

Surname	Initial(s)
Signature	

Paper Reference(s)

5009 5045

Edexcel GCSE

Science (5009)

Physics (5045)

P1a – Topics 9 and 10

Foundation and Higher Tier

Monday 10 March 2008 – 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.

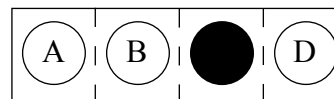
Before the test begins:

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.**

Generating electricity

Joe bought a wind up torch.



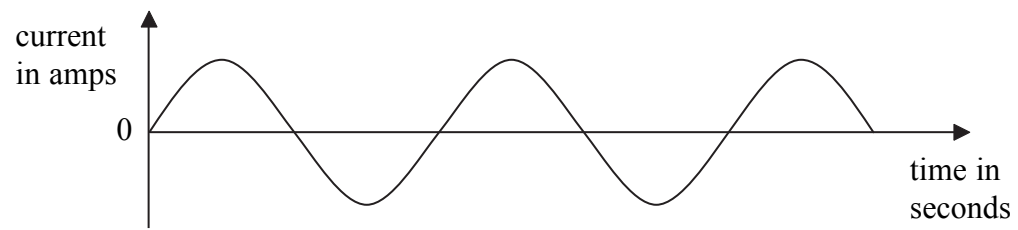
If Joe winds the torch for 1 minute it will give 30 minutes of power.

1. The electric current to charge the torch is produced by
 - A dry batteries
 - B an electric motor
 - C a voltmeter
 - D a dynamo

2. A dynamo works by
 - A rotating a magnet in a coil of wire
 - B rubbing a magnet on an insulator
 - C rotating a resistor in a coil of wire
 - D rubbing a resistor on an insulator

3. The torch produces light from an LED instead of from a filament lamp.
An LED is more efficient than a lamp.
This means that compared to a lamp the LED can change more of the electrical energy into
 - A heat
 - B resistance
 - C current
 - D light

4. The graph shows a current.



This type of current is

- A direct current
 - B indirect current
 - C alternating current
 - D transverse current
5. Which of these is a source of direct electric current?
- A a light-dependent resistor
 - B a thermistor
 - C a solar cell
 - D an ammeter

Rechargeable batteries

Use this information to answer questions 6 to 10.

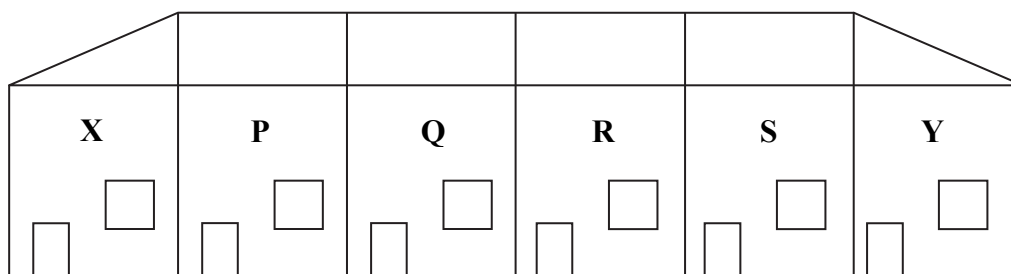
Peter is choosing a new 1.2 V rechargeable battery for his digital camera.
Peter uses the internet to find information about rechargeable batteries.
The table shows this information.

brand	voltage (volts)	capacity (milliamp-hours)	cost per battery (pence)
Lightning	1.2	700	100
Steadfast	1.2	1800	150
Allbright	1.2	3000	300
Energator	6.0	170	500

6. A rechargeable battery is a source of
- A alternating current
 - B direct resistance
 - C alternating resistance
 - D direct current
7. Peter must not use an Energator battery because
- A it has the wrong voltage
 - B it has the smallest capacity
 - C it costs the most
 - D it takes longest to recharge
8. Which battery will keep the camera working for the longest time before it needs to be recharged?
- A Lightning
 - B Steadfast
 - C Allbright
 - D Energator
9. Peter's camera uses an average current of 300 milliamps.
For how long will a fully charged Steadfast battery last when supplying this current?
- A 1.2 hours
 - B 6 hours
 - C 60 hours
 - D 600 hours
10. The battery which gives best value for money in terms of capacity is
- A Lightning
 - B Steadfast
 - C Allbright
 - D Energator

Household insulation

Sarah and Amy compare the effectiveness of different types of insulation. They test four houses in the middle of a row of six. They keep the temperature the same in all six houses by using a computer to switch the heating on and off.



