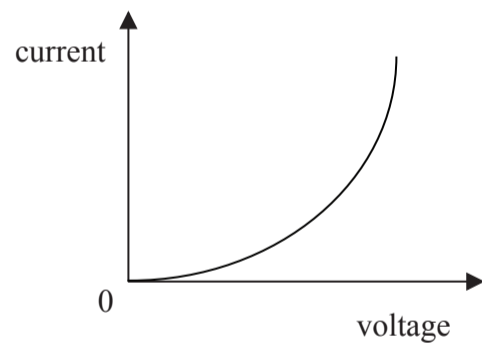
**11.** Which graph shows how current varies with voltage for a fixed value resistor?



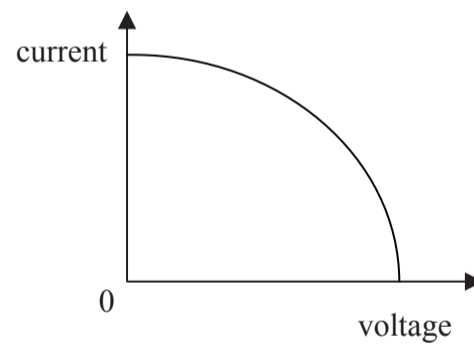
**A**



**B**



**C**



**D**

### 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

16.

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

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

**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.*

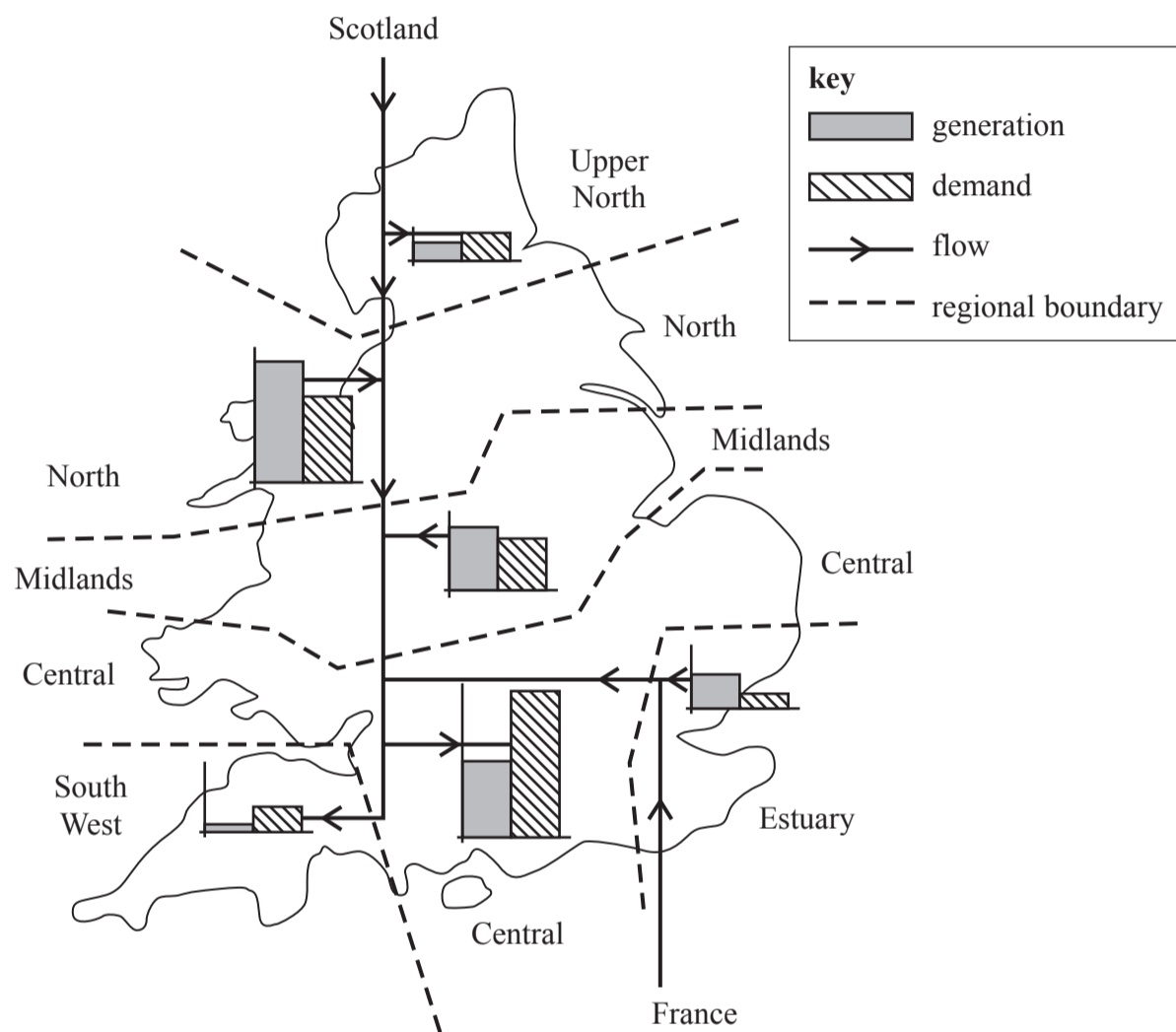
Batteries can be compared to jugs of water.  
In this model, a jug full of water is like a fully-charged battery.  
Emptying the jug is like discharging the battery.

