

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.

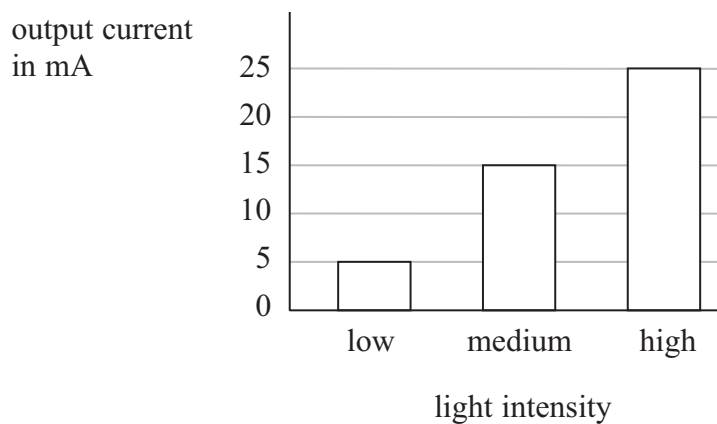
### Solar cells

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

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

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**



power = 11 W  
cost = £1.50  
lifetime = 10 000 hours

**filament (incandescent) lamp**



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

## Paying for electricity

9.

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

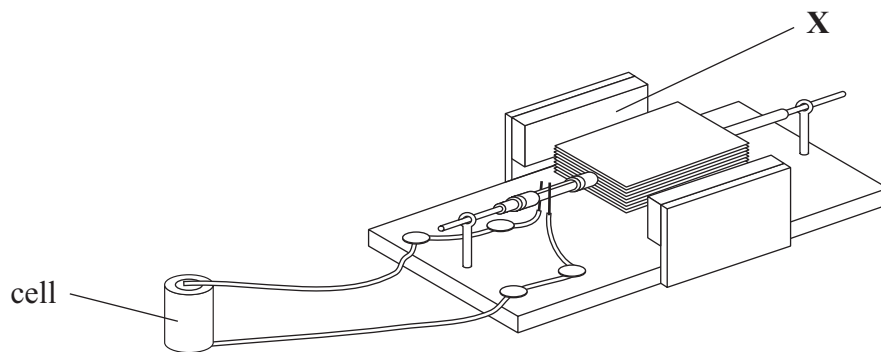
The power of an electrical heater is 2 kW.  
Electricity costs 20p per kWh.

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

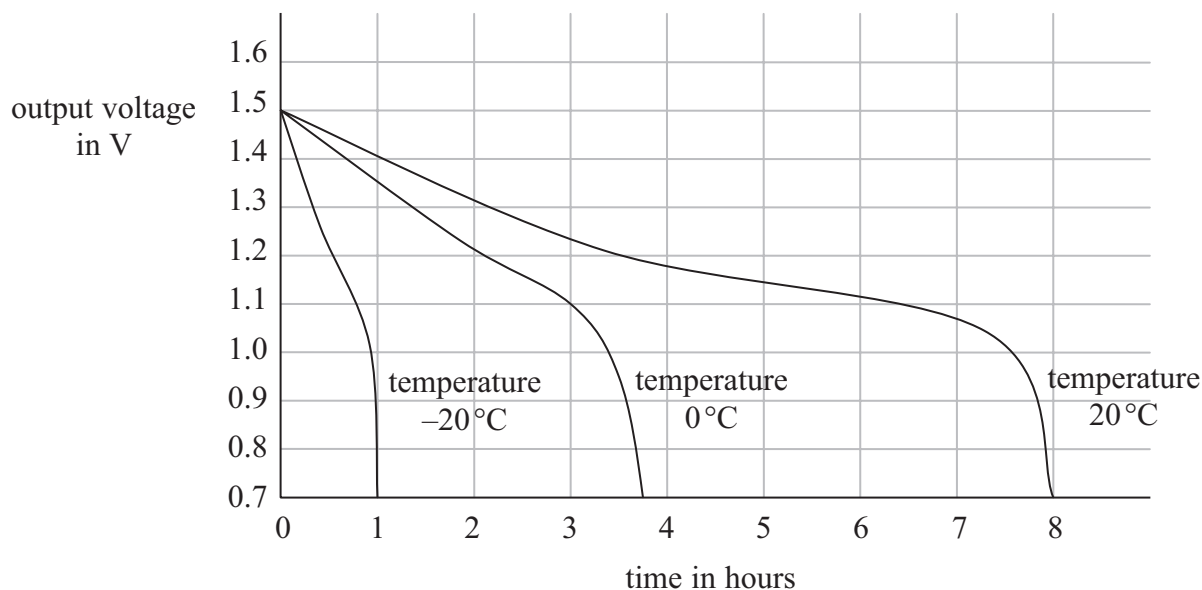
11. An electric motor is **designed** to transfer electrical energy into
- A thermal (heat) energy
  - B sound energy
  - C kinetic energy
  - D chemical energy
12. An electric motor transfers 12 J of electrical energy each second. This means that the motor has
- A a voltage of 12 V
  - B a current of 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

