Paper Reference(s)

5009   5045

Edexcel GCSE

Science (5009)
Physics (5045)

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	Nil
HB pencil, eraser and calculator	

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.
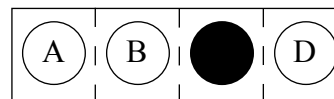All candidates are to answer questions 17 – 24.

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.

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.**

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
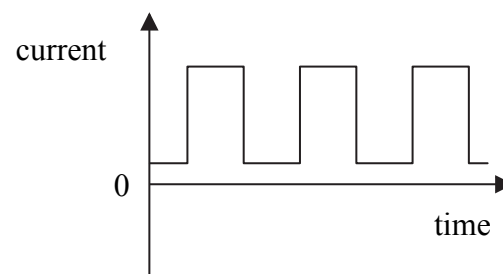
4.   Which of these shows an **alternating** current?
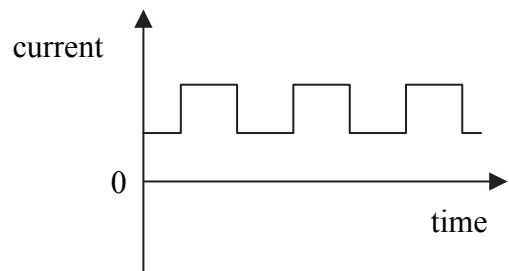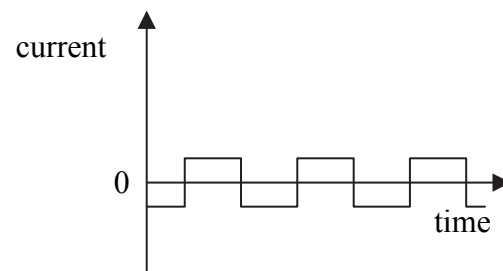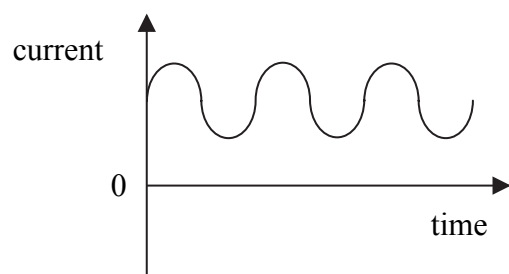
5. Which of these has a **capacity** measured in amp-hours?

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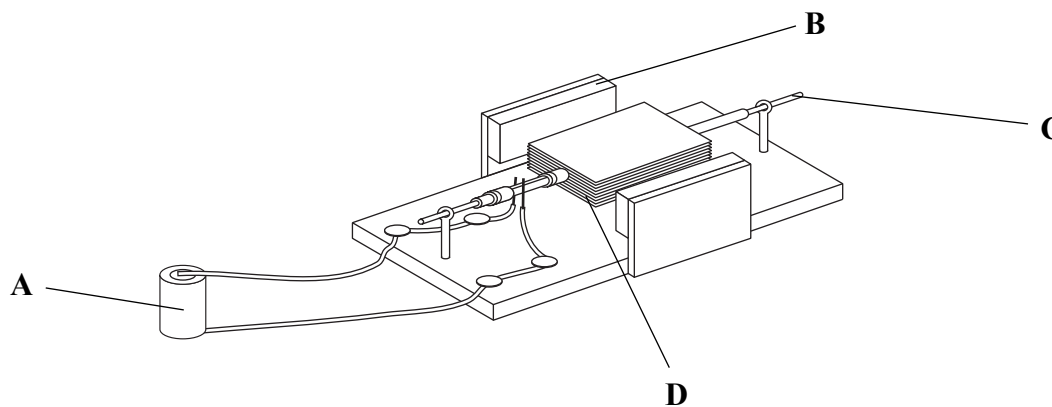
9. The electric current in the wire of an electric motor is a flow of

