

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 5 March 2010 – 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.

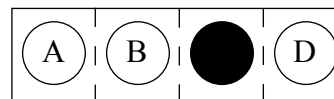
Before the test begins:

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.**

Energy sources

1. Solar cells generate electricity using
 - A light energy
 - B fossil fuels
 - C geothermal energy
 - D nuclear energy

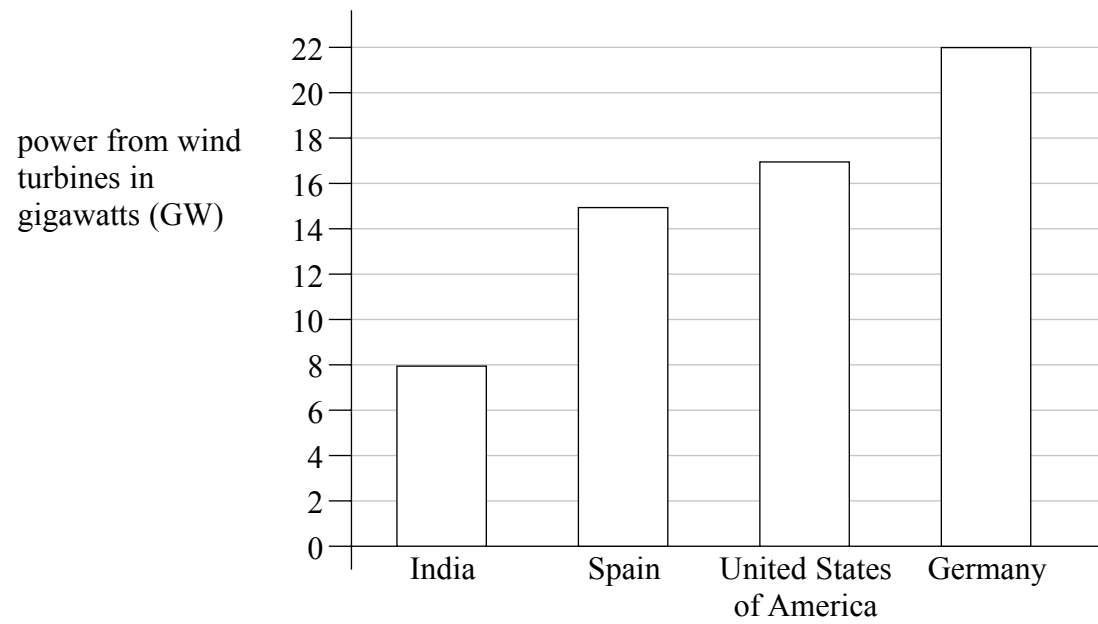
2. Which of these is a renewable source of energy?
 - A coal
 - B wind
 - C oil
 - D natural gas

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

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

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

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

We will still use
1.5 V batteries.

Alan

We will use the same
track for the car to
run along.

Bob

We will use some
different makes
of battery.

Carol

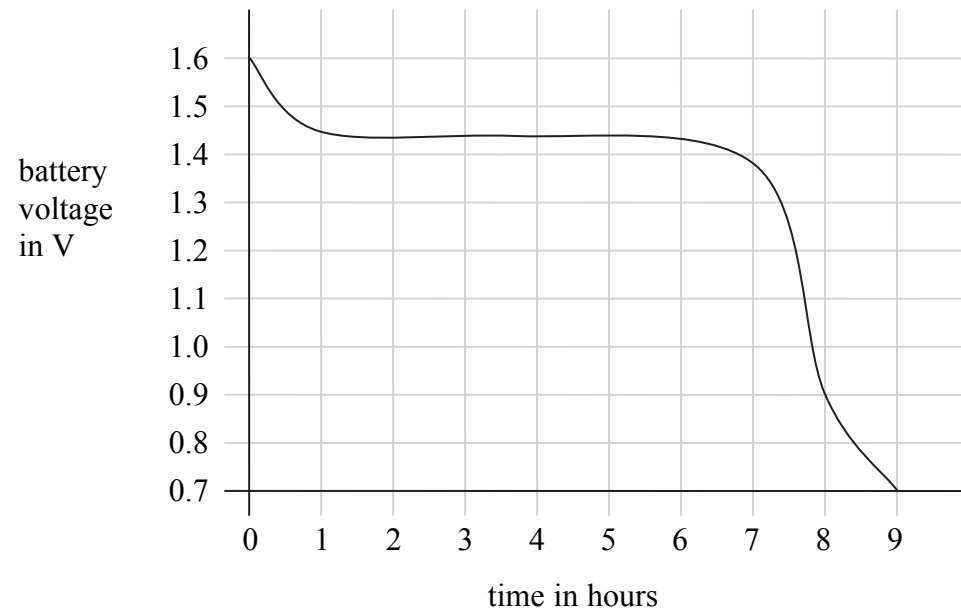
We will use a
different car
next time.