- 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

### 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?

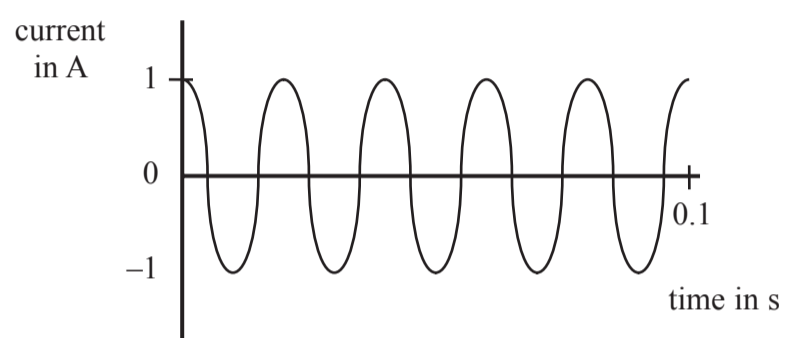
- A Central
- B Estuary
- C Midlands
- D North



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.

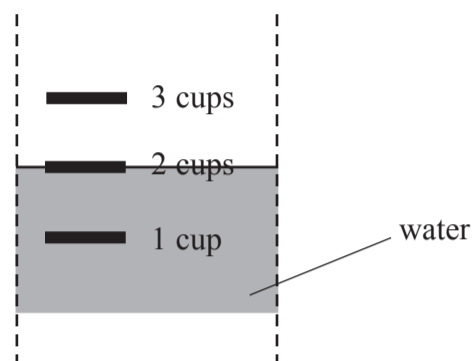


The current is called alternating current because

- 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

### 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.**

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

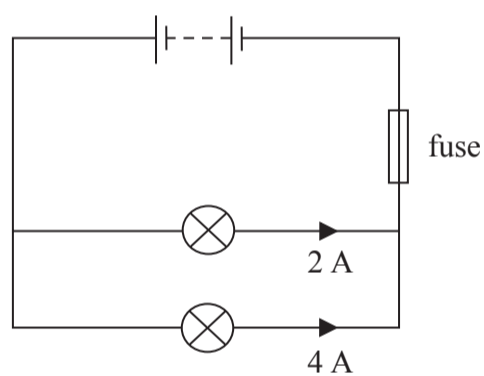
**Electrical safety**

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
<b>A</b>	the wiring and appliance	the user
<b>B</b>	the user	the user
<b>C</b>	the wiring and appliance	the wiring and appliance
<b>D</b>	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