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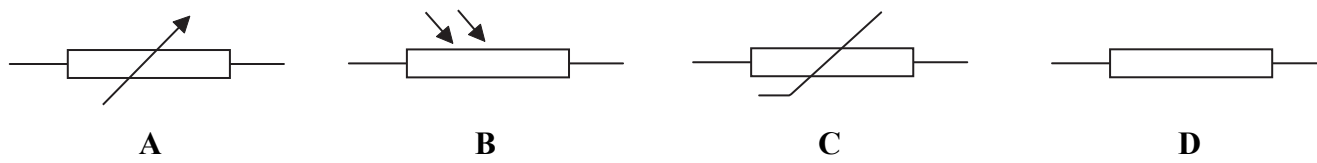
11. Glass fibre is used for loft insulation because the glass fibre

    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

13. John arranges a solar cell of area 200 cm² at an angle of 50° to the horizontal.
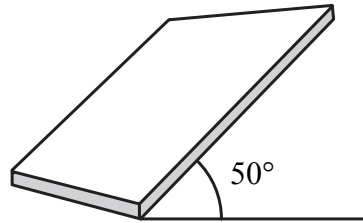
He wants to investigate how the current produced by the cell depends on this angle.
Which row of the table describes another solar cell which will provide evidence to help his investigation?

	area of solar cell (cm²)	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.

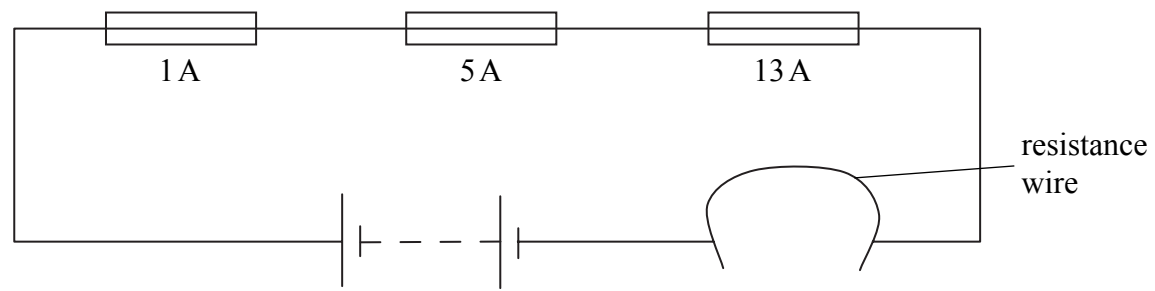On its own the earth wire protects the fuse.

On its own, a fuse protects the user of a circuit.

John   Anne

Who is correct?

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

**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

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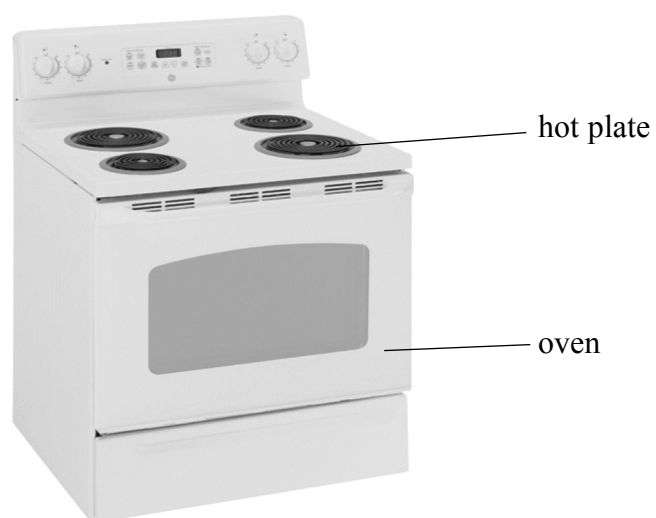
17.   The metal case of the cooker should be connected to the

