



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**COMBINED SCIENCE**

**0653/12**

Paper 1 Multiple Choice (Core)

**May/June 2017**

**45 minutes**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)



**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

**DO NOT WRITE IN ANY BARCODES.**

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 separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

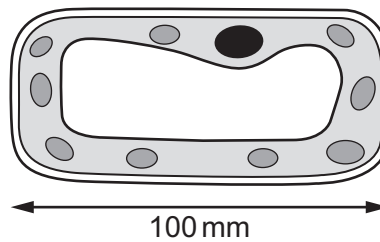
This document consists of **18** printed pages and **2** blank pages.

- 1 A person moves their hand away from a hot object.

Which characteristic of living organisms is this?

- A growth
- B nutrition
- C reproduction
- D sensitivity

- 2 The diagram shows an image of a plant cell that has been magnified.



The magnification is  $\times 200$ .

What is the length of the actual cell?

- A 0.2 mm
  - B 0.5 mm
  - C 2 mm
  - D 20 000 mm
- 3 Which statement about enzymes is correct?
- A They are killed by high temperatures.
  - B They are made from amino acids.
  - C They are unaffected by pH.
  - D They are used up in biological reactions.

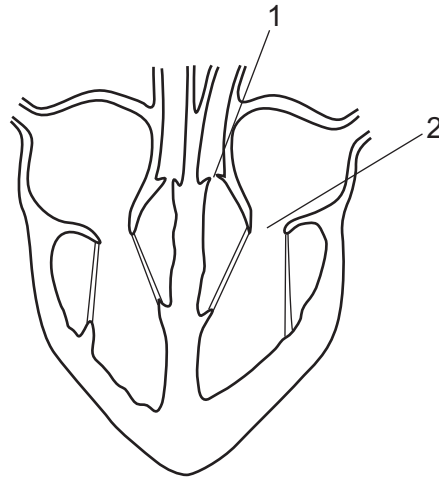
4 An unknown liquid is divided into three test-tubes and tested as shown in the table.

test-tube number	test solution added to mixture	final colour in test-tube
1	Benedict's solution	blue
2	biuret	violet
3	iodine solution	yellow

Which conclusion about the unknown liquid is correct?

- A It contains reducing sugar and starch.
  - B It contains protein and a reducing sugar.
  - C It only contains protein.
  - D It only contains starch.
- 5 What are the products of photosynthesis?
- A carbohydrates + oxygen
  - B carbohydrates + water
  - C carbon dioxide + oxygen
  - D carbon dioxide + water
- 6 What is transpiration?
- A absorption of water by root hair cells
  - B evaporation of water at the surfaces of mesophyll cells
  - C loss of water vapour from the roots of plants
  - D transport of food substances in the phloem

7 The diagram shows a section through the heart.

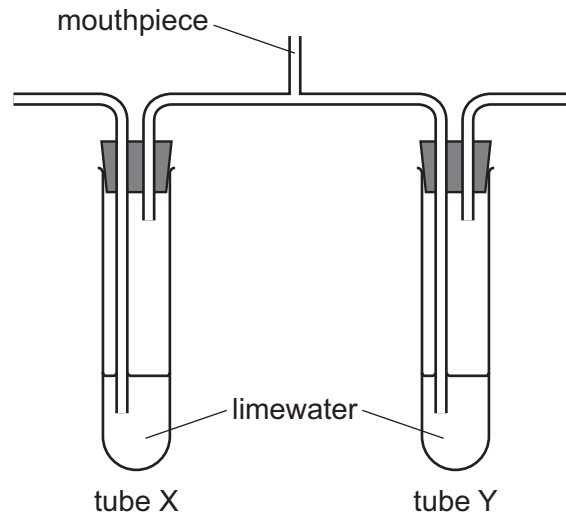


The ventricles contract and blood is forced into the arteries.

What is the state of valves 1 and 2 when this happens?

	valve 1	valve 2
<b>A</b>	closed	closed
<b>B</b>	closed	open
<b>C</b>	open	closed
<b>D</b>	open	open

- 8 The diagram shows apparatus at the start of a breathing experiment.