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.

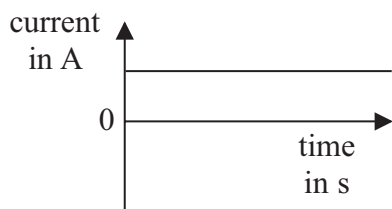


14. The battery stops working when the output voltage reaches 1.1 V.  
The torch is used continuously at a temperature of 0°C.  
About how long will the battery last before its output voltage reaches 1.1 V?
- A 0.75 hours  
B 3.0 hours  
C 3.8 hours  
D 6.5 hours
15. Which of these is correct for this 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

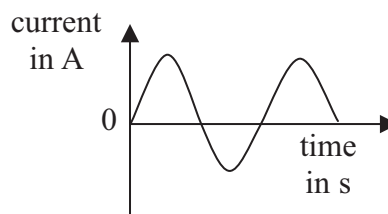
Higher tier candidates start at question 17 and answer questions 17 to 40.  
 Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

### Investigating electric current

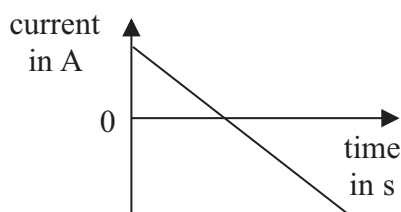
17. Which of these shows a direct current?



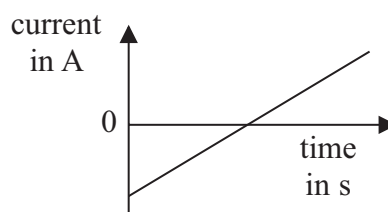
**A**



**B**



**C**



**D**

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

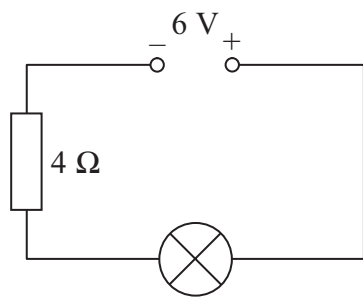
	particles moving through the wire	charge carried by the particles
<b>A</b>	ions	positive
<b>B</b>	ions	negative
<b>C</b>	electrons	positive
<b>D</b>	electrons	negative

19. The current in a lamp is measured by connecting

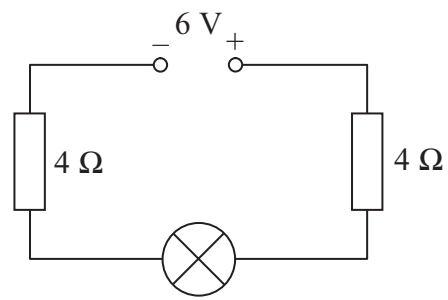
- A** an ammeter in series with the lamp
- B** an ammeter in parallel with the lamp
- C** a voltmeter in series with the lamp
- D** a voltmeter in parallel with the lamp



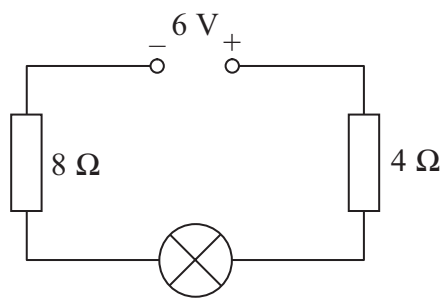
20. The lamps used in these four circuits are identical.  
Which circuit has the biggest current?



