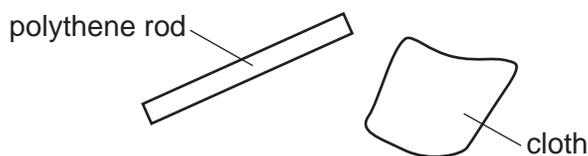


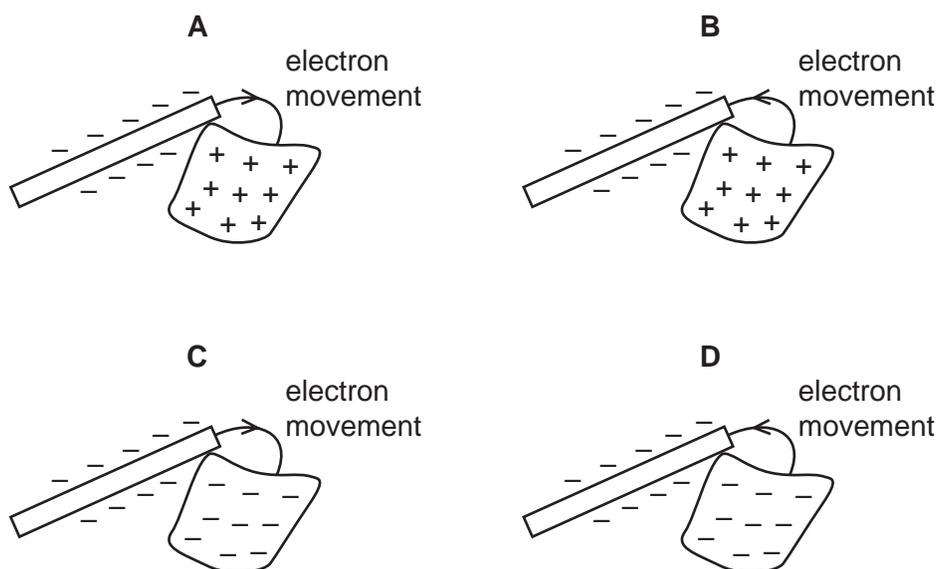
1 A polythene rod is rubbed with a cloth.



The rod and the cloth both become charged as electrons move between them.

The rod becomes negatively charged.

Which diagram shows how the rod becomes negatively charged, and the final charge on the cloth?



2 A wire has a certain electrical resistance.

The diameter and length of the wire may be changed.

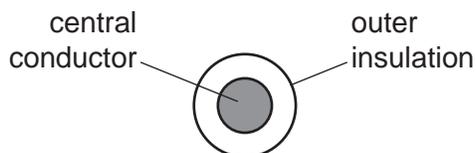
Which pair of changes **must** cause the resistance of the wire to increase?

	change of diameter	change of length
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

3 Which row describes the nature and a property of all  $\beta$ -particles?

	nature	property
<b>A</b>	electrons	can travel through a vacuum
<b>B</b>	electrons	stopped by a thin sheet of paper
<b>C</b>	helium nuclei	can travel through a vacuum
<b>D</b>	helium nuclei	stopped by a thin sheet of paper

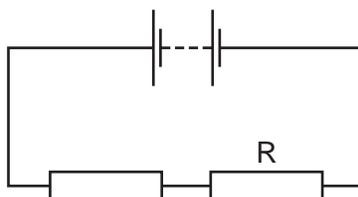
4 A flexible electrical cable consists of a central conductor and outer insulation.



Which pair of materials is suitable for the cable?

	central conductor	outer insulation
<b>A</b>	copper	plastic
<b>B</b>	lead	wood
<b>C</b>	plastic	copper
<b>D</b>	wood	lead

5 The diagram shows a battery connected to two resistors.



Four students separately measure the electromotive force (e.m.f.) of the battery, the current in the resistors, and the potential difference (p.d.) across resistor R.

Their results are shown in the table below.

Which row shows values with their correct units?

	e.m.f.	current	p.d.
<b>A</b>	3.0 A	0.30 V	1.5 A
<b>B</b>	3.0 A	0.30 A	1.5 V
<b>C</b>	3.0 V	0.30 V	1.5 A
<b>D</b>	3.0 V	0.30 A	1.5 V

5 The table describes four different resistance wires. They are all made from the same metal.

Which wire has the smallest resistance?

	length of wire / m	diameter of wire / mm
<b>A</b>	2.0	1.0
<b>B</b>	2.0	1.5
<b>C</b>	3.0	1.0
<b>D</b>	3.0	1.5

7 A polythene rod repels an inflated balloon hanging from a nylon thread.

Why do the rod and balloon repel?

