

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 6 March 2009 – 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.

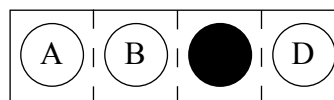
Before the test begins:

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

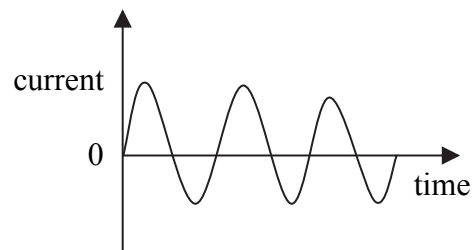
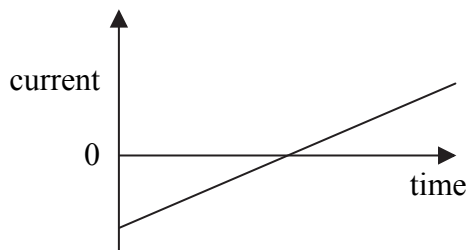
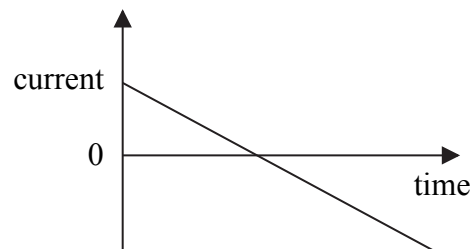
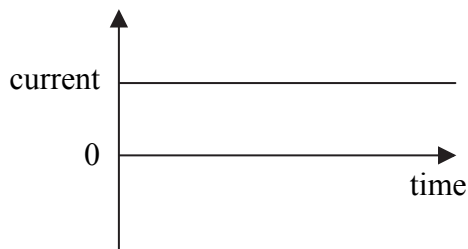
Sources of electric current

Alison investigates different sources of electric current.

1. She finds that solar cells supply

- A** direct current
- B** alternating current
- C** static current
- D** rotating current

2. Which of these could show the current from a battery?



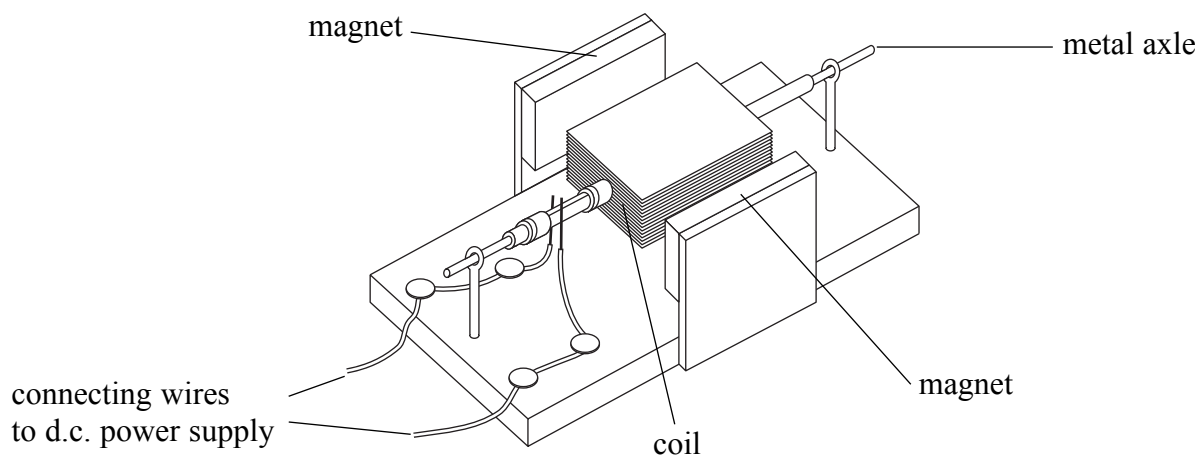
3. Alison finds that in a solar cell the electrical energy is transferred from

- A** chemical energy
- B** potential energy
- C** light energy
- D** wind energy

4. Alison reads that solar cells are more reliable than wind turbines. This is because
- A solar cells are more expensive
 - B solar cells do not work at night
 - C solar cells do not use fossil fuels
 - D solar cells have no moving parts

Electric motors

5. An electric motor is **designed** to transfer electrical energy into
- A chemical energy
 - B kinetic energy
 - C thermal (heat) energy
 - D sound energy
6. The diagram shows a simple electric motor.