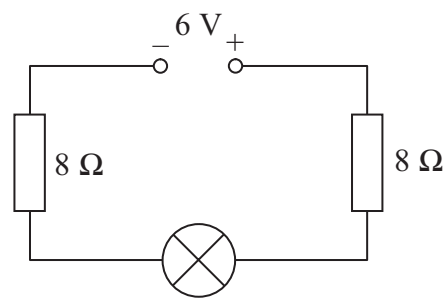
**A**



**B**



**C**



**D**

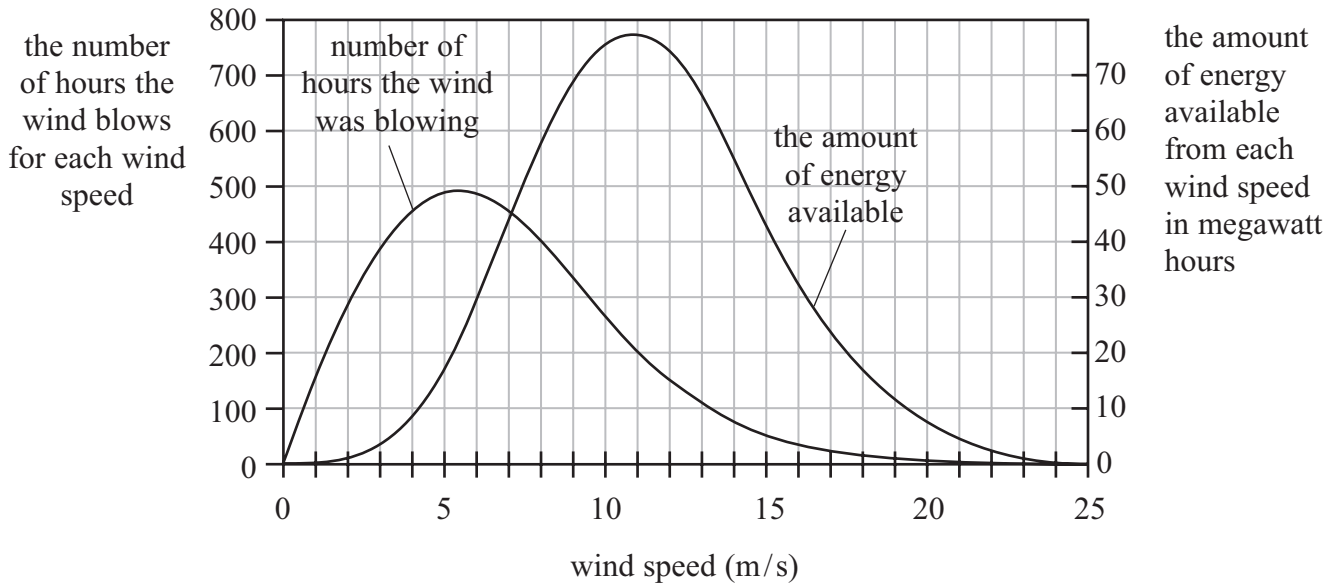
## Wind farms

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

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**

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**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.

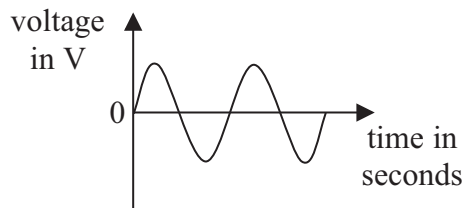
Generating electricity

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.

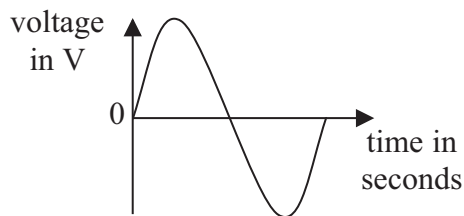
Which row of the table shows a combination that will **not** generate an electric current?

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

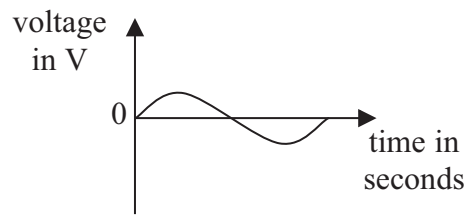
26. The graph shows the output voltage for a generator.



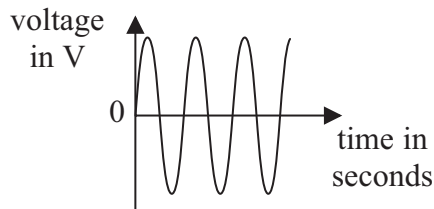
Which graph shows the output when the generator turns at a faster speed.