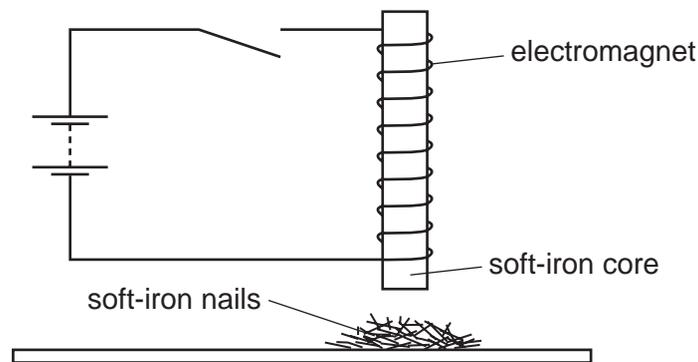
- A The rod and the balloon have opposite charges.
- B The rod and the balloon have like charges.
- C The rod is charged but the balloon is not.
- D The balloon is charged but the rod is not.

8 A student uses a length of wire as a resistor. He makes a second resistor from the same material.

To be certain of making a second resistor of higher resistance, he should use a piece of wire that is

- A longer and thicker.
- B longer and thinner.
- C shorter and thicker.
- D shorter and thinner.

9 An electromagnet with a soft-iron core is connected to a battery and an open switch. The soft-iron core is just above some small soft-iron nails.



The switch is now closed, left closed for a few seconds, and then opened.

What do the soft-iron nails do as the switch is closed, and what do they do when the switch is then opened?

	as switch is closed	as switch is opened
A	nails jump up	nails fall down
B	nails jump up	nails stay up
C	nails stay down	nails jump up
D	nails stay down	nails stay down

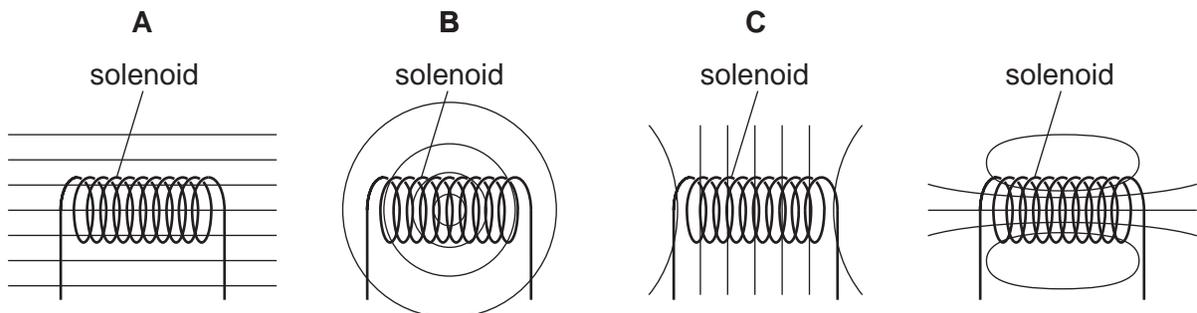
10 The diagram shows a piece of metal resistance wire.



Which wire, made of the same metal, has a smaller resistance?

- A** a wire of the same length with a larger diameter
- B** a wire of the same length with a smaller diameter
- C** a wire of greater length with the same diameter
- D** a wire of greater length with a smaller diameter

11 Which diagram shows the pattern of the magnetic field produced by a current-carrying solenoid?



- 12 A student has wires of different lengths and different diameters. The wires are all made of the same metal.

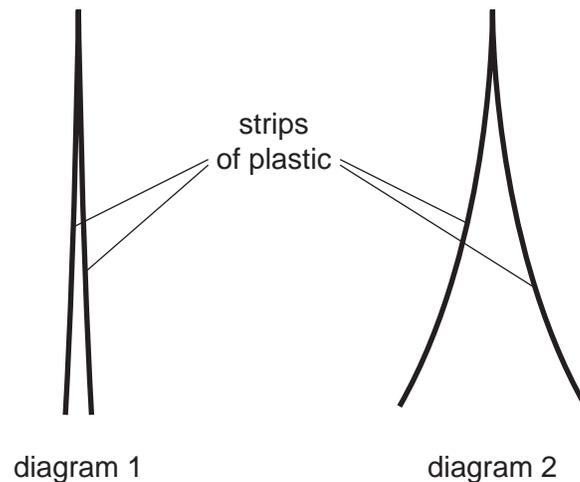
The student measures the resistance of one wire.

Which wire has a greater resistance than the wire he has measured?