The direction in which the coil spins can be reversed by

- A removing one of the magnets
 - B decreasing the voltage from the power supply
 - C replacing the metal axle with a wooden one
 - D changing the direction of the current in the connecting wires
7. The power of an electric motor is 20 W. This means that in each second the motor can transfer
- A 20 J of electrical energy
 - B 20 A of electric current
 - C 20 V of electrical voltage
 - D 20 Ω of electrical resistance

Comparing batteries

Shruti wants to buy a new battery for her digital camera.
She finds this information about batteries that will fit her camera.

name	rechargeable?	number of pictures before battery discharges	cost of battery (p)
permacell	no	800	125
maxilife	no	600	80
charge up	yes	500	420
ecovolt	yes	400	250

8. Shruti decides to buy an ecovolt battery.
One advantage of the ecovolt battery is
- A the ecovolt lets you take fewest pictures before it runs out
 - B the ecovolt is at the bottom of the table
 - C the ecovolt is the cheapest battery
 - D the ecovolt is the cheaper rechargeable battery
9. How many pictures can Shruti take with the cheaper **non**-rechargeable battery?
- A 800
 - B 600
 - C 500
 - D 400
10. A fully charged battery runs down in 4 hours.
It supplies an average current of 0.5 A.
The capacity of the battery is
- A 0.5 amps
 - B 2 amp-hours
 - C 4 hours
 - D 8 amp-hours

Electric current

Jason and his friends are investigating electric current.

11. They discuss electric current.
Only three make correct statements.

Electric current is measured with an ammeter.

Jason

An electric current is a flow of charge.

Katie

A current in a wire is a flow of copper atoms.

Nathan

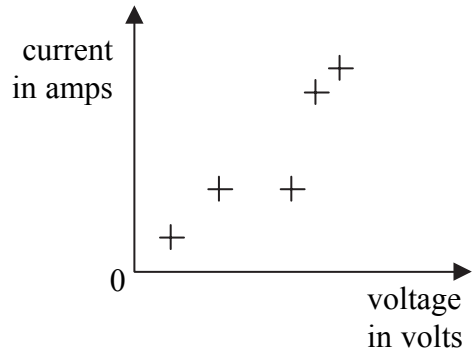
Electrons have a negative charge.

Stephanie

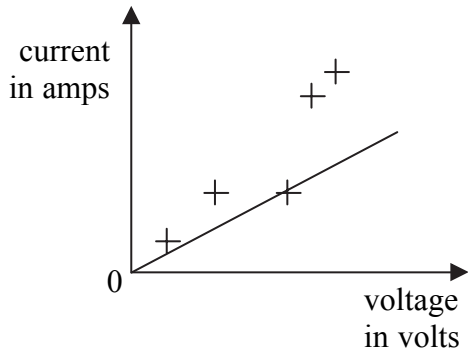
Who is **not** correct?

- A Jason
- B Katie
- C Nathan
- D Stephanie

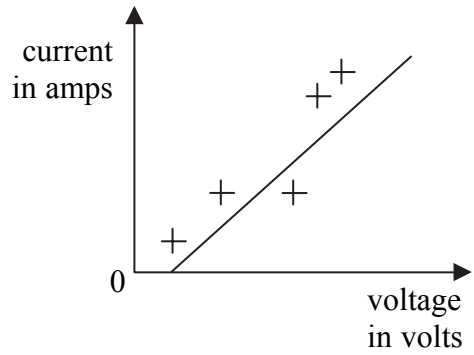
12. Jason and his friends change the voltage in a circuit and measure the current. Jason plots their results on a graph.