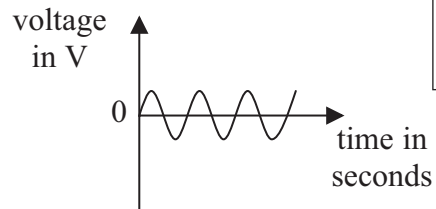
**A**



**B**



**C**

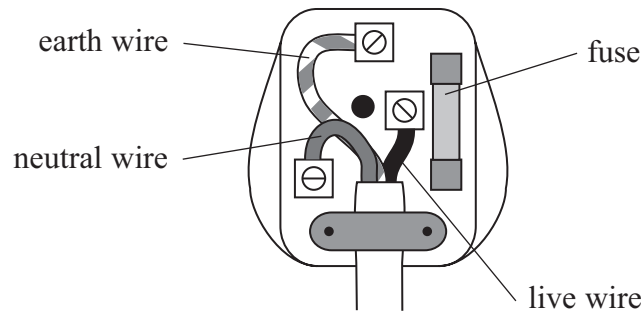


**D**

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

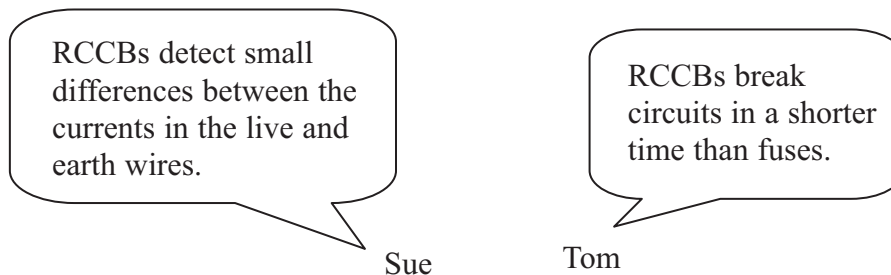
## Electrical machines

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

30. Two students are discussing Maglev trains and superconductors.

Maglev trains are almost frictionless so they are not responsible for any global warming.

Bev

When a material is superconducting its resistance is exactly 1.0 ohm.

Pauline

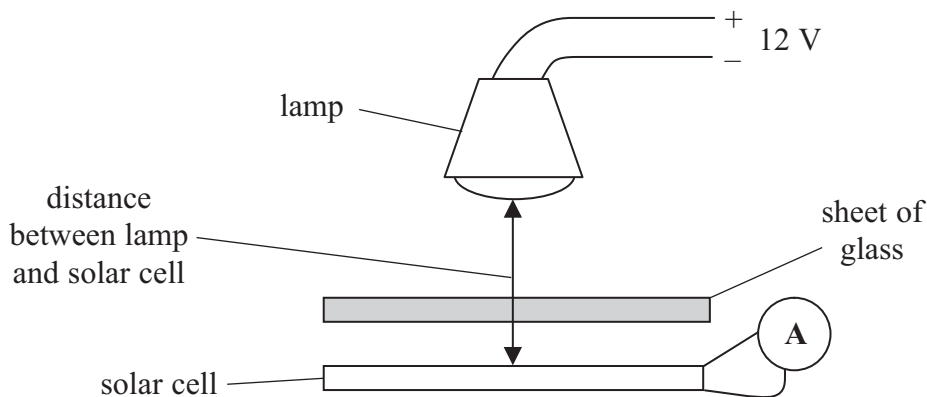
Who is correct?

- 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.

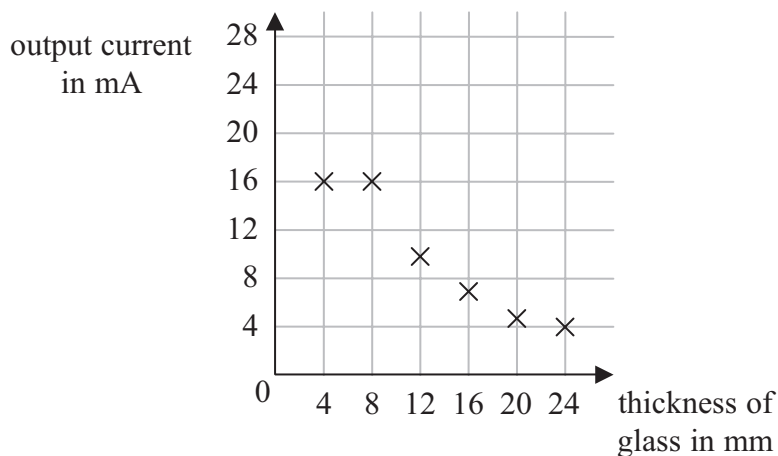


The distance between the lamp and the solar cell is kept constant.