Donna

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

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

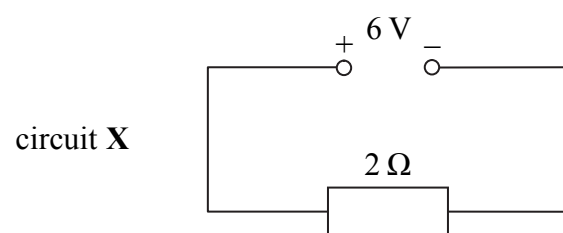
14. The normal current in an electric heater is 10 A.
A suitable fuse for the heater is labelled

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

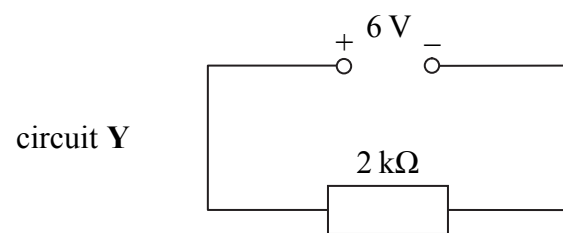
15. Which of these will increase fuel bills?
- A changing the loft insulation from 50 mm thickness to 150 mm
 - B changing the central heating thermostat from 19°C to 21 °C
 - C replacing single glazed windows with double glazed windows
 - D filling cavity walls with insulating material

Comparing resistors

16. Here is circuit X:



In circuit Y the resistance is different.



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

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.

We can set the oven to warm the thermistor to 400 °C.

Amy

The higher the temperature, the more care we need to take.

Barry

As the temperature increases, the resistance of the thermistor will decrease.

Cara

We can calculate resistance by measuring the current and voltage.

Dave

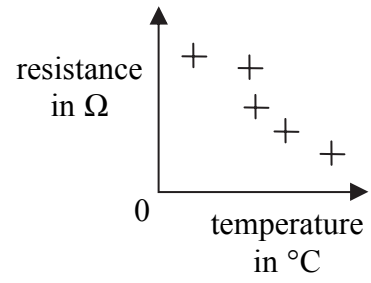
Who has made a prediction for the investigation?

- A Amy
- B Barry
- C Cara
- D Dave

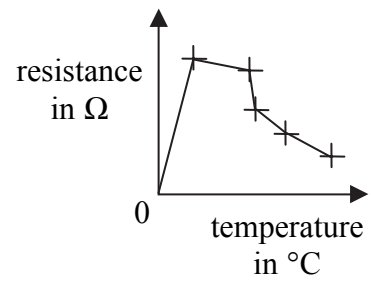
18. To measure the current in the thermistor the students should connect

- 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

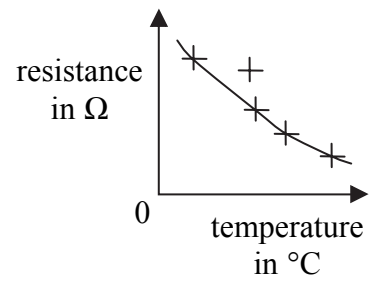
19. The students plot some of their results.



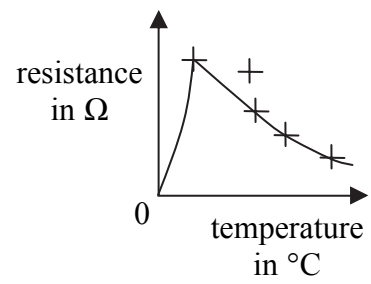
Which of these shows the correct graph for these results?