- A** a shorter wire with a larger diameter
- B** a shorter wire with the same diameter
- C** a wire of the same length with a larger diameter
- D** a wire of the same length with a smaller diameter

- 13 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
<b>A</b>	opposite	attraction
<b>B</b>	opposite	repulsion
<b>C</b>	the same	attraction
<b>D</b>	the same	repulsion

14 What is the unit of electromotive force (e.m.f.)?

- A ampere
- B newton
- C ohm
- D volt

15 Which sample of copper wire has the greatest electrical resistance?

	length of wire / m	diameter of wire / mm
<b>A</b>	1.0	2.0
<b>B</b>	1.0	4.0
<b>C</b>	10	2.0
<b>D</b>	10	4.0

16 Which row gives the unit for electromotive force (e.m.f.) and the unit for potential difference (p.d.)?

	electromotive force	potential difference
<b>A</b>	newton	joule
<b>B</b>	newton	volt
<b>C</b>	volt	joule
<b>D</b>	volt	volt

17 What is the unit of electrical power?

- A ampere
- B joule
- C volt
- D watt

18 Some resistors are made using one type of wire. Two different lengths of wire are available. Each length is available in two different diameters.

Which wire has the highest resistance?

- A the wire with the greater length and the larger diameter
- B the wire with the greater length and the smaller diameter
- C the wire with the smaller length and the larger diameter
- D the wire with the smaller length and the smaller diameter

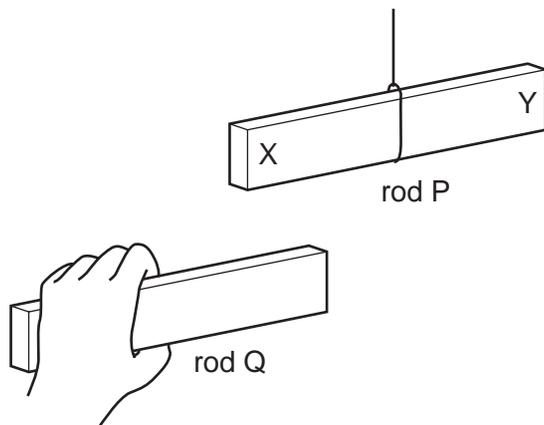
19 Four students are each given an identical resistor and asked to find its resistance. They each measure the potential difference across the resistor and the current in it.

One student makes a mistake.

Which row shows the results of the student that makes a mistake?

	potential difference /V	curren /A
<b>A</b>	1.2	0.
<b>B</b>	2.4	1.
<b>C</b>	1.5	0.
<b>D</b>	3.0	1.

20 Two plastic rods P and Q are both negatively charged. Rod P hangs freely.

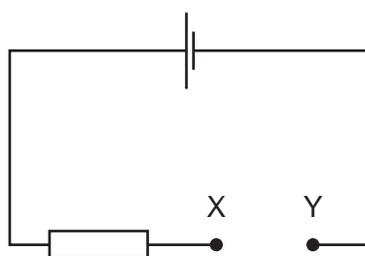


The end of rod Q is brought near to end X of rod P, and then near to end Y of rod P.

What happens to the rods in each position?

	near end X	near end Y
<b>A</b>	they attract	they attract
<b>B</b>	they attract	they repel
<b>C</b>	they repel	they attract
<b>D</b>	they repel	they repel

21 A student has four pieces of resistance wire made of the same material. Each piece is connected in turn between the terminals X and Y in the circuit.



In which wire is the current the largest?

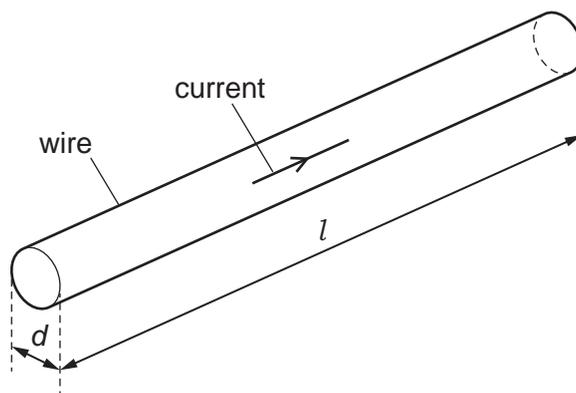
	length of wire / m	diameter of wire / mm
<b>A</b>	0.5	0.5
<b>B</b>	0.5	1.0
<b>C</b>	1.0	0.5
<b>D</b>	1.0	1.0

- 22 A plastic rod is rubbed with a cotton cloth. This process causes the rod and the cloth to become charged. These charges cause a force between the rod and the cloth.

Which row compares the charges on the rod and the cloth, and describes the effect of the force between the rod and the cloth?

	charges on rod and cloth	effect
<b>A</b>	opposite	attract
<b>B</b>	opposite	repel
<b>C</b>	the same	they attract
<b>D</b>	the same	they repel

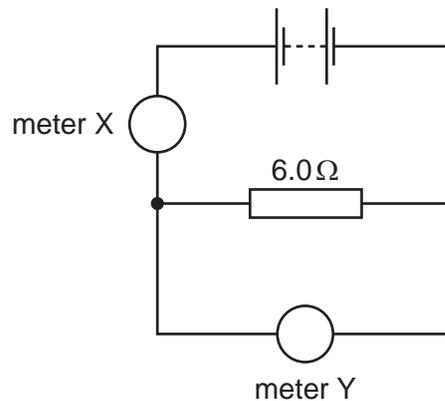
- 23 A metal wire of circular cross-section has diameter  $d$  and length  $l$ .