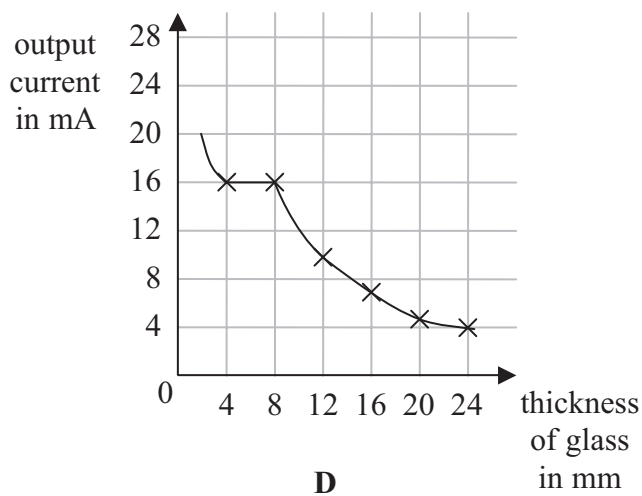
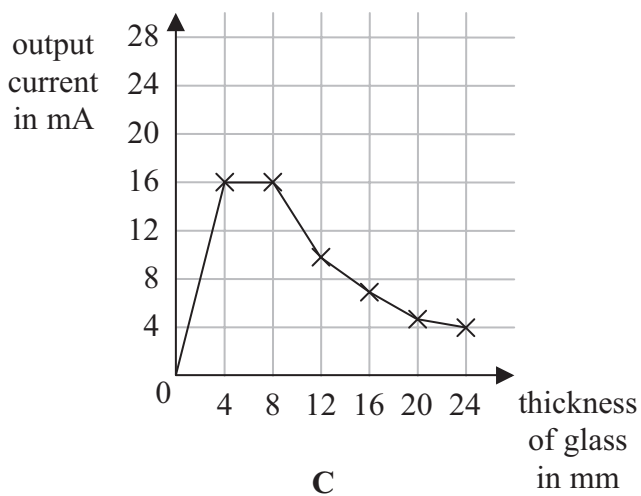
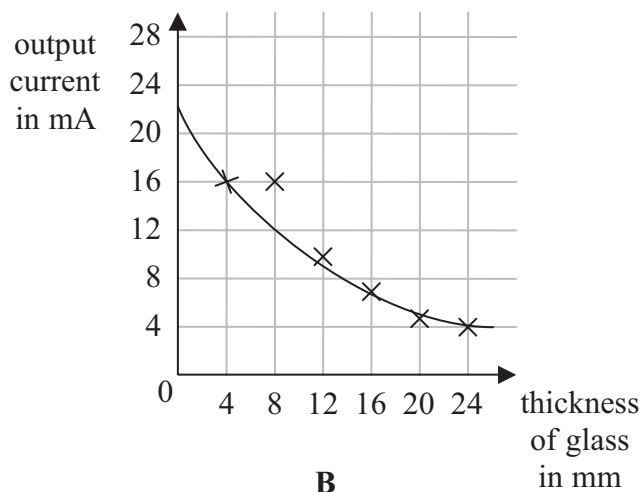
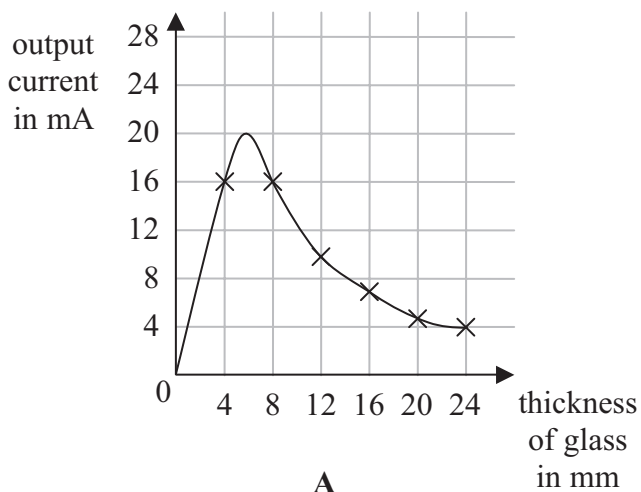
31. Which row of the table is correct for this investigation?

