Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **May/June 2020**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.

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1 Which quantity is a vector?

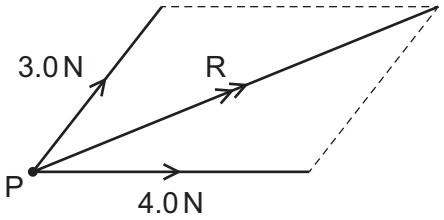
A acceleration

B distance

C speed

D time

2 The diagram shows the resultant R of a 3.0 N force and a 4.0 N force that act at a point P.



The angle between the 3.0 N force and the 4.0 N force can be any value from 0° to 90°.

Which value of R is **not** possible?

A 4.0 N **B** 5.0 N **C** 6.0 N **D** 7.0 N

3 What is measured using a micrometer?

A area

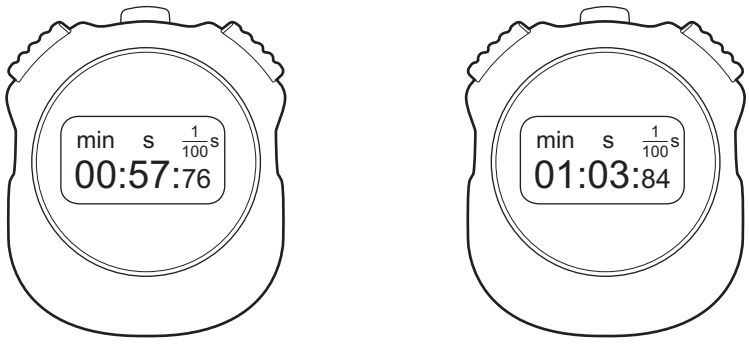
B current

C length

D mass

4 Stop-watches are used to time the runners in a race.

The stop-watches show the times recorded for the winner and another runner.



winner other runner

What is the difference in time between the winner and the other runner?

A 0.4608 s **B** 6.08 s **C** 46.08 s **D** 608 s

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5 Two cameras are a known distance apart. The exact time that a vehicle passes each of the cameras is recorded.

What can be obtained from the information?

A average acceleration of the vehicle

B average speed of the vehicle

C maximum acceleration of the vehicle

D maximum speed of the vehicle

6 A car of weight 11 000 N moves with constant velocity along a horizontal road. A driving force of 5000 N acts on the car.

What is the force opposing the motion of the car?

A 5000 N **B** 6000 N **C** 11 000 N **D** 16 000 N

7 A man with an open parachute falls to Earth at constant speed. The following forces act:

P the upward force of the parachute on the man

Q the upward force of the man on the Earth

R the downward force of the Earth on the parachute

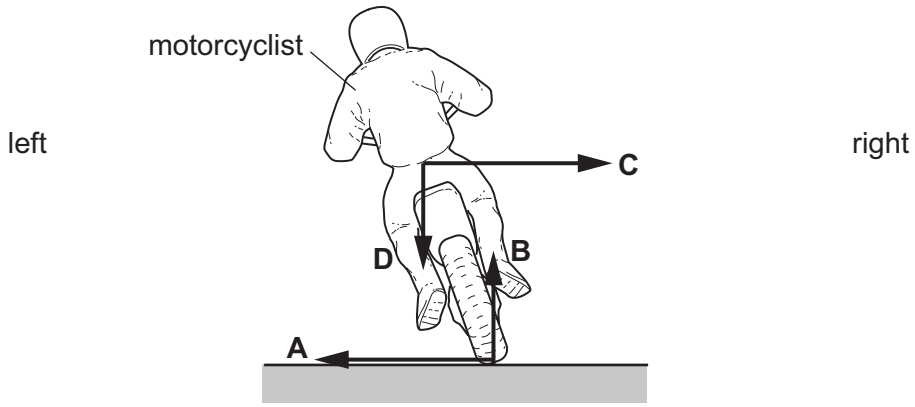
S the downward force of the man on the parachute

Which two forces are a Newton's third law pair?