Which pair of changes, if both are carried out, **must** increase the resistance of the wire?

- A** decrease  $l$  and decrease  $d$
- B** decrease  $l$  and increase  $d$
- C** increase  $l$  and decrease  $d$
- D** increase  $l$  and increase  $d$

- 24 The circuit shown contains a battery, a  $6.0\ \Omega$  resistor and two meters X and Y.  
One meter records current and one meter records potential difference.



Which row shows possible values for the readings on the meters?

	meter X	meter Y
<b>A</b>	2.0 A	1 V
<b>B</b>	2.0 V	1 A
<b>C</b>	12 A	2 V
<b>D</b>	12 V	2 A

- 25 A teacher wishes to show the production of electrostatic charges.

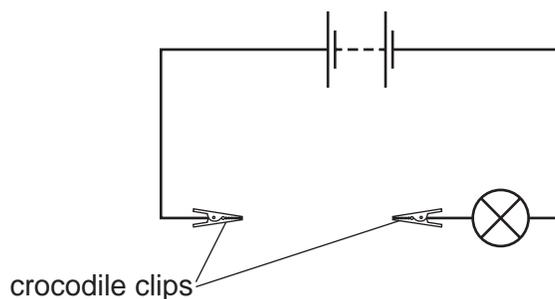
She holds a rod and rubs it with a cotton cloth. A copper rod, a glass rod, a plastic rod and a steel rod are available.

Which two rods would both be suitable to use?

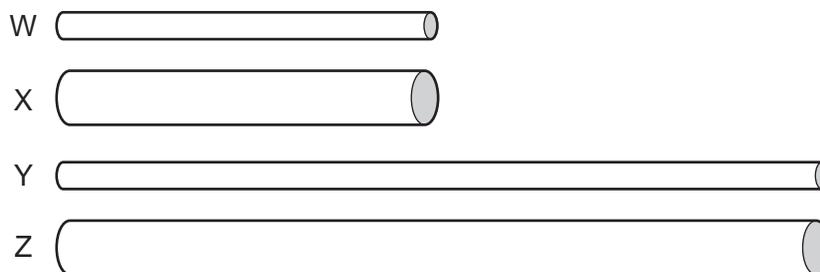
- A** a copper rod and a glass rod
- B** a glass rod and a plastic rod
- C** a plastic rod and a copper rod
- D** a plastic rod and a steel rod

26 A battery is connected to two crocodile clips and a lamp.

There is a gap between the crocodile clips.



Four cylinders W, X, Y and Z are made of the same metal but have different dimensions. The cylinders are connected in turn, by their ends, between the crocodile clips. The diagrams of the cylinders are all drawn to the same scale.



Which cylinder makes the lamp glow most brightly and which cylinder makes the lamp glow least brightly?

	most brightly	least brightly
<b>A</b>	W	Y
<b>B</b>	W	Z
<b>C</b>	X	Y
<b>D</b>	X	Z

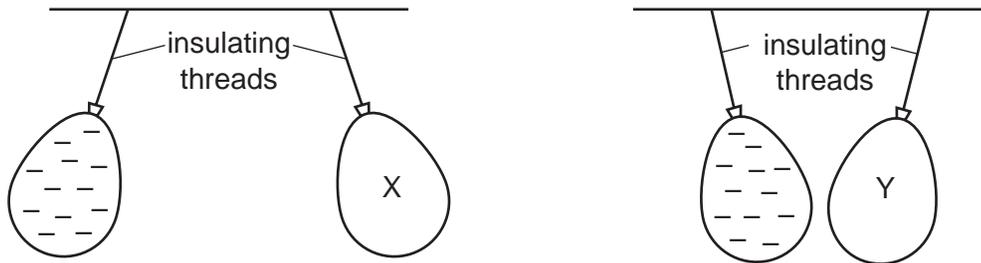
27 A plastic rod and a dry cloth are uncharged.

The rod is now rubbed with the cloth and they both become charged. The rod becomes negatively charged because some charged particles move from the cloth to the rod.

What is the charge on the cloth and which particles moved in the charging process?

	charge on cloth	particles that moved
<b>A</b>	negative	electrons
<b>B</b>	negative	neutrons
<b>C</b>	positive	electrons
<b>D</b>	positive	neutrons

28 Two balloons, X and Y, are suspended by insulating threads. They are each held near a negatively charged balloon. The balloons hang as shown.