	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

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

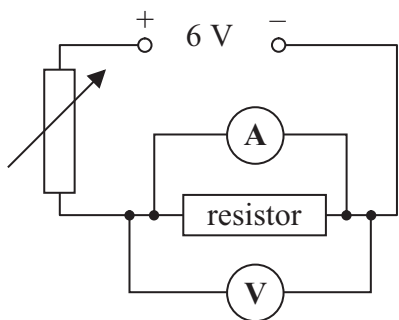


Which of these graphs is the best way of displaying the students' results?

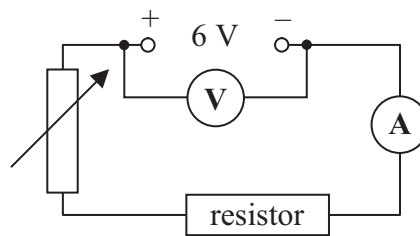


Some students are investigating how current varies with voltage for a resistor.

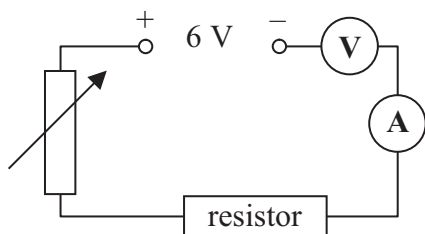
33. Which circuit should they use?



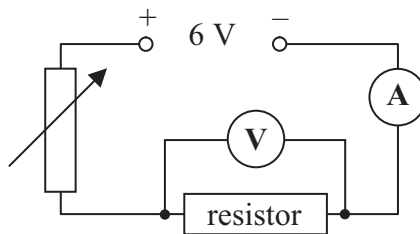
**A**



**B**



**C**

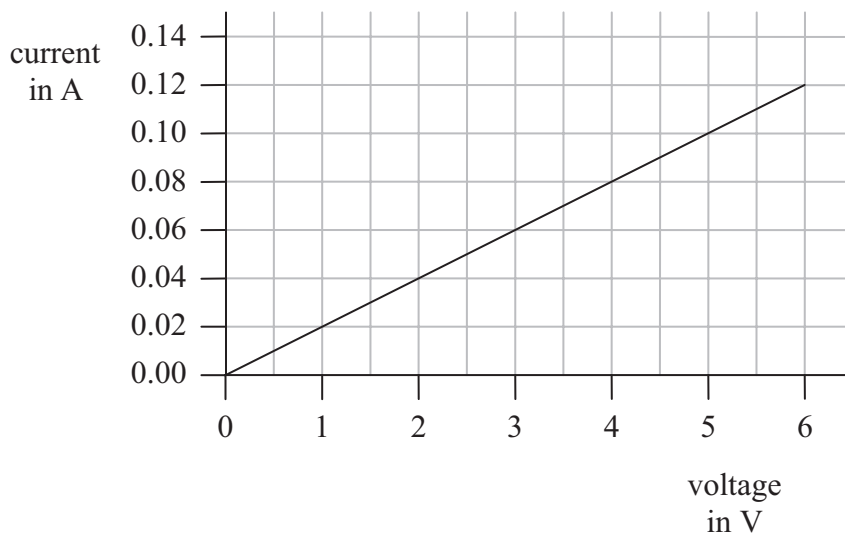


**D**



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  $\Omega$
- B 0.32  $\Omega$
- C 0.5  $\Omega$
- D 50  $\Omega$