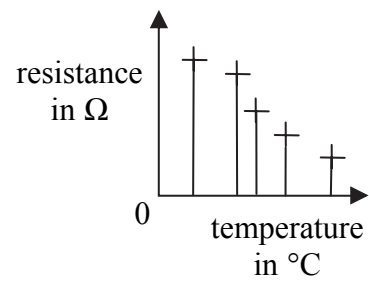
A



B



C



D

20.

$$V = I \times R$$

The students found that, at one temperature,

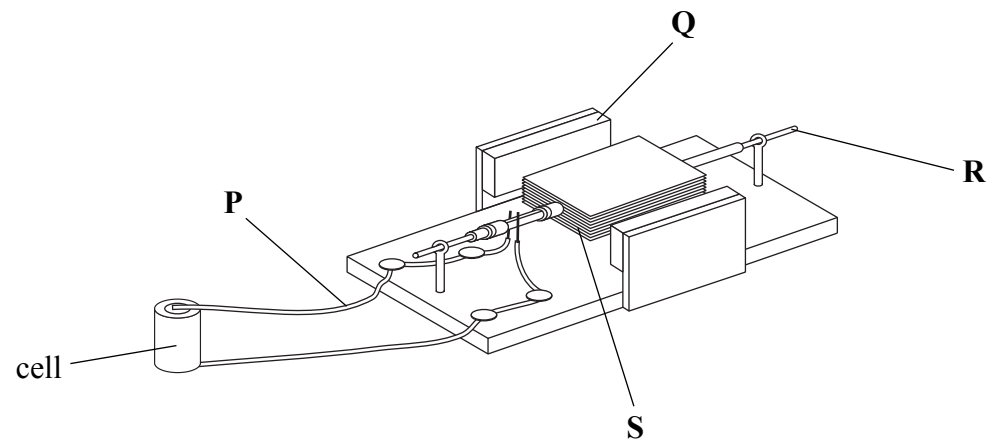
- the resistance of the thermistor was 200Ω
- the current in the thermistor was 0.1 A

What was the voltage across the thermistor?

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

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.

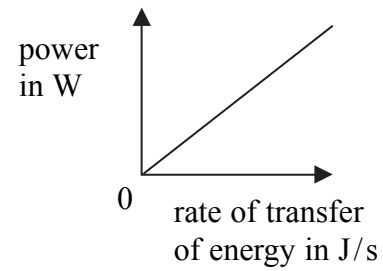
$$\text{power} = \text{current} \times \text{voltage}$$

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

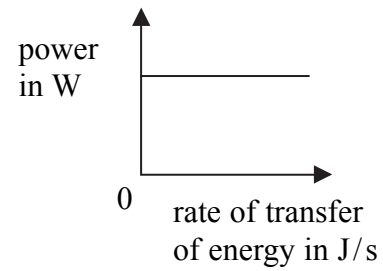
What is the input power of the motor?

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

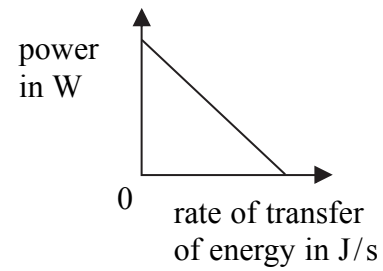
23. Which of these shows how power is related to rate of transfer of energy?



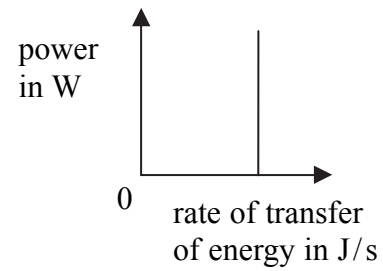
A



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.