     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

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

**22.** Patti drew this graph of her results for two different cells.
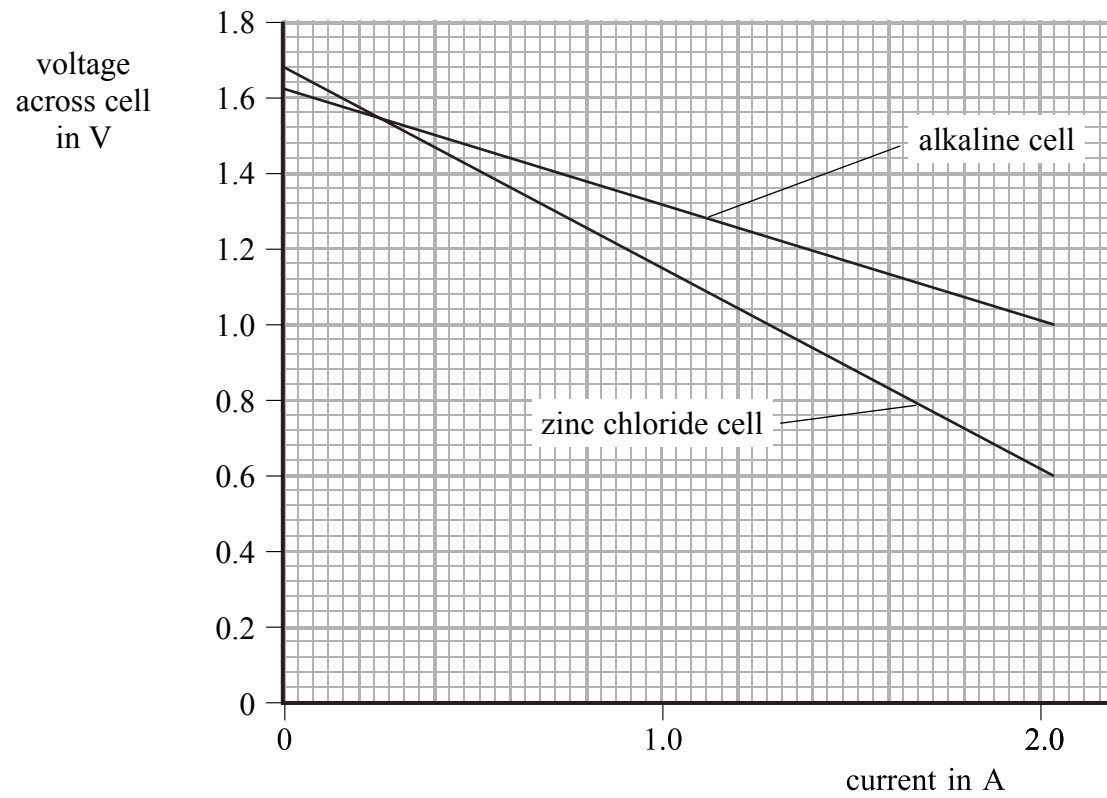
For the range of currents shown, which of these comparisons is correct?

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
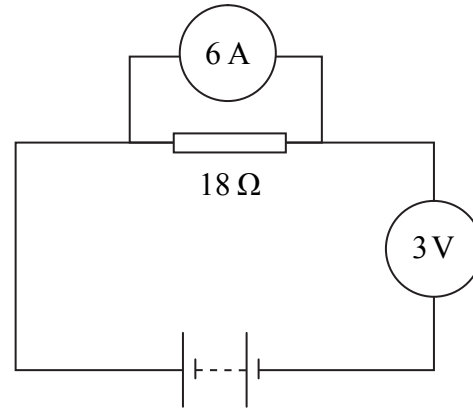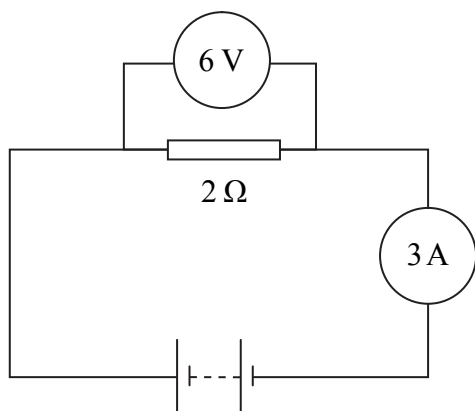
24.

$$V = I \times R$$
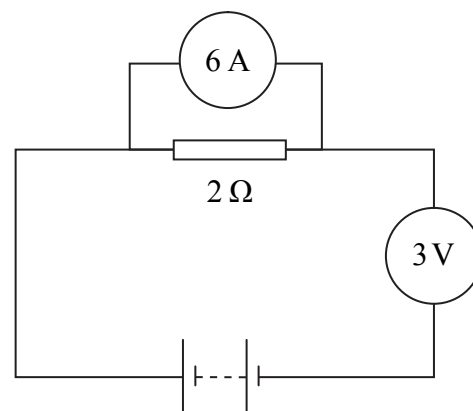
Which set of meter readings in these circuits is correct?
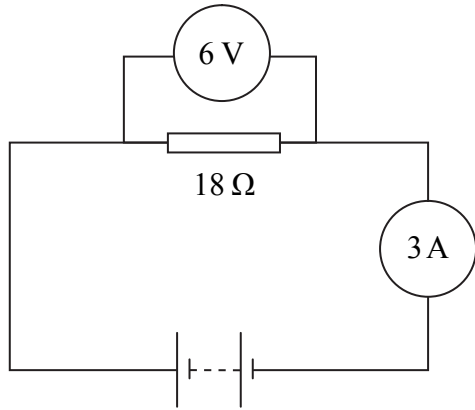
A