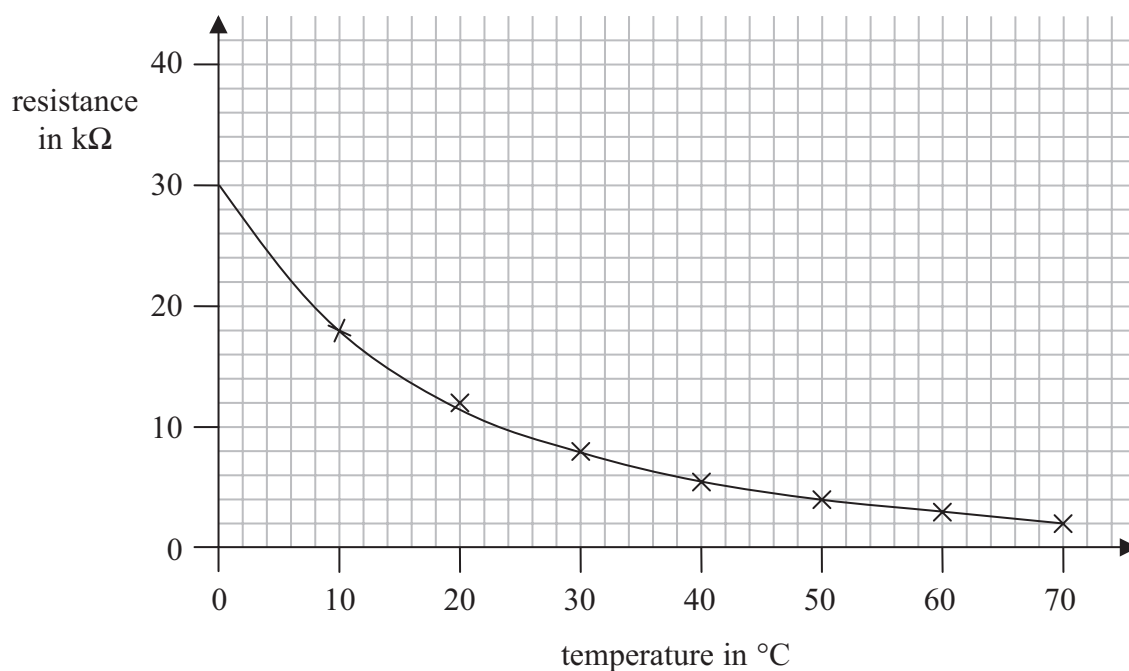
35.

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

Use this information to answer questions 36 and 37.

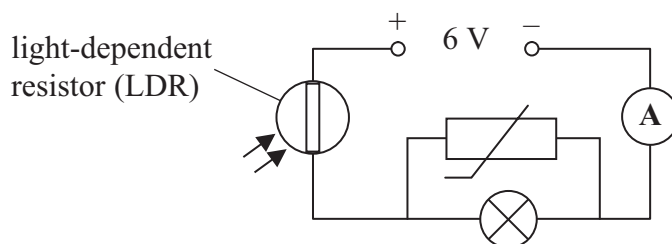
Some students are investigating sensors.  
They find this information about a thermistor.



36. When the temperature increases from  $10^{\circ}C$  to  $50^{\circ}C$ , the resistance will

- A decrease by about  $14 \Omega$
- B decrease by about  $18 \Omega$
- C decrease by about  $14\,000 \Omega$
- D decrease by about  $18\,000 \Omega$

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

### Solar power

38.

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

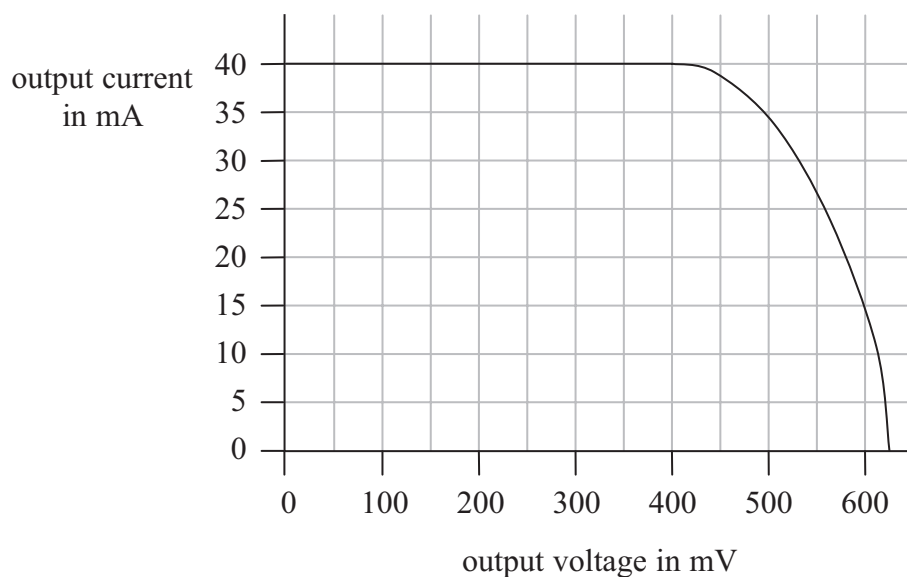
A solar panel supplies an average electrical power of 50 W.  
An electricity company pays 20p for 1 kWh of electrical energy.

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

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.

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

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**