A person breathes in and out through the mouthpiece for a short time.

Which row shows the results?

	limewater in tube X	limewater in tube Y
<b>A</b>	stays clear	stays clear
<b>B</b>	stays clear	turns cloudy
<b>C</b>	turns cloudy	stays clear
<b>D</b>	turns cloudy	turns cloudy

- 9 Which characteristics of living organisms does a plant show during a geotropism?

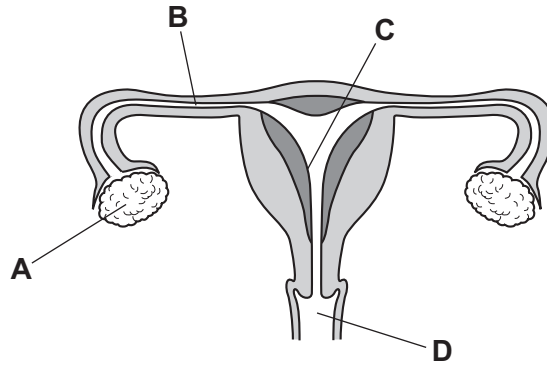
	growth	movement	sensitivity
<b>A</b>	✓	✓	✓
<b>B</b>	✓	✓	x
<b>C</b>	✓	x	x
<b>D</b>	x	✓	✓

- 10 Which environmental factor is **not** a requirement for the germination of most seeds?

- A** light
- B** oxygen
- C** suitable temperature
- D** water

11 The diagram shows the female reproductive system.

Where does implantation of the embryo normally occur?