Here is some of the information that they collect.

Before they were insulated, the fuel bill for each test house was £800 for one year.

house	insulation	cost of insulation (£)	fuel bill for one year (£)
P	draught proofing	100	700
Q	double glazing	4000	720
R	loft insulation	320	640
S	cavity wall insulation	600	600

11. Compared to having no insulation, how much is saved from the fuel bill for one year by fitting loft insulation?
- A £80
 B £160
 C £320
 D £640
12. Which type of insulation saves the most money from the fuel bill for one year?
- A draught proofing
 B double glazing
 C loft insulation
 D cavity wall insulation
13. Which of these is **not** a reason for leaving the end houses, X and Y, out of the investigation?
- A They are a control
 B They have a different number of outside walls
 C They have different sized roofs
 D To make it a fair test

14. Which form of insulation is most cost effective over three years?

- A draught proofing
- B double glazing
- C loft insulation
- D cavity wall insulation

15. The electric heater in each house has an earth wire.
The earth wire provides

- A protection for the user
- B protection for the fuse
- C the current to the heater
- D the current from the heater

16. Sarah uses this equation to calculate the efficiency of a heater in one of the houses.

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

Which of these is correct?

- A efficiency has no unit
- B efficiency is measured in volts
- C efficiency is measured in joules
- D efficiency is measured in watts

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.

Wind turbines

A company plans to build a wind farm on a hill near a town.
The plan is rejected.
Instead, the wind farm is to be built in the sea, a few miles away.

17. The **useful** energy change in a wind turbine is

- A kinetic energy → sound energy
- B gravitational potential energy → kinetic energy
- C gravitational potential energy → electrical energy
- D kinetic energy → electrical energy

18. A wind turbine has a power output of 5 kW.
This means the turbine will transfer energy at a rate of

- A 0.005 J/s
- B 5 J/s
- C 5000 J/s
- D 5 000 000 J/s

19. Some students are discussing the use of wind turbines to generate the amount of electrical power the UK uses.
Who is correct?

Wind turbines do not use a renewable source of energy.

A

The wind is unreliable and can only provide for part of our needs.

B

Electricity from wind turbines costs nothing because wind is free.

C

Wind turbines have no effect on the environment.

D

20. If the wind farm is built in the sea, which of these is **not** a correct statement?
- A There will be less electricity used in the town
 - B There will be less noise pollution in the town
 - C There will be less visual pollution in the town
 - D There will be less damage to land near the town

Controlling current and voltage

Use this information to answer questions 21 and 22.

Elaine and Esther measure the current in different resistors.
They also measure the voltage across each resistor.
These are their results.

voltage across resistor (volts)	resistance of resistor (ohms)	current in resistor (amps)
10	5	2
10	10	1
10	20	0.5
10	40	X

21. Which of these is a correct conclusion from their results?
- A the bigger the resistance the bigger the current
 - B the bigger the voltage the bigger the current
 - C the bigger the resistance the smaller the current
 - D the bigger the voltage the smaller the resistance
22. When they use the 40 ohm resistor, the current **X** is
- A 10 A
 - B 4 A
 - C 0.25 A
 - D 0.125 A

23. Elaine and Esther find out that a light-dependent resistor (LDR) is used as part of a control circuit to switch street lights on and off. They discuss this use of LDRs with some friends. Who is correct?

The LDR switches on in the dark.

A

The resistance of the LDR increases as it becomes darker.

B

The LDR produces a high current in the dark.

C

The resistance of the LDR decreases as it becomes darker.