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

8 The diagram shows a motorcyclist leaning over in order to turn the corner to the left.

Which force causes him to turn?

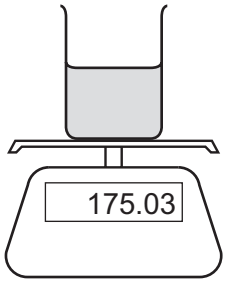


9 An object weighs 40 N on Earth, where the gravitational field strength is 10 N / kg. The object is taken to a planet where the gravitational field strength is 4.0 N / kg.

Which row is correct?

	mass of object on the planet / kg	weight of object on the planet / N
A	4.0	1.0
B	4.0	16
C	400	100
D	400	1600

10 The diagram shows the equipment used to determine the density of a liquid.



Which equation is used to calculate the density of the liquid?

A $\dfrac{\text{mass of beaker and liquid} - \text{mass of beaker}}{\text{volume of liquid}}$

B $\dfrac{\text{mass of beaker and liquid} - \text{mass of liquid}}{\text{volume of liquid}}$

C $\dfrac{\text{volume of liquid}}{\text{mass of beaker and liquid} - \text{mass of beaker}}$

D $\dfrac{\text{volume of liquid}}{\text{mass of beaker and liquid} - \text{mass of liquid}}$

11 Which single item can be used to find the centre of mass of a plane lamina of irregular shape?

A a balance

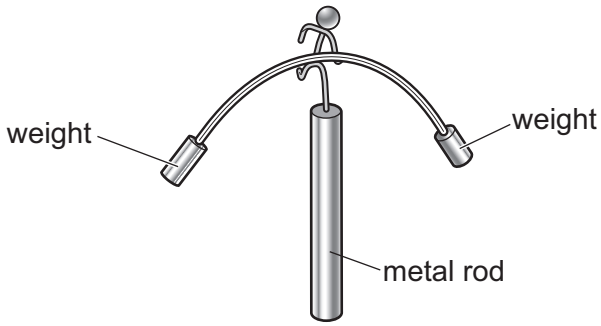
B a measuring tape

C a micrometer

D a vertical pin

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12 A student makes a model toy which balances on the end of a metal rod.



Why are the weights needed?

A They increase the pressure on the rod.

B They increase the weight of the model.

C They lower the centre of mass below the top of the rod.

D They raise the centre of mass above the top of the rod.

13 An unstretched elastic cord of length 15.0 cm stretches by 4.0 cm when a weight of 6.0 N is suspended from it. The cord does not exceed the limit of proportionality.

What is the total length of the cord when the weight is 3.0 N?

A 2.0 cm **B** 7.5 cm **C** 9.5 cm **D** 17.0 cm

14 An object is placed at different depths in liquids of different densities.

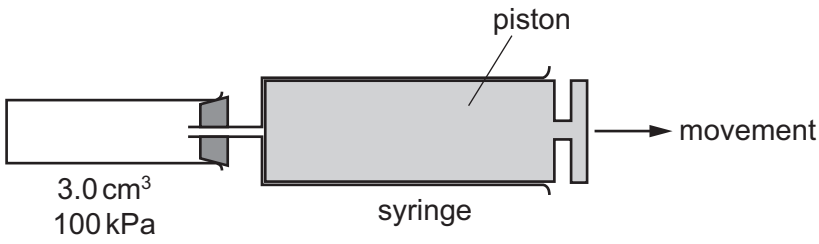
In which liquid and at what depth is the pressure on the object the greatest?

	$\frac{\text{density of liquid}}{\text{kg / m}^3}$	depth / m
A	1000	4.0
B	1000	10
C	1200	4.0
D	1200	10

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15 A small vessel of volume 3.0 cm^3 contains air at a pressure of 100 kPa.

The small vessel is connected to a syringe. The piston is fully inserted into the syringe.