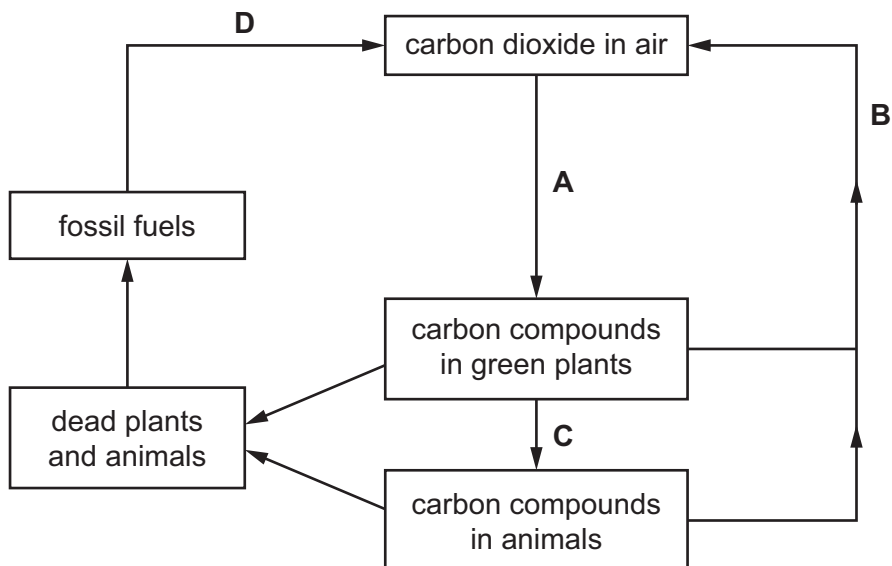


12 What is the correct name for organisms that get their energy by eating plants?

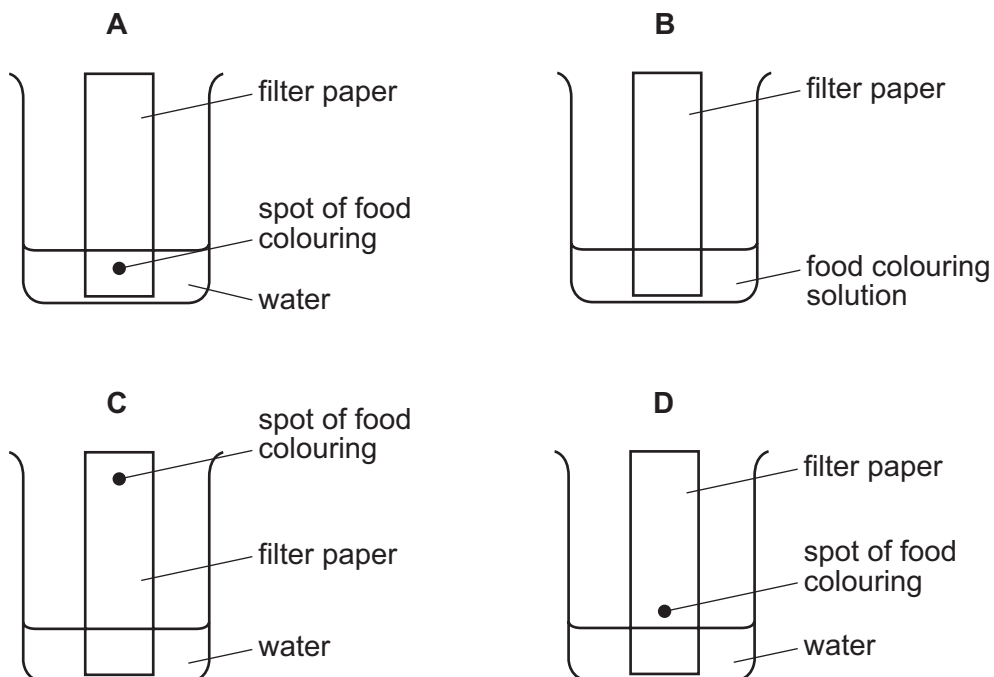
- A carnivores
- B herbivores
- C producers
- D secondary consumers

13 The diagram shows the carbon cycle.

Which arrow represents combustion?



14 Which diagram shows how a mixture of dyes in a food colouring are separated?



15 Which process is a physical change?

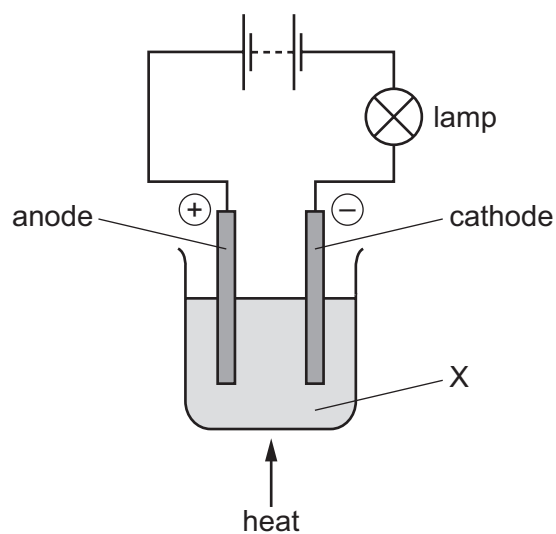
- A adding zinc to dilute sulfuric acid
- B bubbling carbon dioxide through limewater
- C electrolysis molten lead bromide
- D separating petroleum by fractional distillation

16 A neutral atom of chlorine contains 17 electrons and 18 neutrons.

What is the atomic (proton) number and what is the mass (nucleon) number of this atom?

	atomic number	mass number
<b>A</b>	17	35
<b>B</b>	17	52
<b>C</b>	18	35
<b>D</b>	18	52

17 A molten compound X is electrolysed as shown.



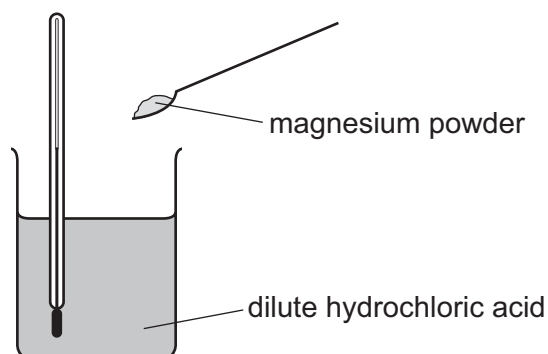
A brown gas is produced at the anode and a grey metal is produced at the cathode.