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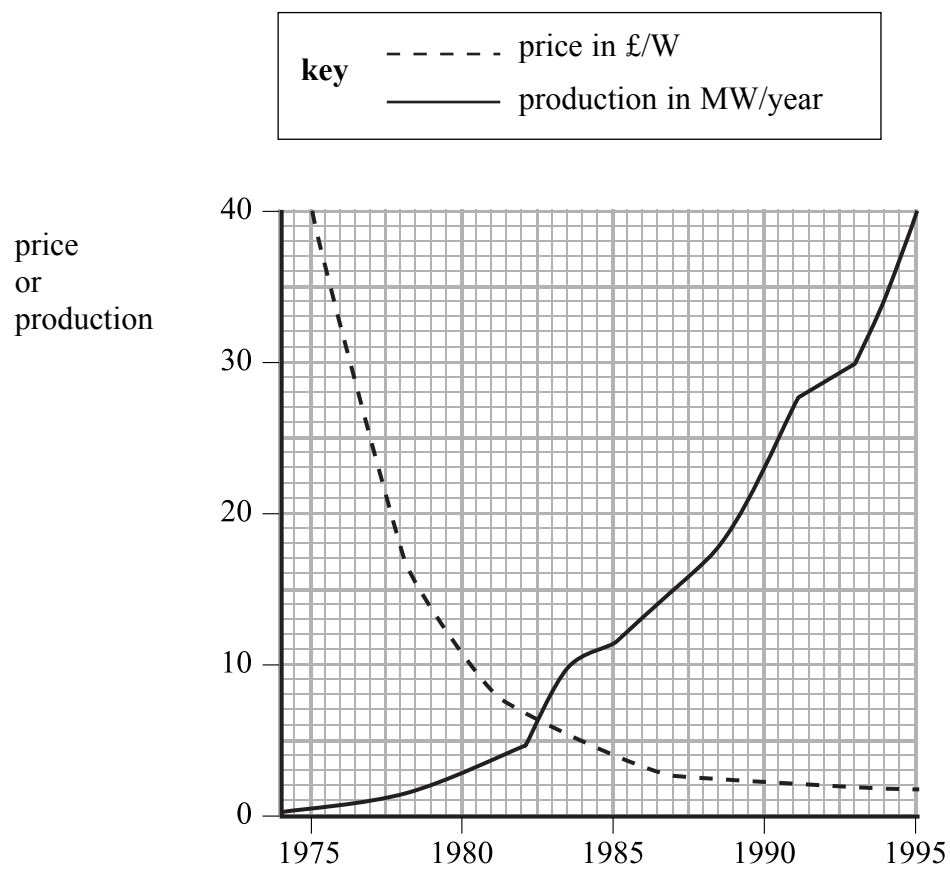
25. Which row of the table is correct for 1995?

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

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

Use this information to answer questions 30 and 31.