D

24. Elaine and Esther use a variable resistor in series with a loudspeaker to control the volume of sound it produces. They notice that the volume of sound increases when there is more electrical power. Which row of the table is correct for increasing the volume of sound from the loudspeaker?

	resistance of variable resistor	current in loudspeaker
A	decreases	increases
B	increases	increases
C	increases	decreases
D	decreases	decreases

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.**

Medical uses of electricity

25. Doctors use a defibrillator when a patient's heart has just stopped beating. The defibrillator gives an electric shock to help the heart beat normally. Peter and Rachel say:

Doctors use electric shocks because they are a tried and tested treatment.

Peter

Electric shocks should not be used because they are dangerous.

Rachel

Who is correct?

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

- 26.

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

A heart monitor in a hospital is connected to a 240 V supply. The current in the monitor is 2 A. The power of the monitor is

- A 120 W
- B 480 W
- C 120 kW
- D 480 kW

27. Dave and Ellen find an advertisement from a newspaper published in 1870.



The maker of the glasses suggests that the optic nerve can be repaired using electricity. The two students discuss the advert.

It must be true because it was in the newspaper

Dave

The advertisement gives no scientific evidence to support the claims.

Ellen

Who is correct?

- A Dave only
- B Ellen only
- C both Dave and Ellen
- D neither

28. A hospital has a new scanner. It is more expensive than the old one. The images from the new scanner are 20% more detailed than the old ones were. Some doctors are discussing the scanners.

The old scanner gave us enough detail most of the time.

Ali

The extra cost is only a fraction of the Health service budget.

Ben

The extra detail means that we can detect cancer sooner, but only for some of the patients.

Chardane

It cost more, but it will make a difference for only a few patients.

Donna

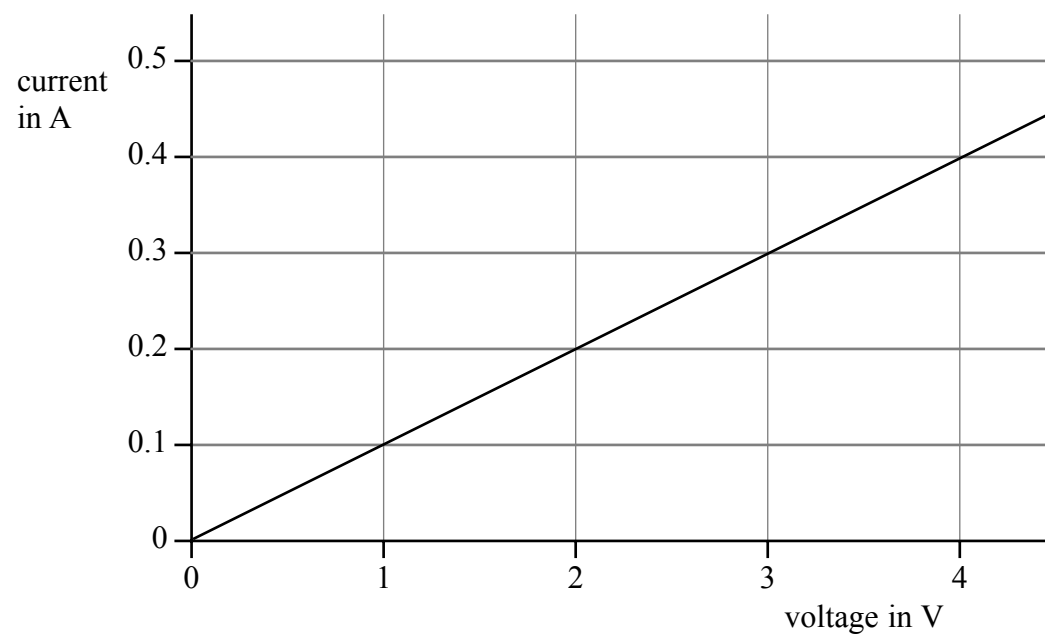
Which doctor gives both an advantage and a disadvantage of the new technology?

- A Ali
- B Ben
- C Chardane
- D Donna

Investigating resistance

Use this information to answer questions 29 and 30.

Paul and Zoë did an experiment to find out how the current in a resistor varies with the voltage. Here is a graph of their results.