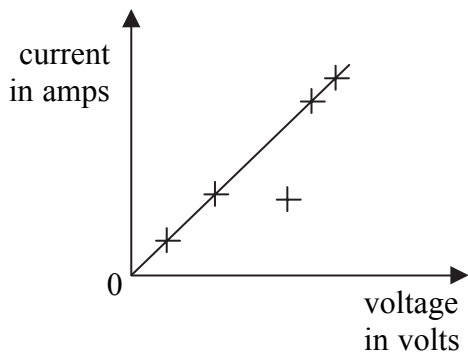
Which of these shows the line of best fit Jason should draw?



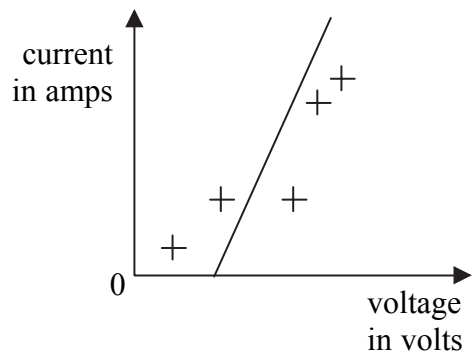
A



B



C



D

13. Jason and his friends discuss the experiment.

We will do the same experiment to obtain a second set of results.

Jason

When we changed the voltage we kept the resistance constant.

Katie

We used five different values of voltage.

Nathan

When we repeat the experiment we will use the same values of voltage.

Stephanie

Who has talked about a control variable?

- A Jason
- B Katie
- C Nathan
- D Stephanie

14. Which of these is **not** a result of increasing processing speeds using microchips?

- A increasing use of mobile phones
- B increasing cost of fossil fuels
- C increasing use of satellite communications
- D development of more powerful computers

Household electricity

15. In a mains circuit the fuse should be placed in

- A the live wire
- B the neutral wire
- C the earth wire
- D both earth and live wires

16. The following statements describe the action of a fuse.

- 1 there is a large current in the fuse
- 2 the circuit is broken
- 3 a fault occurs
- 4 the fuse melts

The correct order of statements is

- A 3 1 2 4
- B 3 4 1 2
- C 3 1 4 2
- D 3 4 2 1

**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.**

Power, cost and efficiency

Mia and Barry are researching household appliances.

17.

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

The mains voltage is 230 V.

The current in Mia's microwave oven is 2 A.

The power of her microwave oven is

- A 115 kW
- B 460 kW
- C 115 W
- D 460 W

18.

An energy saving lamp is more efficient than a filament lamp.

The energy saving lamp is more efficient because

- A it takes more current than a filament lamp
- B it produces more thermal energy than a filament lamp
- C a higher percentage of electrical energy is transferred into thermal energy
- D a lower percentage of electrical energy is transferred into thermal energy

19.

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

An 8 kW shower is used for 30 minutes each day.

One kWh of electrical energy costs 10p.

The cost of using the shower for 7 days is

- A 40p
- B £2.80
- C £5.60
- D £11.20

20.

Barry uses a 100 W filament lamp.

The energy cost is £15 each year.

He decides to use a 20 W energy-saving lamp instead.