The piston is moved slowly to the right so that the air in the syringe has a volume of 12 cm^3. The temperature of the air does not change.

What is the pressure of the air in the syringe?

A 20 kPa **B** 25 kPa **C** 80 kPa **D** 100 kPa

16 A rocket of mass *M* when empty carries a mass *M* of fuel. The rocket and fuel travel at speed *v*. The engine of the rocket is fired and all of the fuel is expelled. The speed of the rocket increases to 2*v*.

What happens to the kinetic energy of the rocket?

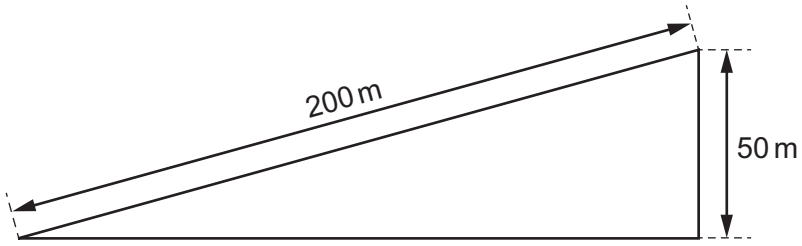
A It doubles.

B It halves.

C It increases by a factor of four.

D It stays the same.

17 A car of mass 1000 kg is driven 200 m up an incline so that it rises 50 m vertically.



The acceleration of free fall *g* is 10 m / s^2.

What is the gain in gravitational potential energy?

A 5000 J **B** 200 000 J **C** 500 000 J **D** 2 000 000 J

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18 In which situation is energy being released by the fusion of hydrogen nuclei to form helium?

A in the decay of ^{14}C used to date an object

B in a radioactive isotope emitting alpha-particles

C in the centre of the Earth

D in the centre of the Sun

19 The main stages in the operation of a coal-fired power station are listed. They are **not** in the correct order.

1 The turbine turns a generator.

2 Water in the boiler becomes hot.

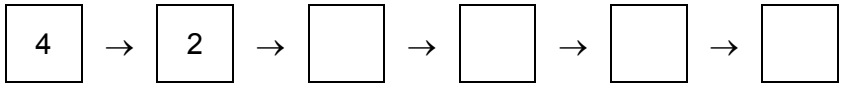
3 Steam turns a turbine.

4 Burning coal produces thermal energy.

5 Electromagnetic induction produces electrical energy.

6 Steam is produced.

The flow chart shows the first two stages.



What is the correct order for the remaining stages?

A $6 \rightarrow 3 \rightarrow 1 \rightarrow 5$

B $6 \rightarrow 1 \rightarrow 3 \rightarrow 5$

C $1 \rightarrow 6 \rightarrow 3 \rightarrow 5$

D $6 \rightarrow 3 \rightarrow 5 \rightarrow 1$

20 In which situation is there **no** transfer of energy?

A a car battery turning the starter motor

B a car moving along a horizontal road at constant speed

C a solar panel warming water

D a spacecraft orbiting the earth at constant height

21 The 200 V battery of an electric car is charged with a current of 33 A for 4.0 hours. The efficiency of the charging process is 90%.

How much useable energy is transferred to the battery?

A 21 MJ **B** 86 MJ **C** 95 MJ **D** 106 MJ

22 In an experiment to measure the power output of a small steam engine, a known load is lifted by the engine.

Which two measuring instruments are also required?

A measuring cylinder and thermometer

B measuring cylinder and metre rule

C metre rule and stop-watch

D stop-watch and thermometer

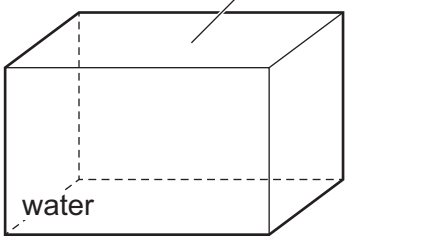
23 Four metal containers, with identical dimensions, are filled with water at 90 °C.