29.

$$V = I \times R$$

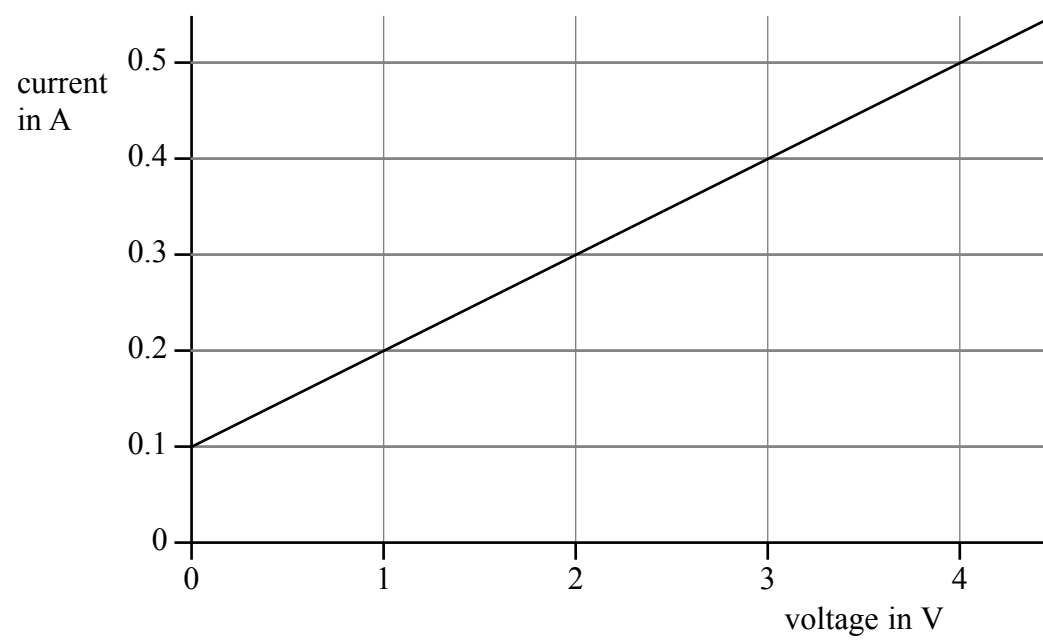
The resistance at 2 V is

- A 0.1 Ω
- B 0.2 Ω
- C 0.4 Ω
- D 10 Ω

30. For the voltages used by Paul and Zoë, the resistance is

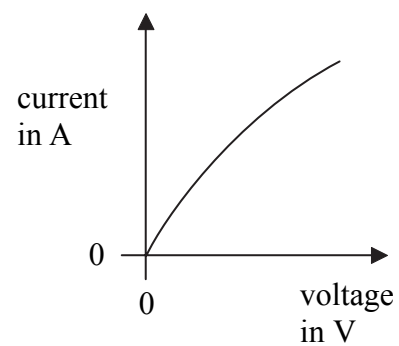
- A always constant
- B always changing
- C steadily decreasing
- D steadily increasing

31. Jamie and Abbie tried to repeat Paul and Zoë's experiment. Here is a graph of their results.



Which statement is a correct evaluation of this experiment?

- A If we repeat the experiment we should check the zero settings of the meters
 - B We need no improvements because we have a straight line graph
 - C Our graph has a constant shape
 - D The voltage is 0.1 when the current is zero
32. Paul and Zoë repeated their experiment using the same resistor. They used much higher currents. Here is their new graph.



The graph is curved this time because

- A the experiment is repeated.
- B the resistance of the resistor increases when its temperature increases.
- C the resistance of the resistor decreases when its temperature increases.
- D the resistance of the resistor has stayed the same.

House improvements

Joe is planning to install some electrical devices in his house.