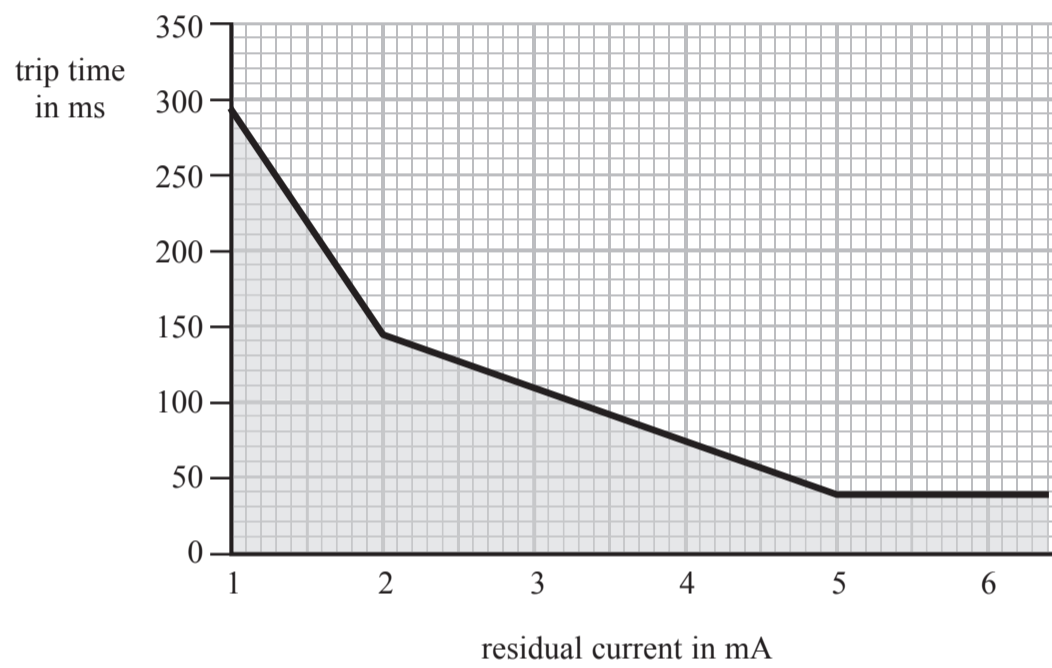
- A** 6 V
- B** 9 V
- C** 18 V
- D** 216 V

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.



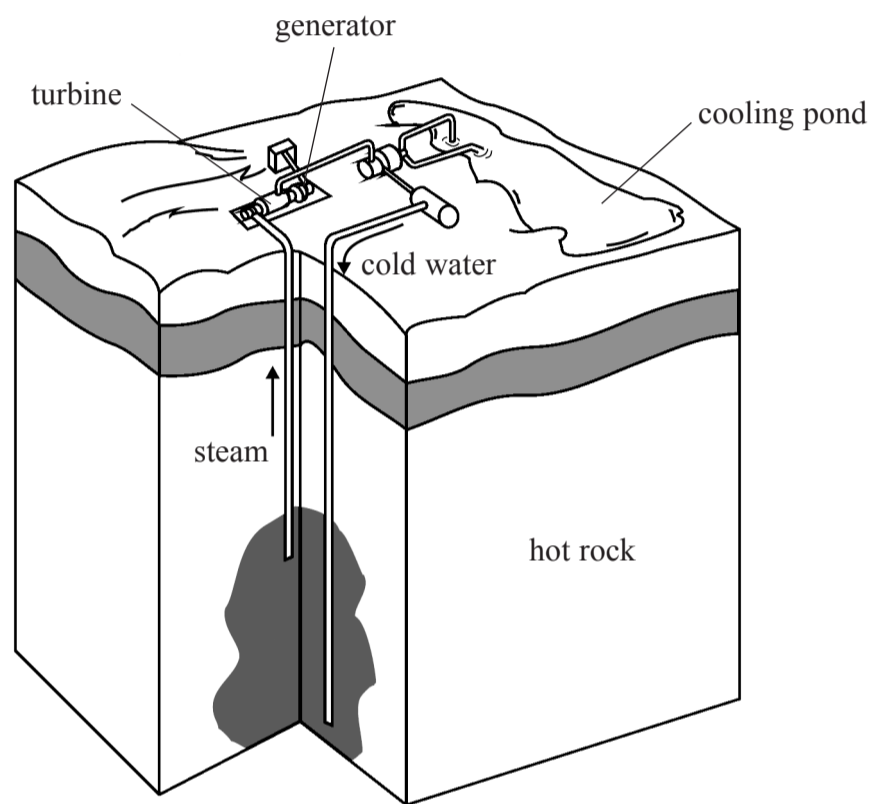
Which row of the table is correct?