All the faces, except one, of each container are covered in a very good insulator.

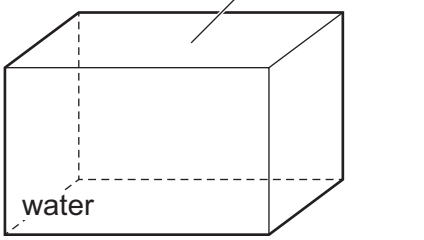
The one exposed face on each container is painted either black or white.

In which container does the water cool the fastest?

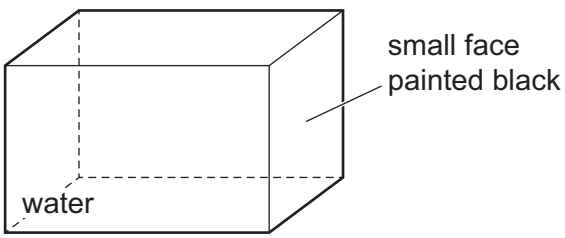
A



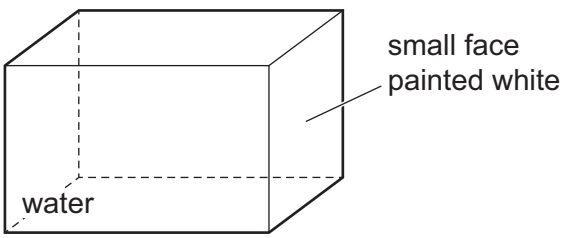
B



C



D



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24 Thermal energy is used to turn water at 100 °C to steam at 100 °C.

Which of the following occurs?

1 The forces between the molecules decrease.

2 The speed of the molecules increases.

3 The separation of the molecules increases.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

25 The thermal energy produced by an electric heater in three minutes is used to melt wax. The solid wax is initially at its melting point of 60 °C.

The specific latent heat of the wax is 220 J / g. The heater supplies 7700 J of thermal energy to the wax. Some of the wax melts.

How much wax melts?

A 0.58 g **B** 1.7 g **C** 12 g **D** 35 g

26 What always happens when the temperature increases?

A A gas at constant pressure expands.

B A metal rod becomes longer, but its volume remains constant.

C A liquid contracts and then expands.

D The hole in the centre of a metal disc becomes smaller.

27 Which row explains why a liquid has a fixed volume but does **not** have a fixed shape?

	force between molecules in the liquid	movement of molecules in the liquid
A	large	free to move within the liquid
B	large	vibrate at fixed positions
C	small	free to move within the liquid
D	small	vibrate at fixed positions

28 The air in a sealed can is heated.

Which statement explains the increase in pressure inside the can?