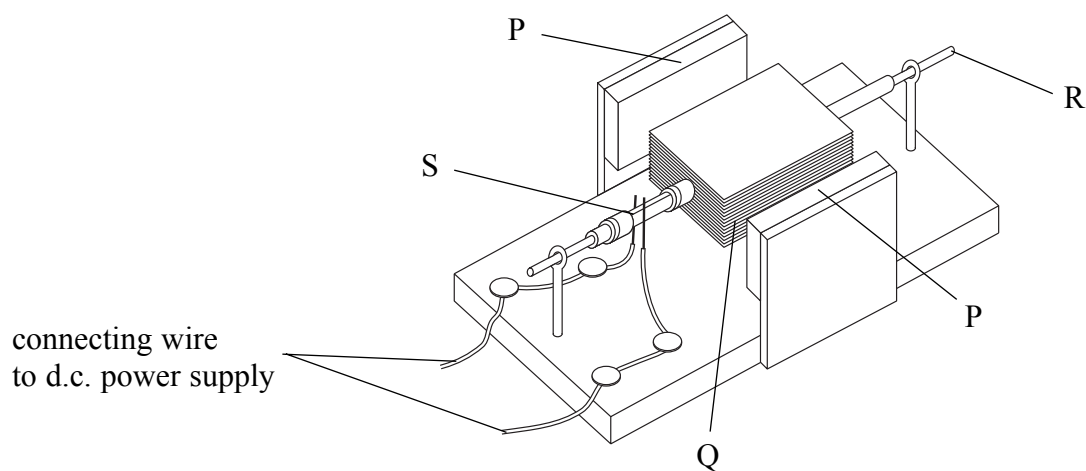
33. Joe decides to fit a residual current circuit breaker (RCCB).
Which row of the table is correct for RCCBs and fuses?

	advantage of RCCBs	disadvantage of fuses
A	RCCBs maintain a steady current in the live wire	fuses also need an earth wire to protect the user
B	RCCBs can be reset	fuses also need an earth wire to protect the user
C	RCCBs maintain a steady current in the live wire	fuses are very cheap to replace
D	RCCBs can be reset	fuses are very cheap to replace

34. He is deciding whether to fit solar cells on his roof.
One disadvantage of a solar cell is that it

- A** only produces high d.c. voltage
- B** only produces high a.c. voltage
- C** only produces low d.c. voltage
- D** only produces low a.c. voltage

35. Joe has bought a new washing machine.
It has an electric motor.
The diagram shows a simple electric motor.



Which two parts provide the turning force in the motor?

- A** P and Q
- B** P and S
- C** Q and R
- D** R and S

36.

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

Joe's washing machine has an average power rating of 500 W.
His electricity costs 10p for one kilowatt hour.
How long can he use the washing machine for a cost of 50p?

- A 0.01 hours
- B 0.1 hours
- C 1 hour
- D 10 hours

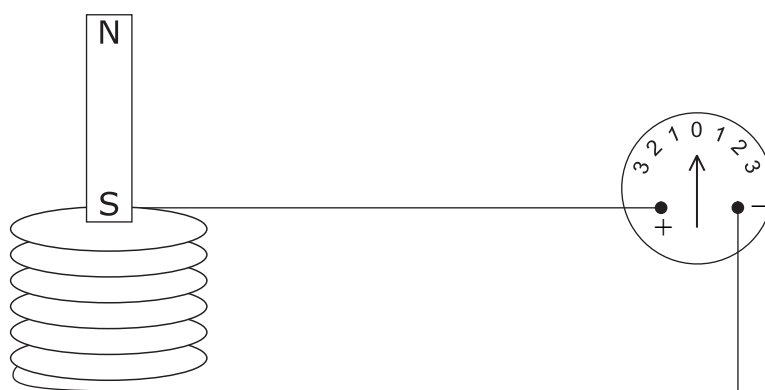
Current affairs

Alison and Joanne are researching electric current for a school project.