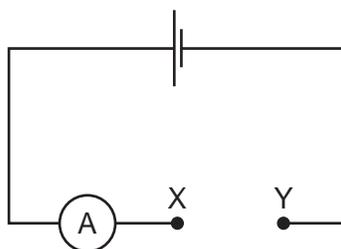
What is the charge on balloon X and what is the charge on balloon Y?

	balloon X	balloon Y
<b>A</b>	negative	negative
<b>B</b>	negative	positive
<b>C</b>	positive	negative
<b>D</b>	positive	positive

29 Which quantities is a voltmeter used to measure?

- A current and e.m.f. only
- B current and p.d. only
- C e.m.f. and p.d. only
- D e.m.f., current and p.d

30 The diagram shows an incomplete circuit.



Four wires of different length and thickness are connected in turn between point X and point Y. All four wires are made of the same metal.

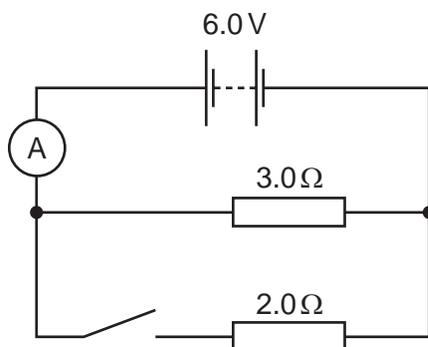
Which wire will cause the greatest reading on the ammeter?

- A long and thick
- B long and thin
- C short and thick
- D short and thin

31 Which row gives the unit for energy and the unit for electromotive force (e.m.f.)?

	energy	e.m.f.
<b>A</b>	J	N
<b>B</b>	J	V
<b>C</b>	W	N
<b>D</b>	W	V

32 The diagram shows a circuit with a 6.0 V battery, an ammeter and two resistors connected in parallel.



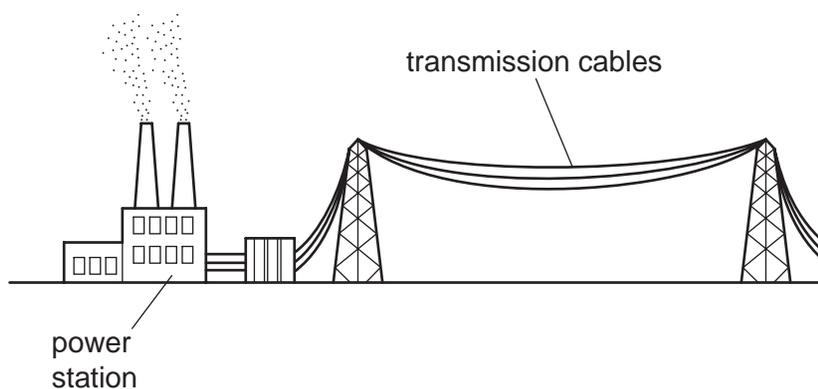
The switch is open, and the ammeter reads 2.0 A.

The switch is now closed and the ammeter reads the total current in both resistors.

What is the ammeter reading with the switch closed?

- A** 1.2 A      **B** 3.0 A      **C** 4.0 A      **D** 5.0 A

- 33 The diagram shows cables used in the transmission of electrical energy. High voltages are used for the transmission.



Why are high voltages used for the transmission of electrical energy?

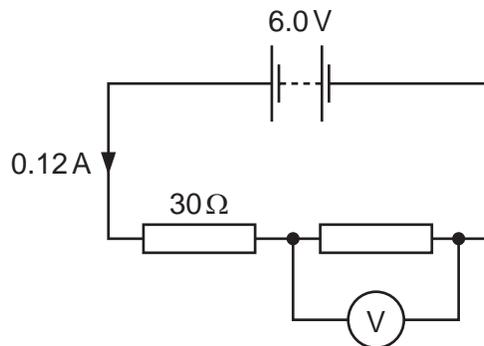
- A** Fear of high voltages stops people from interfering with the cables.
- B** Heat loss in the cables is smaller than if low voltages are used.
- C** High voltages increase the current in the cables.
- D** High voltages produce large magnetic fields, so less insulation is needed.

- 34 Four wires are made from the same material.

Which wire has the least resistance?

	diameter of wire / mm	length of wire / cm
<b>A</b>	0.2	100
<b>B</b>	0.2	200
<b>C</b>	0.4	100
<b>D</b>	0.4	200

35 A  $30\ \Omega$  resistor is connected in series with another resistor and a  $6.0\text{V}$  battery. The current in the circuit is  $0.12\text{A}$ . A voltmeter is connected across the other resistor.

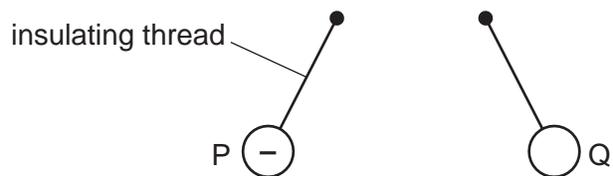


What is the reading on the voltmeter?