The graph shows how the resistance of a piece of wire changes with temperature.
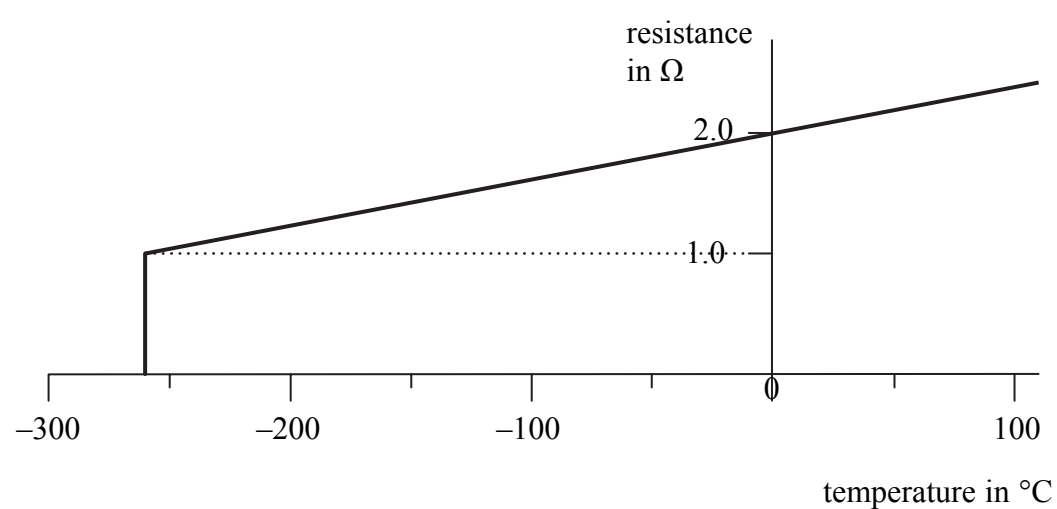
30. The material becomes superconducting at

A   −260 °C
B   0 °C
C   1.0 °C
D   2.0 °C

31.

$$V = I \text{ x } R$$

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
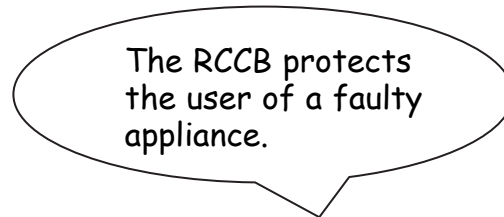C   4.0 A
D   16.0 A

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.

After it has broken the circuit, the RCCB must be replaced with a new one.

John

The RCCB protects the user of a faulty appliance.

Anne

Who is correct?

    A   John only
    B   Anne only
    C   both John and Anne
    D   neither
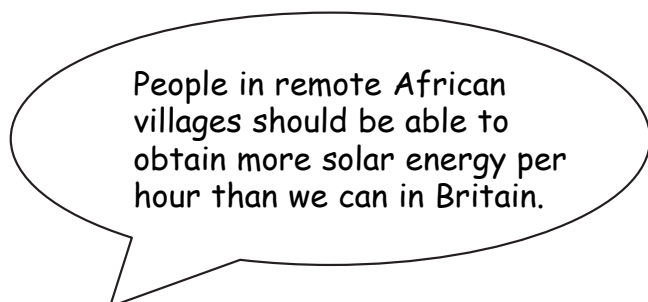
Renewable sources of energy

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

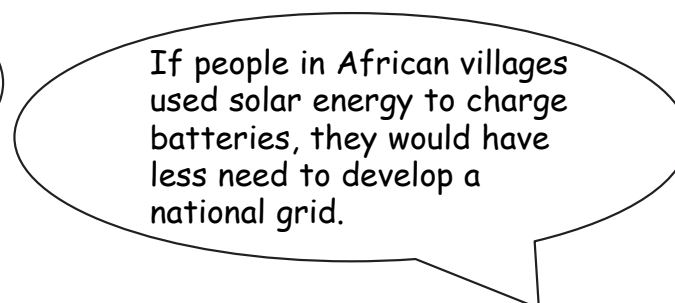| renewable source	2005	2006
bio-power	21.9%	23.2%
geo-power	2.9%	3.1%
wind power	4.6%	5.3%
solar power	7.5%	8.1%

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.

John: People in remote African villages should be able to obtain more solar energy per hour than we can in Britain.