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

### Producing electricity

Use this information to answer questions 30 and 31.

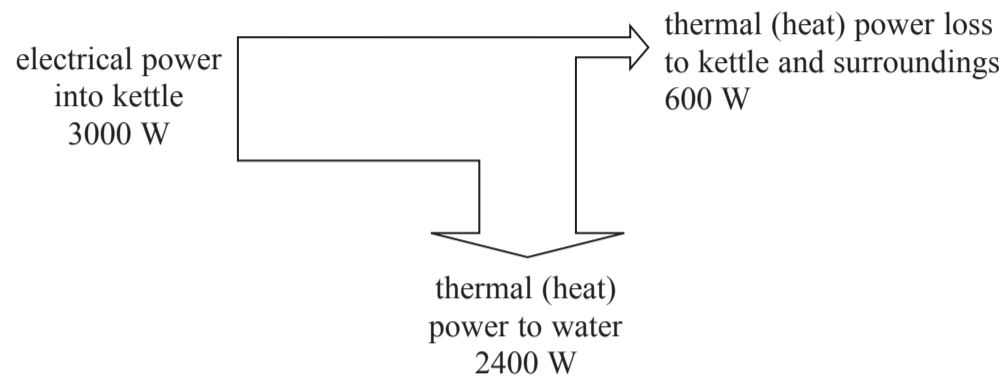
The diagram shows a way of taking energy from hot rock.  
Cold water is pumped through hot rock below the surface of the Earth.  
The water turns to steam.  
The steam drives a turbine that turns an electrical generator.



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

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.

$$\text{cost} = \text{power} \times \text{time} \times \text{cost per kWh}$$

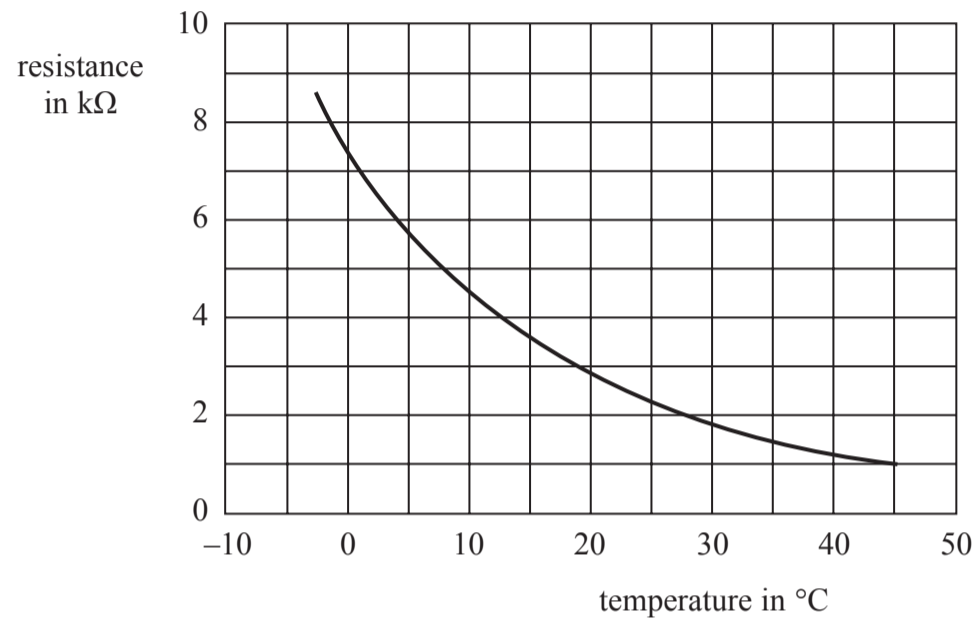
The kettle works at full power for 3 minutes.  
If the total cost of this is 3p, how much does electricity cost per kWh?