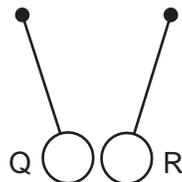
- A** 2.4V      **B** 3.6V      **C** 6.0V      **D** 9.6V

36 Three charged balls, P, Q and R are suspended by insulating threads. Ball P is negatively charged.

Ball Q is brought close to ball P.



Ball Q is now brought close to ball R.



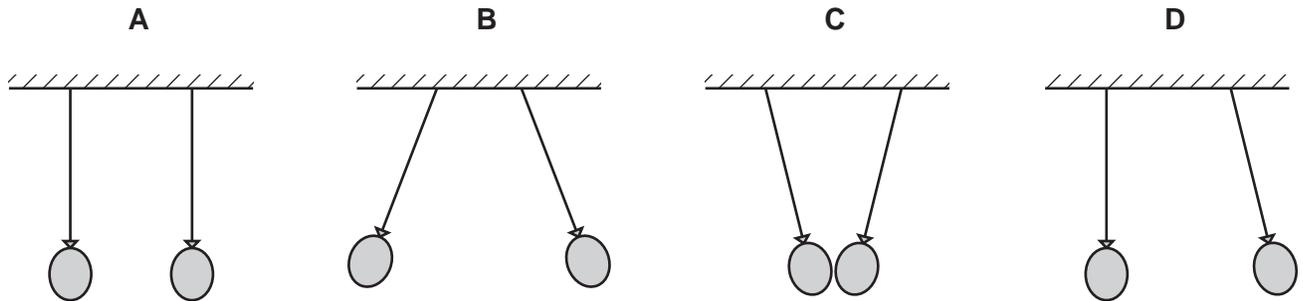
What are the charges on ball Q and on ball R?

	ball Q	ball R
<b>A</b>	positive	positive
<b>B</b>	positive	negative
<b>C</b>	negative	positive
<b>D</b>	negative	negative

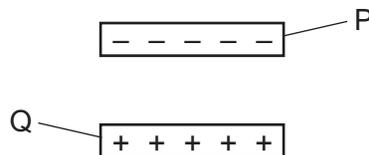
- 37 Which copper wire would have the smallest resistance?
- A** a long, thick wire
  - B** a long, thin wire
  - C** a short, thick wire
  - D** a short, thin wire
- 38 Which group contains only good electrical conductors?
- A** air, carbon (graphite), plastic
  - B** air, gold, mercury
  - C** carbon (graphite), copper, mercury
  - D** copper, gold, plastic
- 39 Which equation can be used to calculate the resistance  $R$  of a resistor?
- A**  $V = I \div R$       **B**  $I = V \times R$       **C**  $R = V \times I$       **D**  $V = I \times R$
- 40 A student wishes to measure first the electromotive force (e.m.f.) of a battery, and then the potential difference (p.d.) across a resistor.
- She has the resistor, the battery and some connecting wires.
- What else does she need?
- A** a force meter (newton meter) and a voltmeter
  - B** an ammeter and a voltmeter
  - C** an ammeter only
  - D** a voltmeter only

41 Two similar balloons hang side by side, on insulating threads, a short distance apart. They are both rubbed with the same dry cloth and become charged.

Which diagram shows how the balloons hang after charging?



42 A negatively charged plastic rod P is placed above a positively charged plastic rod Q.



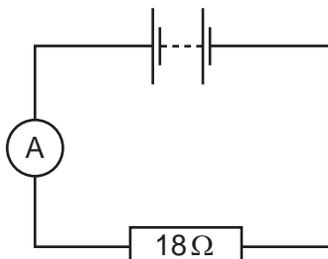
What are the directions of the electrostatic forces on rod P and on rod Q?

	electrostatic force on rod P	electrostatic force on rod Q
<b>A</b>	downwards	downwards
<b>B</b>	downwards	upwards
<b>C</b>	upwards	downwards
<b>D</b>	upwards	upwards

43 In which unit is potential difference measured?

- A** ampere
- B** ohm
- C** volt
- D** watt

- 44 An ammeter and an  $18\ \Omega$  resistor are connected in series with a battery. The reading on the ammeter is  $0.50\ \text{A}$ . The resistance of the battery and the ammeter can be ignored.



What is the electromotive force (e.m.f.) of the battery?

- A**  $9.0\ \text{N}$       **B**  $9.0\ \text{V}$       **C**  $36\ \text{N}$       **D**  $36\ \text{V}$

- 45 A polythene rod repels an inflated balloon hanging from a nylon thread.

What charges must the rod and the balloon carry?

- A** The rod and the balloon carry opposite charges.  
**B** The rod and the balloon carry like charges.  
**C** The rod is charged but the balloon is not.  
**D** The balloon is charged but the rod is not.