What is X?

- A aluminium oxide
- B copper chloride
- C lead(II) bromide
- D sodium chloride



- 18 The diagram shows how the temperature change is measured when magnesium powder reacts with dilute hydrochloric acid.



Thermometer reading before adding magnesium powder =  $20.6^{\circ}\text{C}$

Thermometer reading after adding magnesium powder =  $32.4^{\circ}\text{C}$

Which statement is correct?

- A The reaction is endothermic and gives out heat.
  - B The reaction is endothermic and takes in heat.
  - C The reaction is exothermic and gives out heat.
  - D The reaction is exothermic and takes in heat.
- 19 Magnesium ribbon reacts with dilute hydrochloric acid to form hydrogen gas.

Which change increases the rate of the reaction?

- A adding water to the mixture
  - B trapping the hydrogen gas
  - C using a lower temperature
  - D using powdered magnesium
- 20 In which reactions is the underlined substance oxidised?
- 1 iron when it rusts
  - 2 methane when it burns in air
  - 3 copper oxide when it reacts with carbon
- A 1, 2 and 3    B 1 and 2 only    C 1 and 3 only    D 2 and 3 only

- 21 Magnesium sulfate is a soluble solid produced by reacting excess solid magnesium oxide with dilute sulfuric acid.

Which processes produce **pure** magnesium sulfate crystals?

- A distilling the reaction mixture and leaving the distillate to crystallise
- B evaporating the water from the reaction mixture
- C filtering and drying the solid from the reaction mixture
- D filtering the reaction mixture and leaving the filtrate to crystallise

- 22 Substance X is warmed with aqueous sodium hydroxide and aluminium.

A gas is produced which turns damp red litmus paper blue.

Which anion is present in X?

- A carbonate
- B hydroxide
- C nitrate
- D sulfate

- 23 Part of the Periodic Table is shown.

The letters are **not** the symbols of the elements.

Which element is a non-metal?

The diagram shows a partial periodic table with the following layout:

- Row 1: A box containing 'A' in the first column, followed by a gap, then a box containing 'B' in the first column, followed by a gap, then a box containing 'C' in the last column, followed by a gap, then a box containing 'D' in the last column.
- Row 2: A box containing 'A' in the first column, followed by a gap, then a box containing 'B' in the first column, followed by a gap, then a box containing 'C' in the last column, followed by a gap, then a box containing 'D' in the last column.

There is an additional box above the gap between the first and last columns of the first row.

- 24 What is an alloy?

- A a compound containing two metallic elements
- B a compound containing two non-metallic elements
- C a mixture containing two metallic elements
- D a mixture containing two non-metallic elements

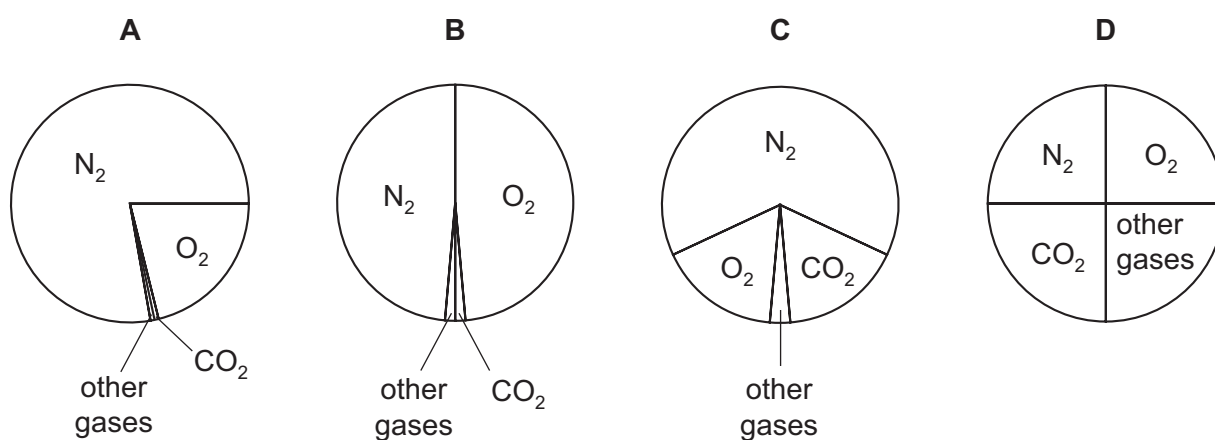
25 A mixture of copper(II) oxide and substance Q is heated.