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

Renewable energy

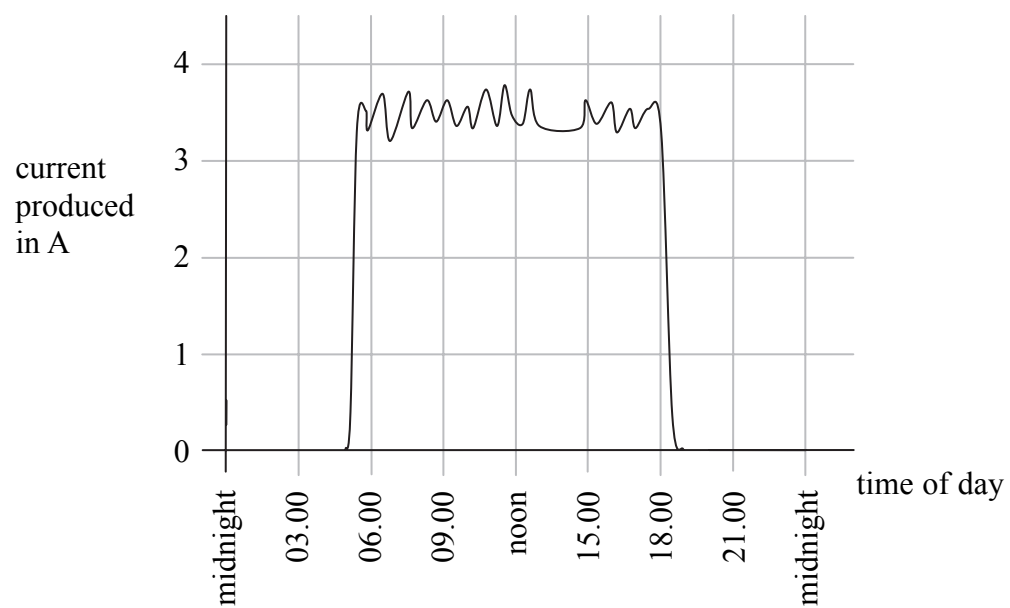
Darren lives on a remote farm.
He has four different electricity generators.
They use

- 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

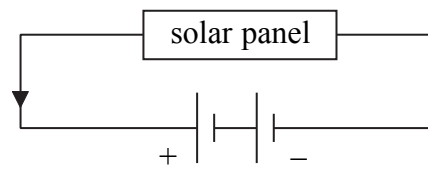
26. The graph shows the current produced by the solar generator during one day.



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

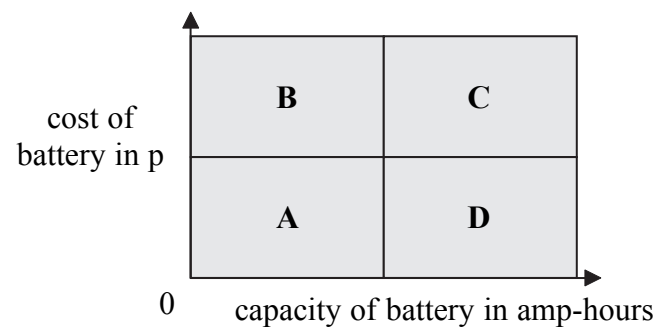
- A** 5 hours
- B** 11 hours
- C** 13 hours
- D** 18 hours

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?