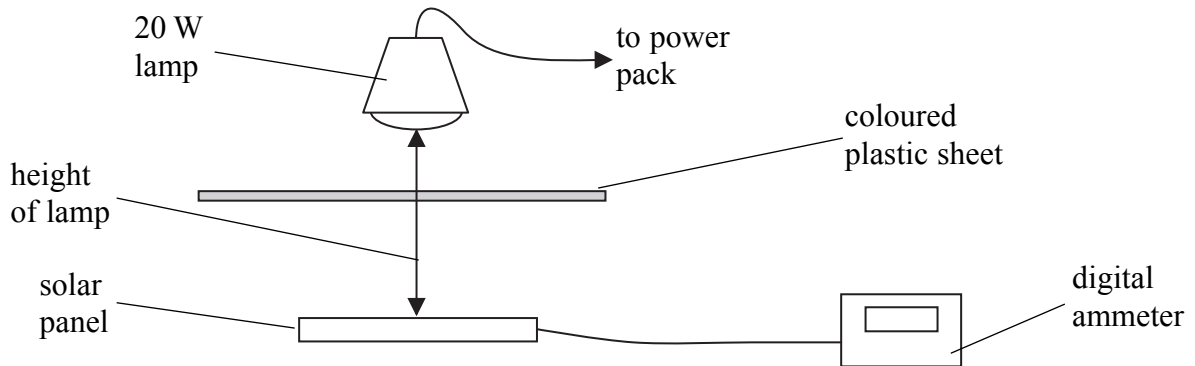
The new energy cost is

- A £0.75
- B £3
- C £7.50
- D £30

Investigating solar cells

Omar and his friends are investigating how the colour of the light shining on a solar panel affects the output current.

They will put different coloured plastic sheets between a lamp and the solar panel.



21. The students discuss their investigation.

The colour of the plastic sheet will not affect the output current.

Constance

The solar cell is always completely covered by the plastic sheet.

Jane

We will measure the output current for 5 different coloured sheets.

Kallum

We must keep the lamp at the same height above the solar cell.

Omar

Who has made a prediction?

- A Constance
- B Jane
- C Kallum
- D Omar

22. In this investigation, the independent variable is

- A the height of the lamp
- B the power of the lamp
- C the colour of the plastic sheet used
- D the output current from the solar panel

23. These are the students' results for the output current for a green plastic sheet.

27 mA 24 mA 5 mA 24 mA

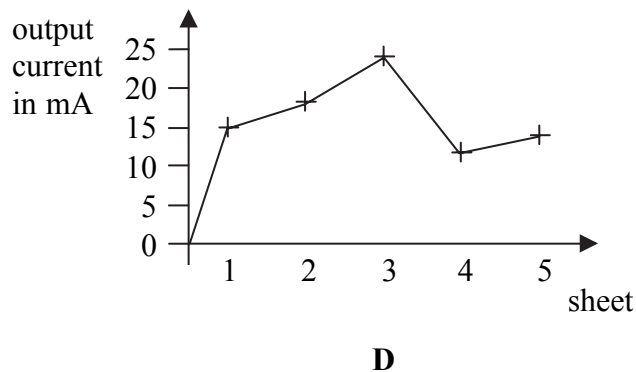
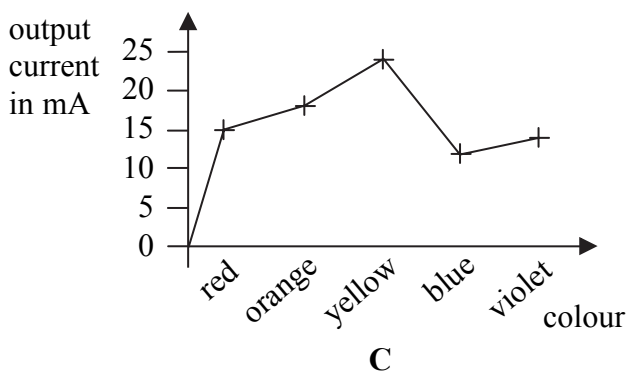
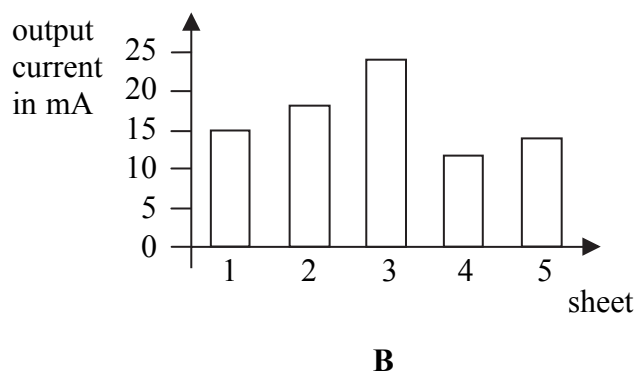
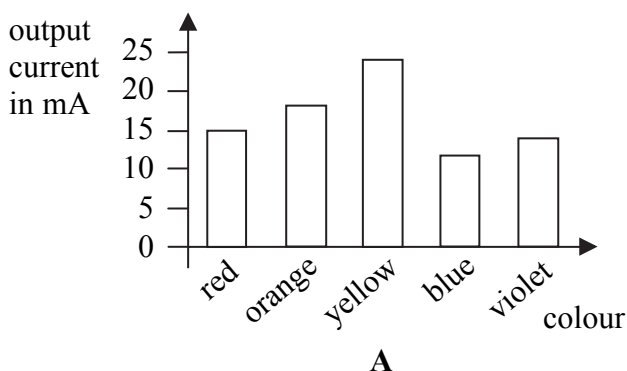
The value the students should use to plot on a graph is