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

### Temperature and resistance

Use this information to answer questions 34 and 35.

Anne finds this graph about a thermistor.



34. The resistance changes from  $8000\ \Omega$  to  $2000\ \Omega$ .  
The corresponding temperature change is about

- A  $6\ ^\circ\text{C}$
- B  $26\ ^\circ\text{C}$
- C  $30\ ^\circ\text{C}$
- D  $47\ ^\circ\text{C}$

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

The rate at which the resistance changes with temperature is bigger at  $10\ ^\circ\text{C}$  than at  $30\ ^\circ\text{C}$ .

John

The resistance of the thermistor at  $15\ ^\circ\text{C}$  is in the range  $3600\ \Omega$  to  $3800\ \Omega$  and also in the range  $2900\ \Omega$  to  $4500\ \Omega$ .

Anne

Who is correct?

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

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

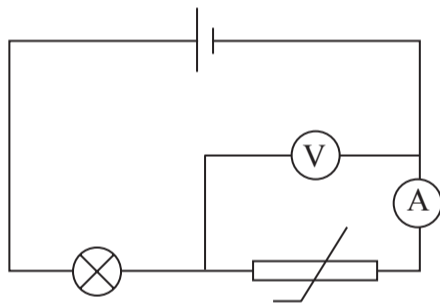
37.  $V = I \times R$

At room temperature a different thermistor has a resistance of  $30 \Omega$ . It is in a circuit and the voltage across it is  $60 \text{ mV}$ .

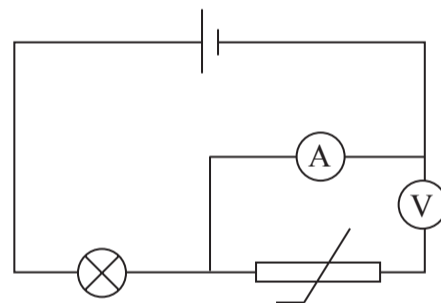
What is the current in the thermistor?

- A  $0.5 \text{ mA}$
- B  $2 \text{ mA}$
- C  $0.5 \text{ A}$
- D  $2 \text{ A}$

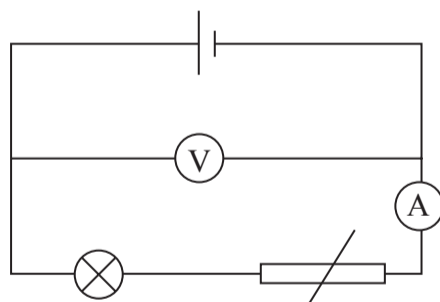
38. Which of these circuits is suitable to find the resistance of a thermistor?