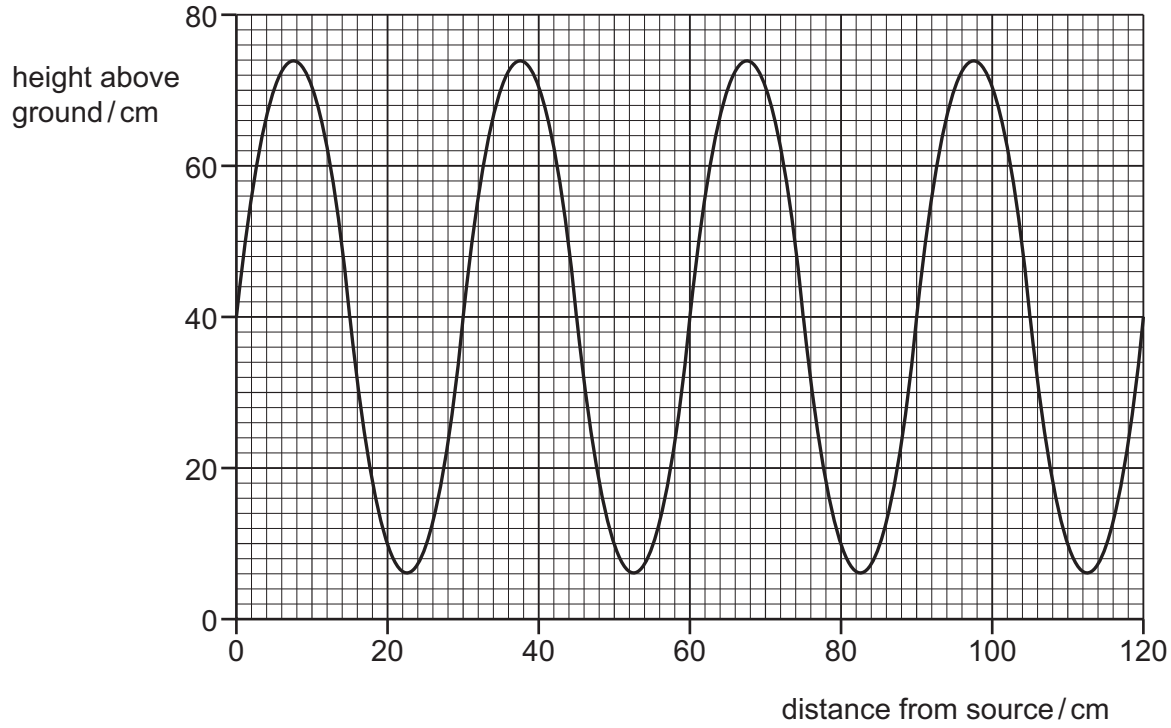
A The molecules collide with the walls of the can more frequently when the air is heated.

B The mass of the molecules is greater when the air is heated.

C There are more molecules per unit volume when the air is heated.

D The separation of molecules becomes greater when the air is heated.

29 The diagram shows how the height above the ground of a rope transmitting a wave varies with distance from the source of vibrations at one instant in time.



What is the amplitude of the wave shown?

A 30 cm **B** 34 cm **C** 72 cm **D** 74 cm

30 A vibrator produces 12 wavelengths on the surface of water in 10 s. The spacing between the first crest and the third crest is 60 cm.

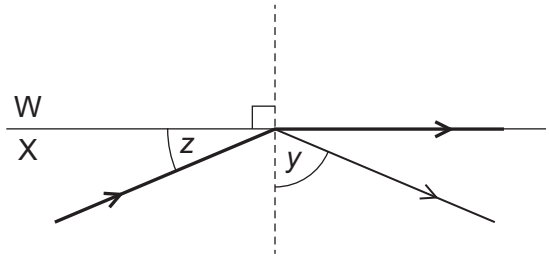
What is the speed of the wave?

A 24 cm / s **B** 25 cm / s **C** 36 cm / s **D** 72 cm / s

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31 The diagram shows a ray of light incident on the boundary between two mediums W and X.

The mediums have different refractive indexes.



Some light is reflected and some passes along the surface between the two mediums. Angle *y* is greater than angle *z*.

Which statement is correct?

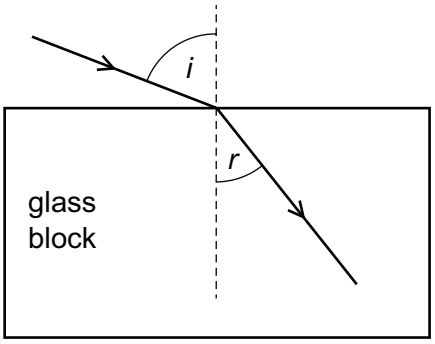
A W has a greater refractive index than X and angle *y* is equal to the critical angle.

B W has a greater refractive index than X and angle *z* is equal to the critical angle.

C X has a greater refractive index than W and angle *y* is equal to the critical angle.

D X has a greater refractive index than W and angle *z* is equal to the critical angle.