- A 5 mA
- B 20 mA
- C 25 mA
- D 27 mA

24. These are some of the results the students obtained.

sheet	output current (mA)
red	15
orange	18
yellow	24
blue	12
violet	14

Which of these graphs is the best way of showing these results?



TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

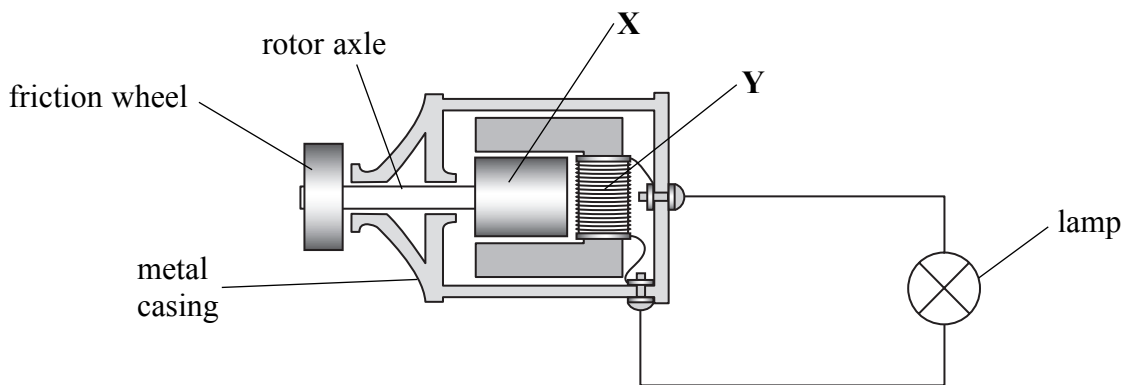
Foundation tier candidates do not answer any more questions after question 24.

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

Generating electricity

Use this information about bicycle dynamos to answer questions 25 to 30.

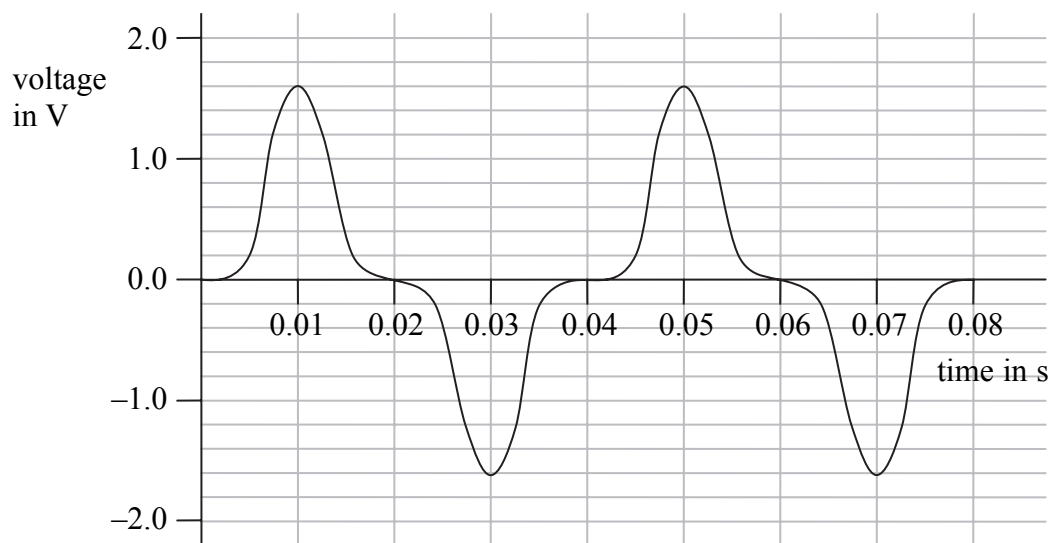
Josh and Micah are investigating dynamos.