- 46 Which test could be used to find which end of a magnet is the north pole?

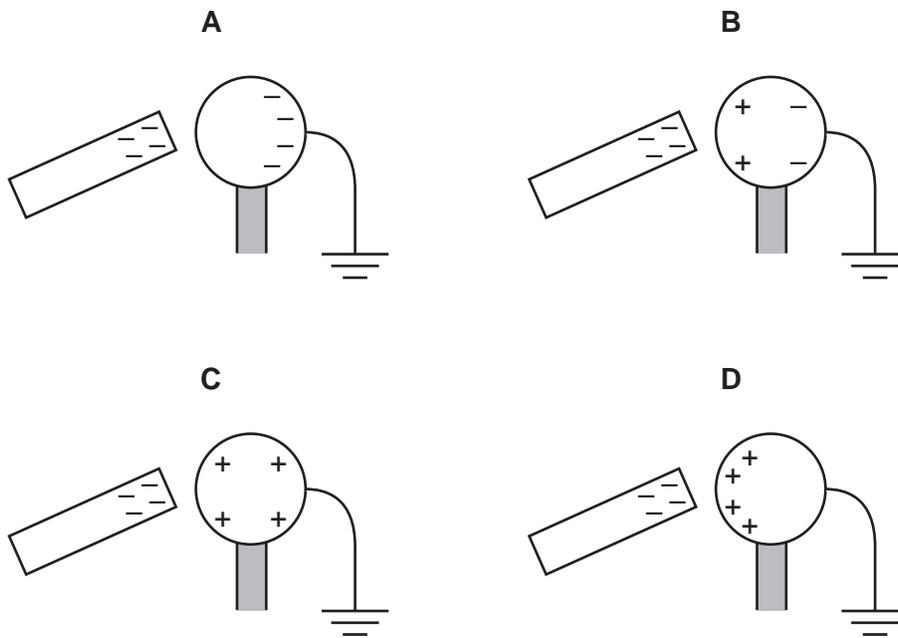
- A** putting it near a compass needle  
**B** putting it near a ferrous metal  
**C** putting it near a non-ferrous metal  
**D** putting it near a steel spoon

47 Which symbols are used for the units of current and of resistance?

	unit of current	unit of resistance
<b>A</b>	A	W
<b>B</b>	A	$\Omega$
<b>C</b>	C	W
<b>D</b>	C	$\Omega$

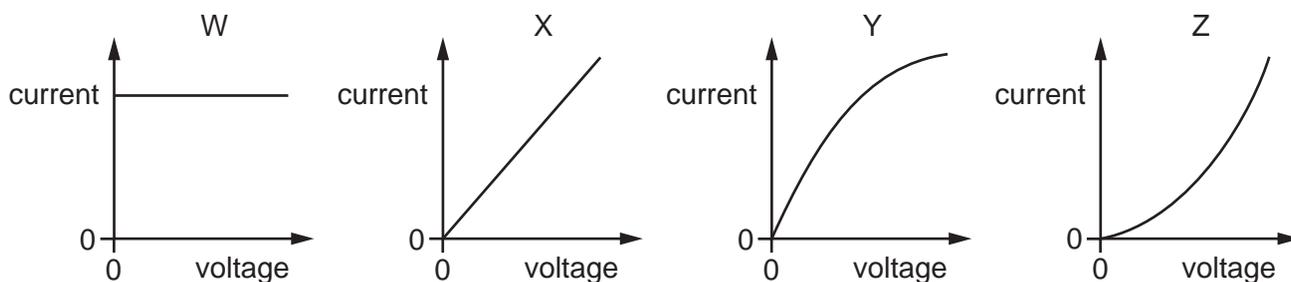
48 A negatively charged rod is held close to one side of a metal sphere. The other side of the sphere is earthed.

Which diagram shows the distribution of charge on the metal sphere?



49 The diagrams show four current-voltage graphs.

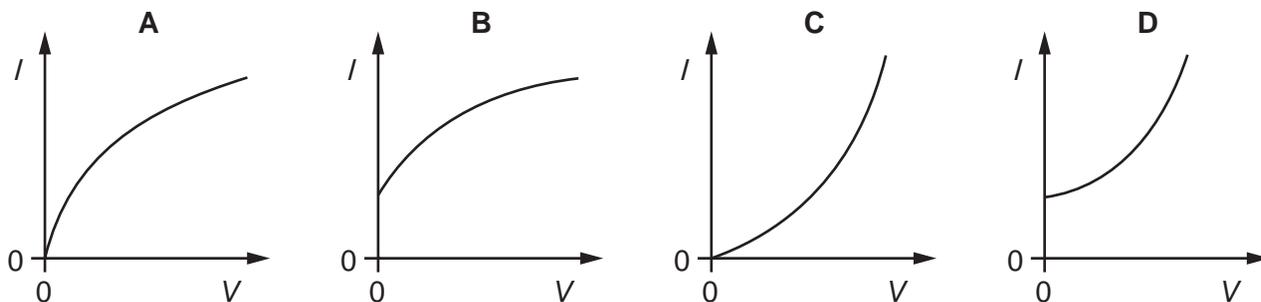
Which two graphs show the characteristics of an ohmic resistor and of a filament lamp?