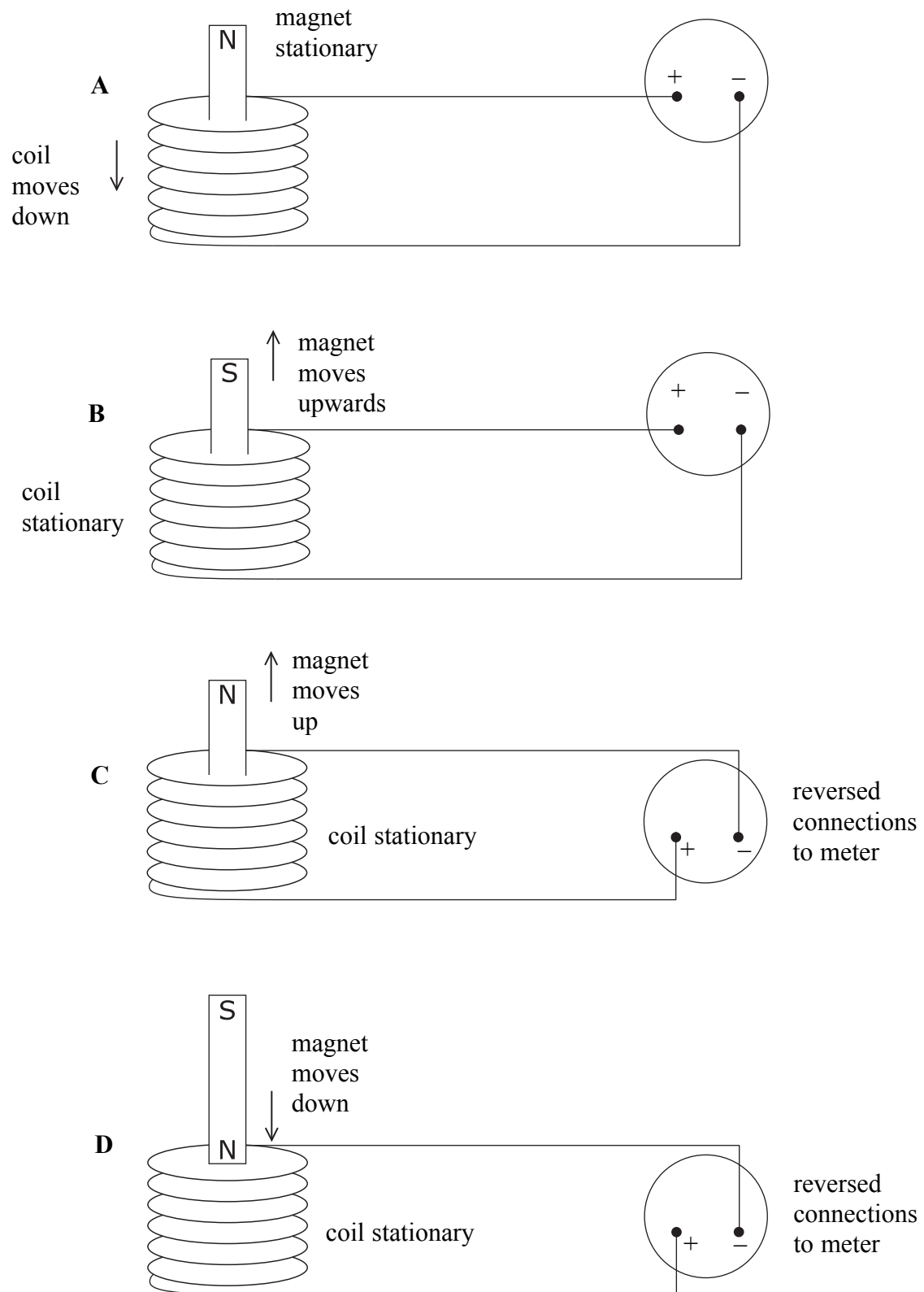
37. Alison correctly explained how to measure the current in a lamp.
The explanation was:

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

38. Alison and Joanne used this equipment to explain electromagnet induction.



When the S pole of the magnet was moved into the coil the pointer on the sensitive meter moved to the left.
Which of these actions will make the pointer move to the right?



39.

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

Alison measures the total input energy to a lamp as 400 J.
The efficiency of the lamp is 20%.
The useful output energy from the lamp is

- A 8000 J
- B 2000 J
- C 80 J
- D 20 J

40. Alison and Joanne discuss electric currents.

In a metal such as iron,
an electric current is the
rate of flow of protons
or electrons.

Alison

An electric current in a
copper wire is the rate of
flow of positive electrons.

Joanne

Who is correct?

- A Alison only
- B Joanne only
- C both Alison and Joanne
- D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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