25. Which row of the table is correct for X and Y in the dynamo?

	X is a	Y is a
A	coil of wire	magnet
B	coil of wire	coil of wire
C	magnet	magnet
D	magnet	coil of wire

26. The graph shows the output voltage of the dynamo as the friction wheel is turned steadily.



The maximum output voltage of this dynamo is about

- A 0.08 V
- B 1.3 V
- C 1.6 V
- D 2.6 V

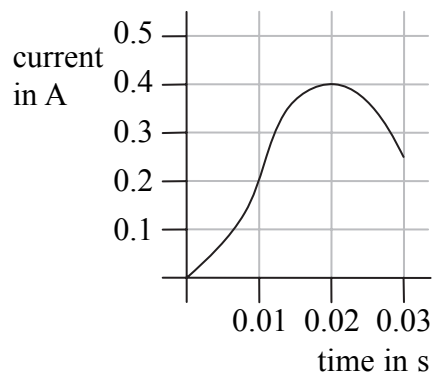
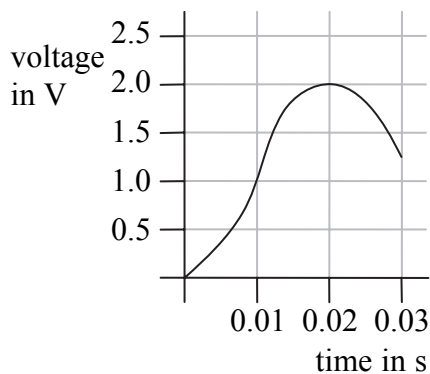
27. Which row of the table is correct for the current in the lamp?

	moving charges are	the charges in the lamp move like this
A	electrons	↓
B	electrons	↑
C	electrons	↕
D	copper atoms	↕

28.

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

The graphs show the current in and voltage across a lamp using a different dynamo.



When the time is 0.02 s the output **power** of this dynamo is

- A 0.4 A
- B 0.8 W
- C 2 V
- D 5 W

29. The diagram of a bicycle dynamo on page 12 shows a friction wheel. Which row of the table is correct if the friction wheel turns faster?

	output voltage is	output voltage changes from positive to negative
A	lower	less often
B	higher	less often
C	higher	more often
D	lower	more often

30. Josh and Micah discuss the voltage induced in the coil of the bicycle dynamo.

Increasing the friction between the friction wheel axle and the metal casing will increase the efficiency of the dynamo.

Josh

If you increase both the strength of the magnet and the number of turns on the coil the voltage induced in the coil will stay the same.

Micah

Who is correct?

- A Josh only
- B Micah only
- C both Josh and Micah
- D neither

Electricity in hospitals

Susan and Fatima are visiting the X-ray department of a hospital.

- 31.

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

An X-ray machine has an efficiency of 1%.
 The energy of the X-rays produced by the machine is 400 J.
 The X-ray machine needs an energy input of

- A 4 J
- B 400 J
- C 4 000 J
- D 40 000 J

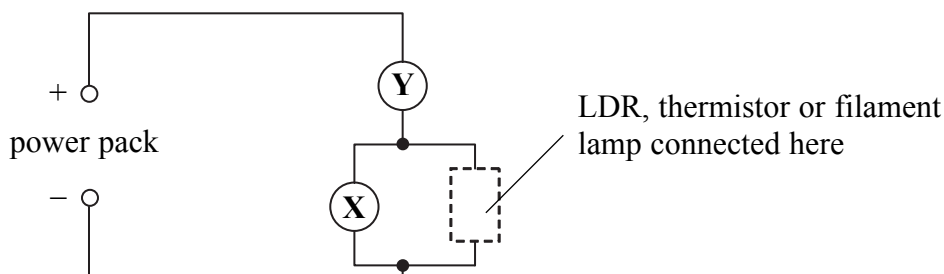
32. Susan sees a different type of X-ray machine which uses 2 000 J of electrical energy in 0.5 s. The power input of this machine is
- A** 1 000 W
B 4 000 W
C 10 000 W
D 40 000 W