Anne: If people in African villages used solar energy to charge batteries, they would have less need to develop a national grid.
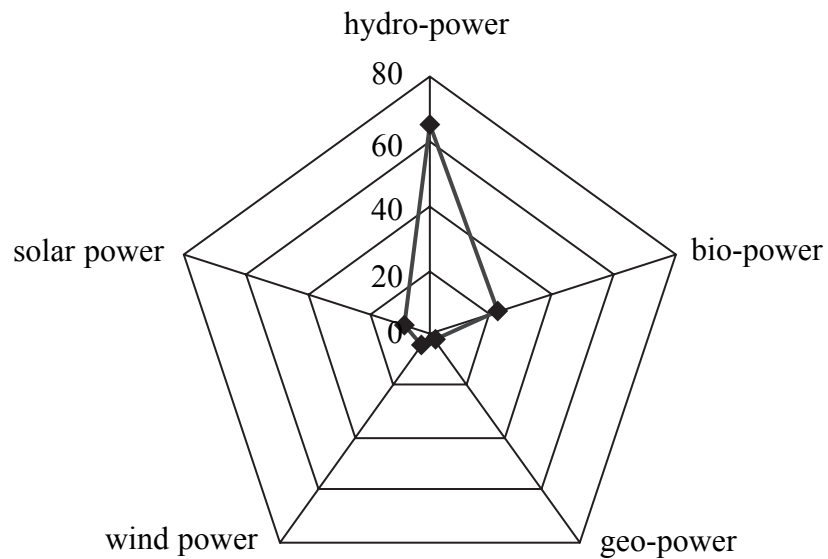
Who is correct?

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

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

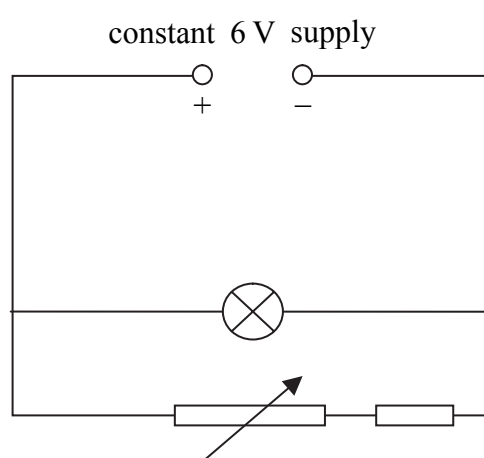> Before 1985, there were no renewable energy sources **available**.

Anne

Who is correct?

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

Use this information to answer questions 38 and 39.

The diagram shows a parallel circuit containing a power supply.

constant 6 V 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

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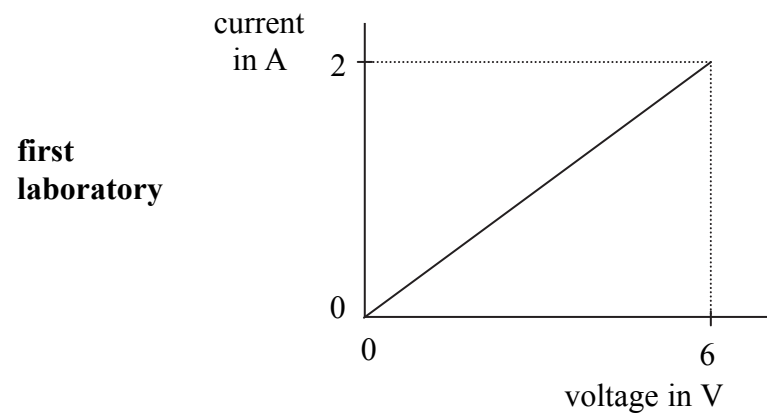
He took the same set-up into a second laboratory and did the experiment again.
This graph shows the results.
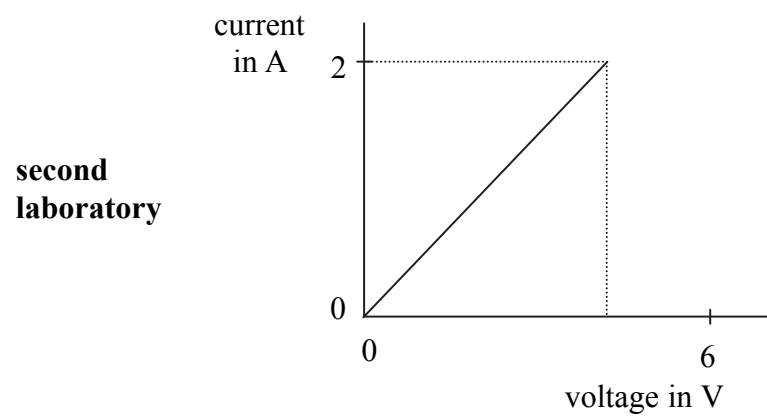
second laboratory

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

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