	ohmic resistor	filament lamp
<b>A</b>	W	Y
<b>B</b>	X	Y
<b>C</b>	W	Z
<b>D</b>	X	Z

50 A small potential difference  $V$  is applied across a filament lamp. The current  $I$  in the lamp is measured.  $V$  is increased in stages and  $I$  is measured at each stage.

Which graph shows the results obtained?



51 A resistor of resistance  $R$  is connected to a battery of e.m.f.  $V$ .

There is a current  $I$  in the resistor.

Power  $P$  is dissipated by the resistor, and in time  $t$  the energy transferred is  $E$ .

Which expression is correct?

- A**  $E = IVt$       **B**  $E = Pit$       **C**  $P = VIR$       **D**  $P = \frac{V}{R}$

52 Which produces an electromotive force (e.m.f.)?

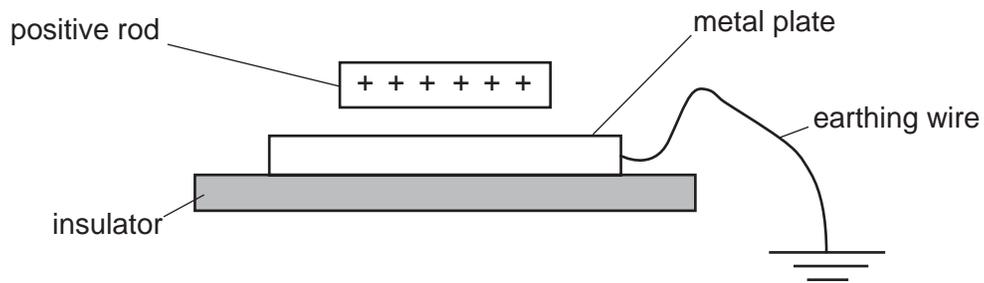
- A** a battery
- B** a filament lamp
- C** a resistor
- D** a spring balance

53 The table describes four different resistance wires. They are all made from the same metal.

Which wire has the smallest resistance?

	length of wire / m	diameter of wire / mm
<b>A</b>	2.0	1.0
<b>B</b>	2.0	1.5
<b>C</b>	3.0	1.0
<b>D</b>	3.0	1.5

- 54 A positively charged plastic rod is placed just above a thick metal plate. The metal plate rests on an insulator and is connected to the earth by a wire.



A student disconnects the earthing wire and then removes the positively charged rod.

The experiment is repeated. This time the student removes the positively charged rod and then removes the earthing wire.

Which statement is correct?

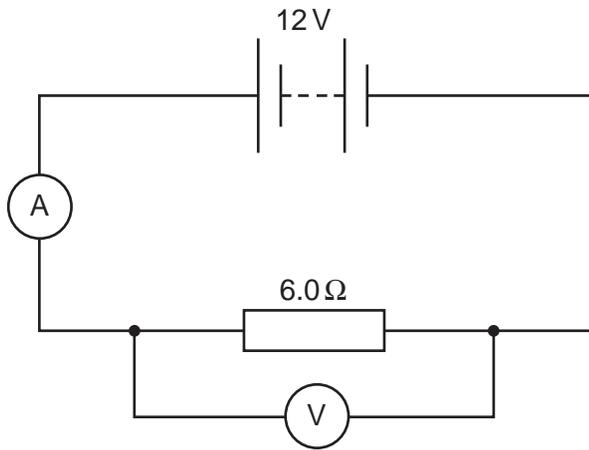
- A** When the earthing wire is disconnected first, the metal plate becomes positively charged.
- B** When the earthing wire is disconnected first, the metal plate becomes negatively charged.
- C** When the plastic rod is removed first, the metal plate becomes positively charged.
- D** When the plastic rod is removed first, the metal plate becomes negatively charged.

- 55 The resistance of a wire depends on its length  $l$  and on its cross-sectional area  $A$ .

The resistance is

- A** directly proportional to  $l$  and directly proportional to  $A$ .
- B** directly proportional to  $l$  and inversely proportional to  $A$ .
- C** inversely proportional to  $l$  and directly proportional to  $A$ .
- D** inversely proportional to  $l$  and inversely proportional to  $A$ .

56 In the circuit shown, the ammeter reads 2.0A and the voltmeter reads 12V.



How much energy is transferred by the resistor in 10 seconds?

- A** 2.4 J
- B** 14.4 J
- C** 240 J
- D** 1440 J