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

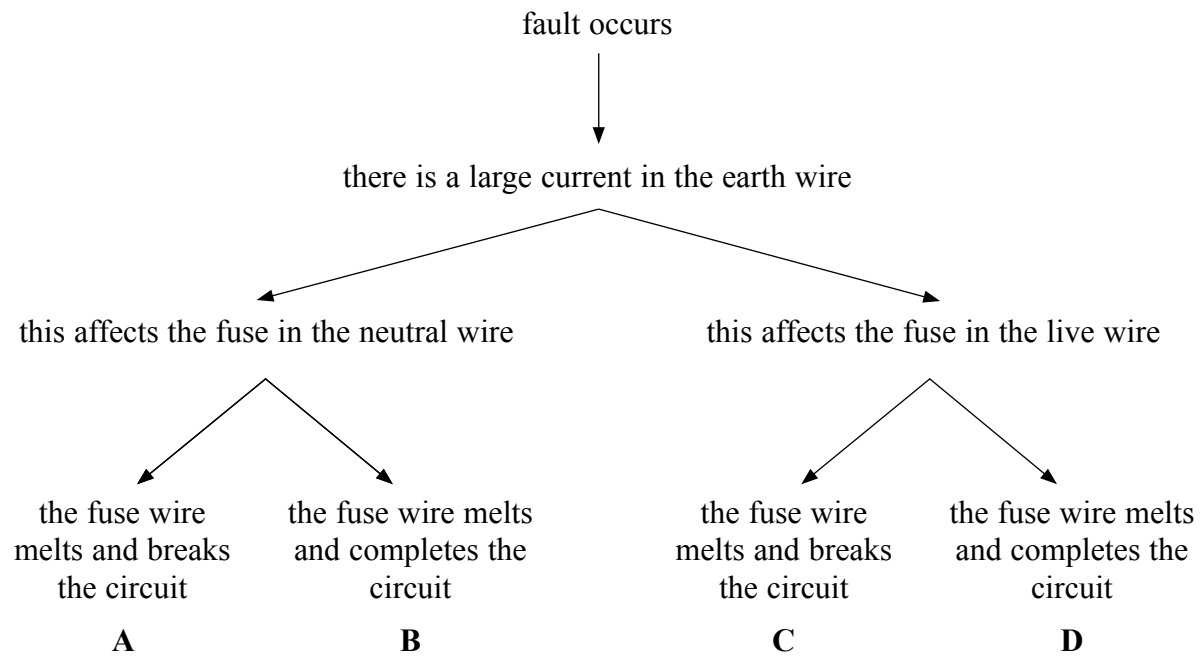
- 32.

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

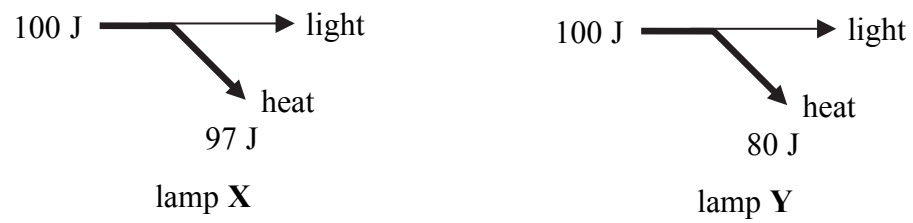
The power of an oven is 4 kW.
The cost of 1 kWh is 12 p.
For how long can the oven be used for 96 p?

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

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

Technology

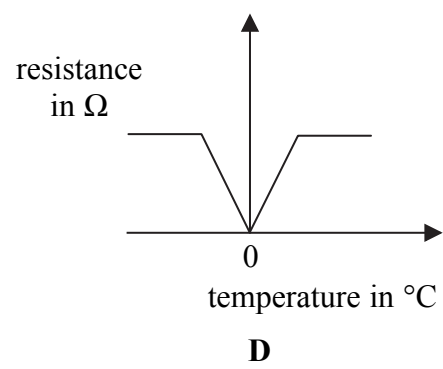
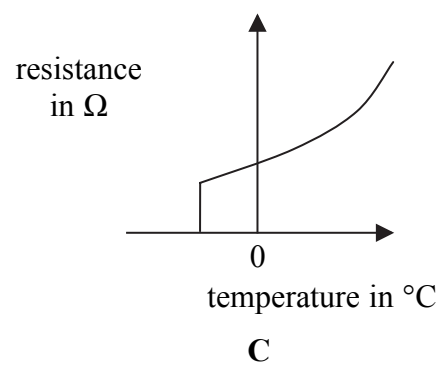
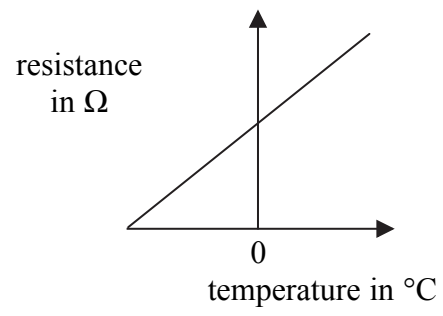
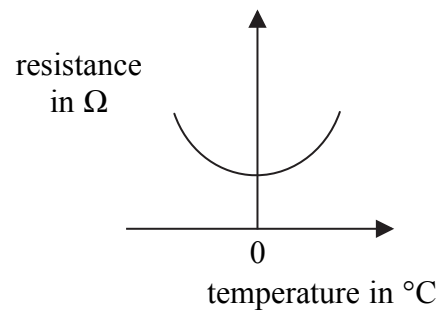
35. Maglev trains can achieve higher speeds than conventional trains.