The reaction produces copper.

What is Q?

- A aluminium oxide
- B carbon
- C carbon dioxide
- D oxygen

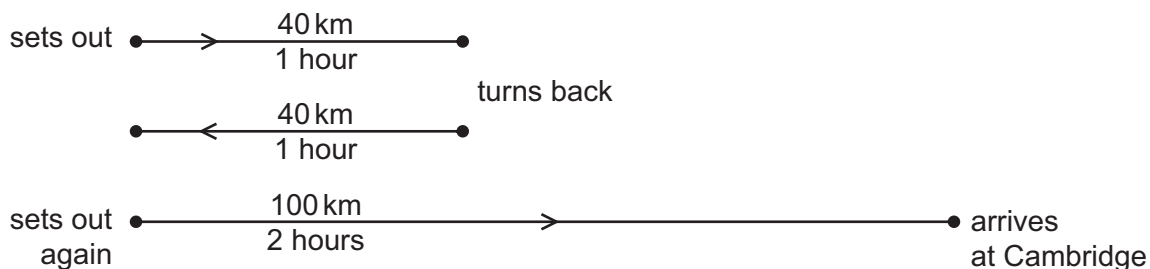
26 Which pie chart shows the proportions of gases in clean air?



27 Which property of the compounds in petroleum is used to separate it into useful fractions?

- A boiling point
- B density
- C melting point
- D solubility

- 28 A car driver sets out from home to travel to Cambridge. After 1 hour he is 40 km from home. He discovers that he must return home to collect his briefcase. This journey also takes him 1 hour. He sets off again immediately. He reaches Cambridge, 100 km from home, 2 hours later.



What is the average speed for the whole of his journey from leaving home the first time?

- A 25 km/h      B 45 km/h      C 50 km/h      D 90 km/h
- 29 Which row shows the unit for force, the unit for mass and the unit for weight?

	force	mass	weight
<b>A</b>	kg	kg	N
<b>B</b>	kg	N	kg
<b>C</b>	N	kg	N
<b>D</b>	N	N	kg

- 30 A car uses petrol as fuel. The car has been parked overnight.

The engine is now started and the car is driven along a horizontal road at an increasing speed.

Which two forms of energy of the car both increase as the car moves?

- A chemical and gravitational  
 B chemical and thermal  
 C gravitational and kinetic  
 D kinetic and thermal

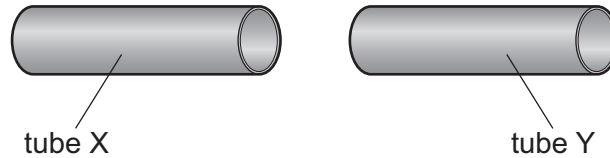
31 Four different forces move an object by different distances in different times.