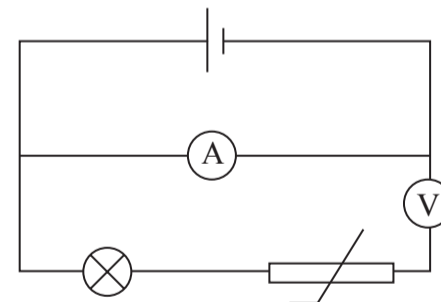
A



B



C



D

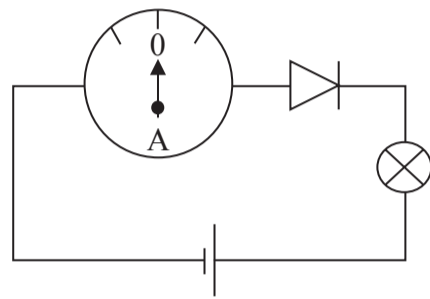


### Diodes

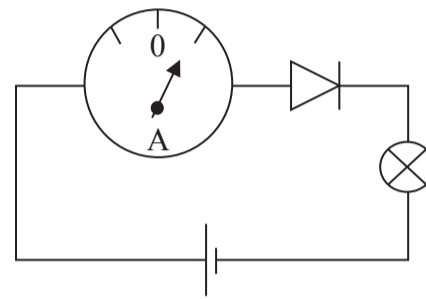
Use this information to answer questions 39 and 40.

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.

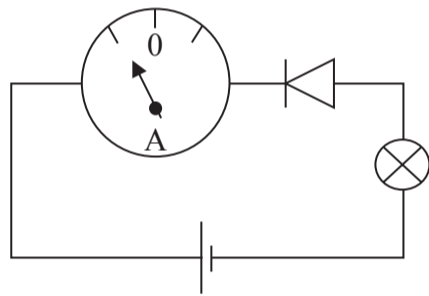


current not allowed

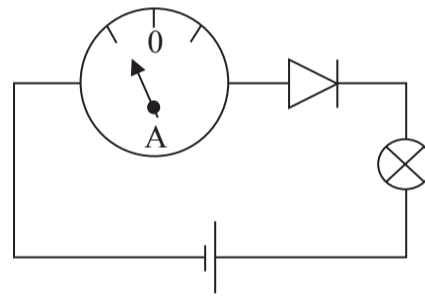


current allowed

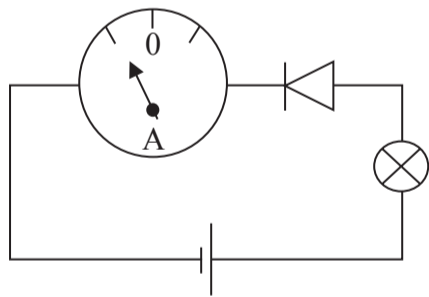
39. Which of these four arrangements of the diode and cell shows the correct ammeter reading?



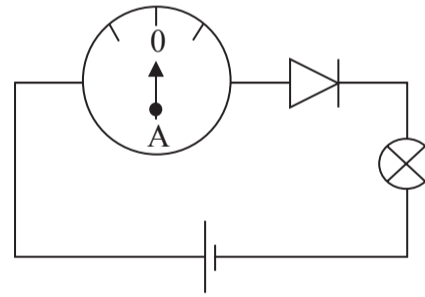
**A**



**B**

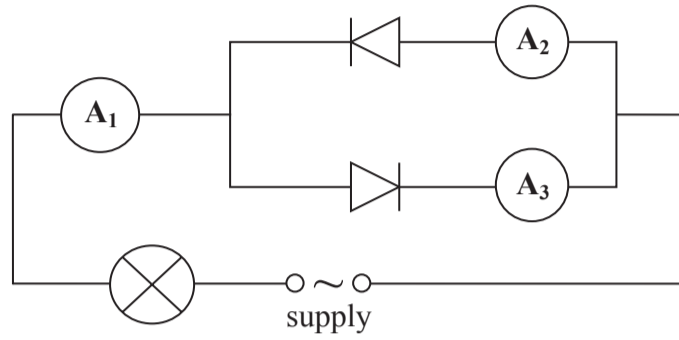


**C**

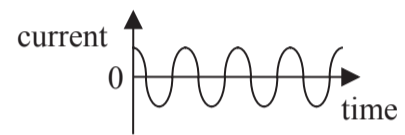


**D**

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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