33. Fatima learns that the electrical circuits in the department are fitted with residual current circuit breakers (RCCBs). Which row of the table is correct for an RCCB?

	an RCCB detects differences between	compared to a fuse an RCCB
A	currents in the live and neutral wires	disconnects an appliance faster
B	currents in the live and earth wires	disconnects an appliance faster
C	currents in the live and neutral wires	is cheaper to replace
D	currents in the live and earth wires	is cheaper to replace

Investigating resistors

Jo and her science group set up this circuit to find the resistances of a light-dependent resistor (LDR), a thermistor and a filament lamp.



34. Which row of the table is correct for meters **X** and **Y**?

	meter X	meter Y
A	ammeter	ammeter
B	ammeter	voltmeter
C	voltmeter	ammeter
D	voltmeter	voltmeter

35. Jo's group use an LDR in the circuit. They find the resistance as they change the brightness of the light shining on the LDR. Which row of the table is correct when the LDR is in the dark?

	resistance of LDR	current in LDR
A	low	low
B	high	low
C	low	high
D	high	high

36. Jo's group uses the thermistor in the circuit and finds its resistance at different temperatures. They discuss the experiment.

We found it difficult to measure the temperature of the thermistor and so our results are not reliable.

Jo

We can take an average because we got six different resistance values.

Kim

I think that doubling the temperature will halve the resistance.

Lyn

The temperature of the thermistor was the independent variable.

Malcolm

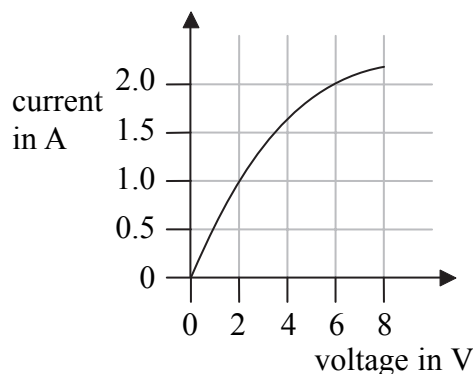
Who has made an evaluation of the investigation?

- A** Jo
- B** Kim
- C** Lyn
- D** Malcolm

Use this information to answer questions 37 and 38.

Jo's group then investigate a filament lamp.

The graph shows how the current in a filament lamp varies with voltage.



37.

$$V = I \times R$$

The resistance of the filament lamp at 6 V is

- A 2 Ω
- B 3 Ω
- C 8 Ω
- D 12 Ω

38. Which of these is correct for the graph?

- A The resistance of the lamp increases at higher voltages
- B The resistance of the lamp decreases at higher voltages
- C The current in the lamp decreases at higher voltages
- D I is directly proportional to V for all values of voltage

39. Jo and Kim discuss using a data-logger to collect data and a computer to display the results from their lamp investigation.

Using a data-logger and a computer will make our investigation more valid.

Jo

Using a more powerful computer will improve the accuracy of our measurements.

Kim

Who is correct?

- A Jo only
- B Kim only
- C both Jo and Kim
- D neither

Solar power

40. An advertisement for some new solar panels claims:

The solar panels will generate electricity at a price comparable to coal-fired power stations.
We are aiming to make solar power stations up to 10 MW in size.

Peter and Rashid discuss this.

In developing countries with many small villages, using lots of small power stations could save the cost of building a national grid system.

Peter

Sunlight is free so electricity from a solar power station will be free.

Rashid

Who is correct?

- A Peter only
- B Rashid only
- C both Peter and Rashid
- D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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