Which row shows the situation in which the greatest power is produced by the force?

	time taken /s	force /N	distance moved / m
<b>A</b>	10	400	3.0
<b>B</b>	20	200	2.0
<b>C</b>	30	400	2.0
<b>D</b>	40	200	3.0

32 The diagram shows two thin steel tubes X and Y. The tubes have identical dimensions at room temperature.

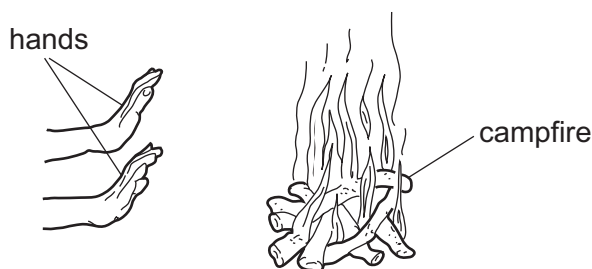
Tube X needs to be made to fit inside tube Y.



How can this be done?

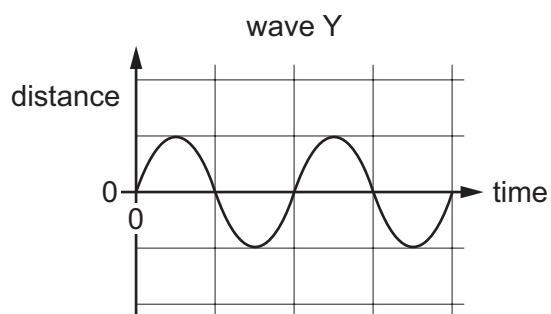
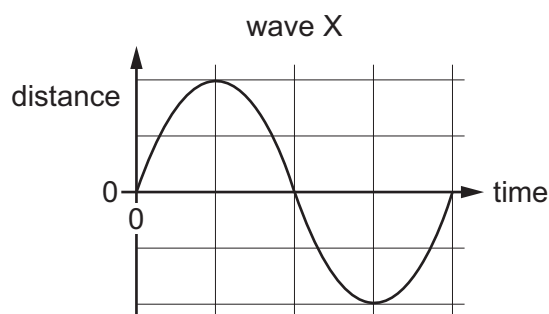
- A** Cool both tubes to the same low temperature.
- B** Cool tube X only, to a low temperature.
- C** Heat both tubes to the same high temperature.
- D** Heat tube X only, to a high temperature.

- 33 On a cold night, a person stands near a campfire. He holds his hands out towards the fire. His hands are heated by the fire.



Which process is responsible for transferring thermal energy from the fire to his hands?

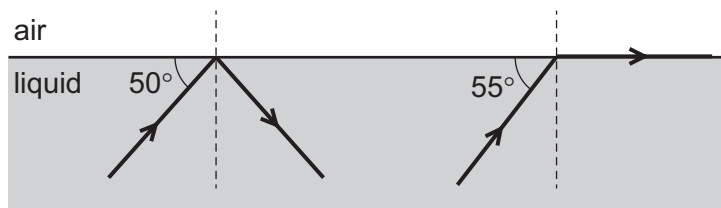
- A** conduction  
**B** convection  
**C** evaporation  
**D** radiation
- 34 The diagrams represent two waves X and Y. The diagrams are drawn to the same scale.



From this information, which property must be greater for wave X, and which property must be greater for wave Y?

	greater for wave X	greater for wave Y
<b>A</b>	amplitude	frequency
<b>B</b>	amplitude	wavelength
<b>C</b>	frequency	amplitude
<b>D</b>	frequency	wavelength

- 35 The diagram represents the surface of a transparent liquid. Two rays of light are travelling within the liquid. They both reach the surface. The path of each ray is shown.

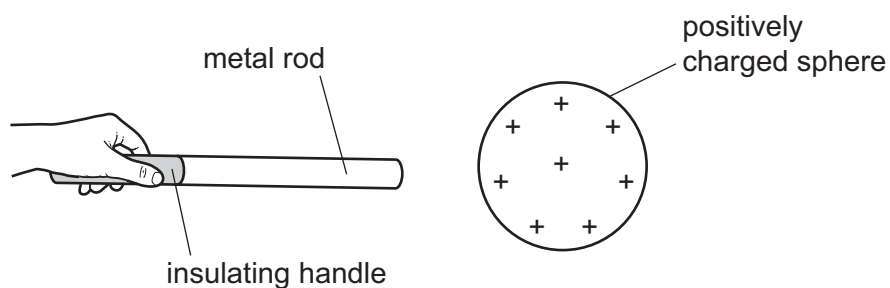


What is the critical angle for this liquid?