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?



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.

Using multigate transistors in a microprocessor will decrease its efficiency.

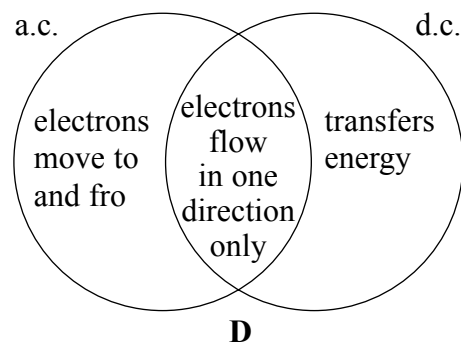
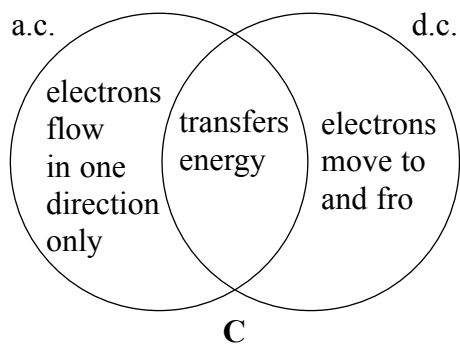
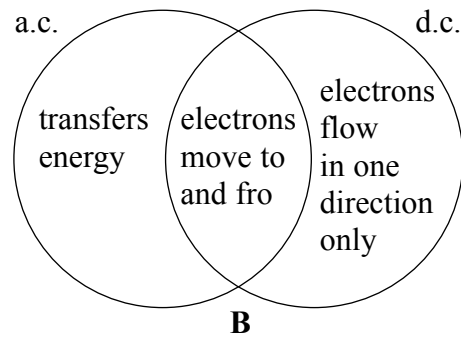
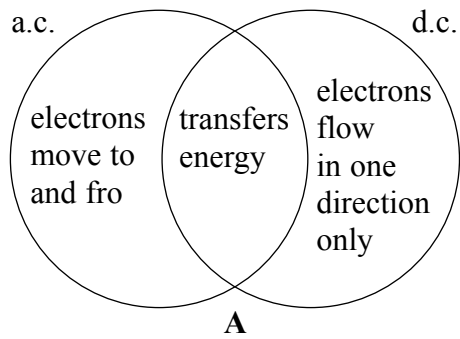
Tom

If the number of transistors keeps increasing it will soon be difficult to keep a microprocessor cool enough to work properly.

Viv

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.)?



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

An RCCB detects a difference between the currents in the live and earth wires.

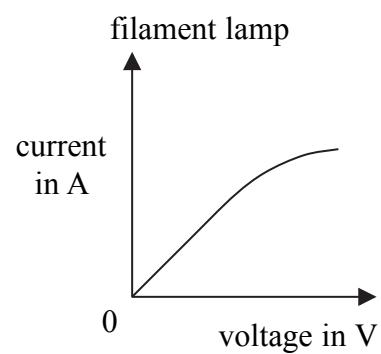
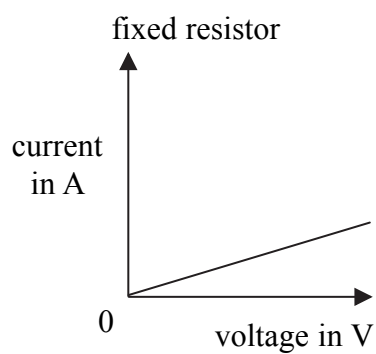
Reza

After it has detected a fault and switched off the mains supply, an RCCB must be replaced.

Tara

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.

The current in this fixed resistor is proportional to the voltage across it.

Sally

When the voltage across this filament lamp is doubled, the current in the lamp always doubles.

Vinoja

Who is correct?

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

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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