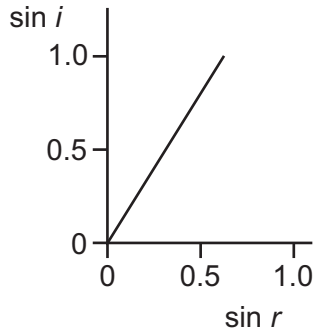
32 Light enters a glass block at an angle of incidence *i* and it produces an angle of refraction *r* in the glass.



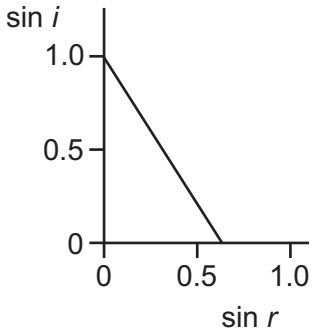
Several different values of *i* and *r* are measured, and a graph is drawn of sin *i* against sin *r*.

Which graph is correct?

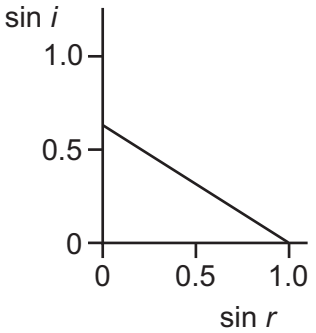
A



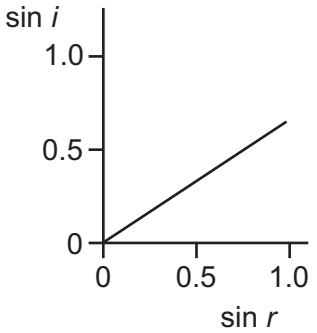
B



C



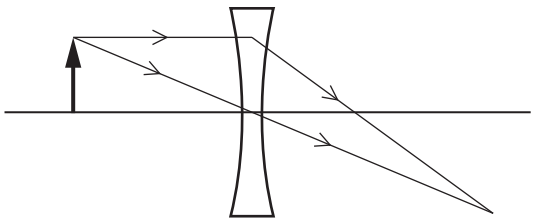
D



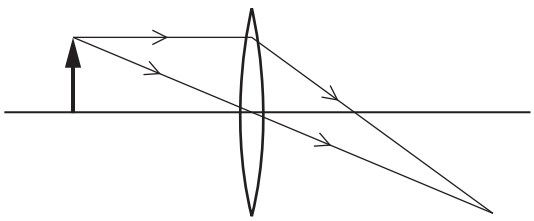
33 A converging glass lens is used to produce a virtual, magnified image.

Which ray diagram shows the rays passing through the converging lens?

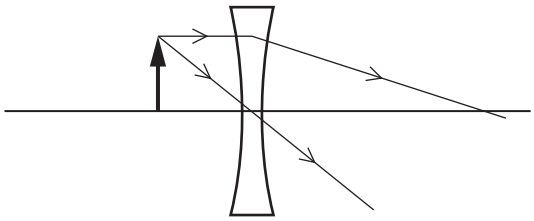
A



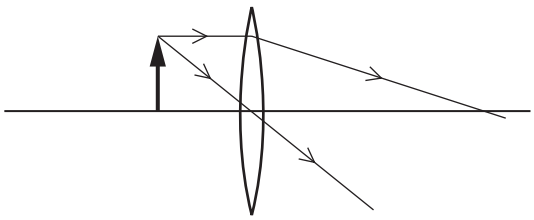
B



C



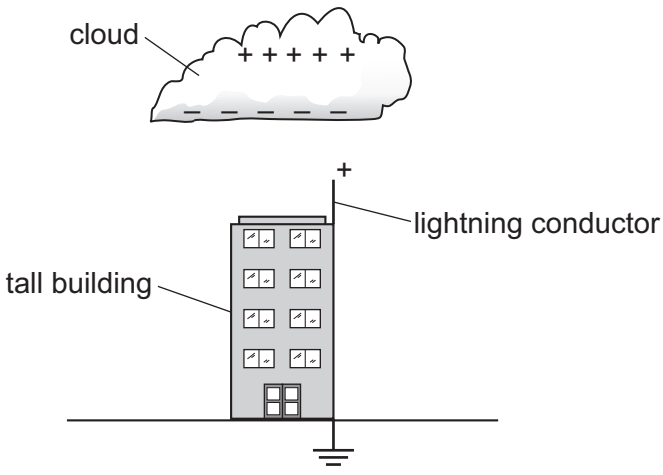
D



34 A metal lightning conductor is placed on the top of a tall building.

The conductor is connected to Earth.

When a charged cloud passes over the building, the metal lightning conductor becomes positively charged.



What happens to the lightning conductor to produce a positive charge at its top?

A Electrons move downwards and protons move upwards in the conductor.

B Only electrons move in the conductor.

C Only protons move in the conductor.

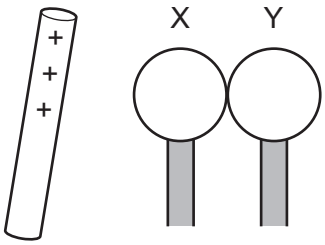
D Protons in the air attach themselves to the conductor.

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35 Two insulated and uncharged metal spheres X and Y are touching.

A positively charged rod is held near X and then the spheres are moved apart.

X now has a negative charge.



What is the charge on Y?

A negative and smaller than that on X

B negative and the same size as that on X

C positive and smaller than that on X

D positive and the same size as that on X

36 A stationary negative charge in an electric field experiences an electric force in the direction shown.



What is the direction of the electric field?

A to the left

B to the right

C down the page

D up the page

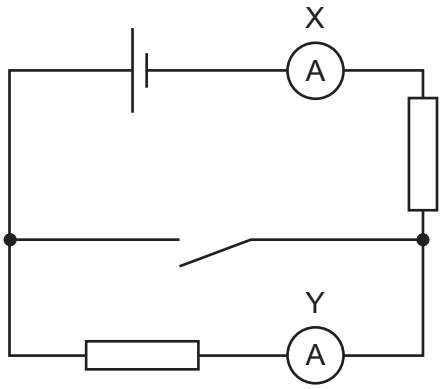
37 A metal wire of length l and cross-sectional area A has resistance R.

A second wire is made from the same metal. It has a length $2l$ and a cross-sectional area $4A$.

What is the resistance of the second wire?

A $8R$ **B** $2R$ **C** $\frac{R}{2}$ **D** $\frac{R}{8}$

38 The diagram shows a circuit.



What effect does closing the switch have on the readings of ammeters X and Y?

	reading on ammeter X	reading on ammeter Y
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

39 A rectangular current-carrying coil is pivoted between the poles of an electromagnet.

Which action does **not**, on its own, increase the size of the turning effect exerted on the coil?

A increasing the current in the coils of the electromagnet

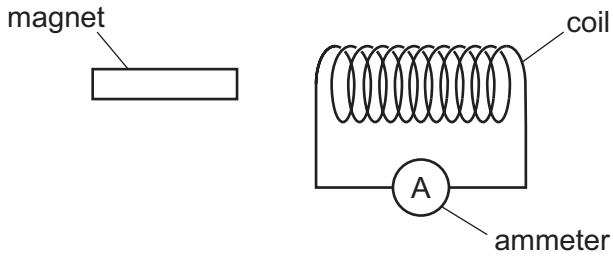
B increasing the current in the rectangular coil

C reversing the current in the electromagnet

D increasing the number of turns on the rectangular coil

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40 The diagram shows a coil connected to a very sensitive ammeter. A magnet is next to the coil.



Which action results in a zero reading on the ammeter?

A moving the coil and the magnet at the same speed in opposite directions

B moving the coil and the magnet at the same speed in the same direction

C moving the coil away from the stationary magnet

D moving the magnet towards the stationary coil

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