- A**  $35^\circ$                       **B**  $40^\circ$                       **C**  $50^\circ$                       **D**  $55^\circ$
- 36 Which type of electromagnetic wave is used in airport security scanners?
- A** gamma-rays  
**B** microwaves  
**C** radio waves  
**D** X-rays
- 37 An electronic circuit in a fire alarm makes a loudspeaker vibrate alternately at two different frequencies.
- Which pair of frequencies is suitable to use in the alarm to alert people to the danger of fire?
- A** 1.5 Hz and 15 Hz  
**B** 15 Hz and 150 000 Hz  
**C** 150 Hz and 15 000 Hz  
**D** 150 000 Hz and 15 000 000 Hz

38 An uncharged metal rod is held by an insulating handle.

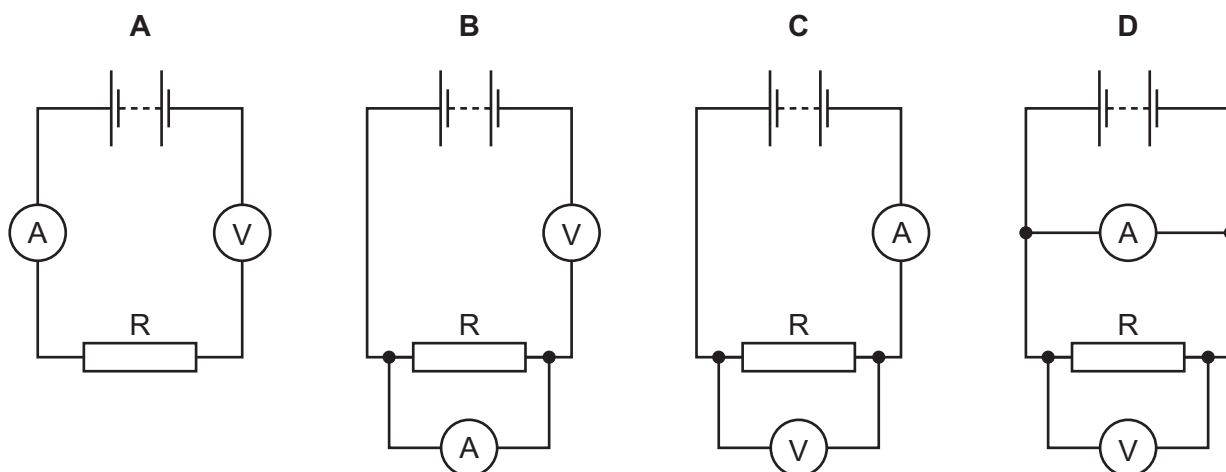
The rod is brought near to a positively charged sphere. This causes some particles in the rod to move.



Which particles in the rod move and in which direction do the particles move?

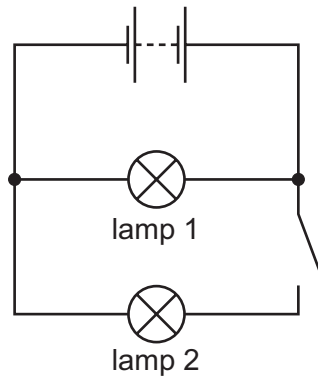
	particles that move	direction of movement
<b>A</b>	electrons	away from the sphere
<b>B</b>	electrons	towards the sphere
<b>C</b>	protons	away from the sphere
<b>D</b>	protons	towards the sphere

39 Which circuit can be used when determining the resistance of resistor R?





40 The circuit shown includes two identical lamps and an open switch.



The switch is now closed.

Which statement is now correct?

- A Lamp 1 is brighter than lamp 2.
- B The brightness of lamp 1 increases.
- C The p.d. across each lamp is the same.
- D The total resistance of the circuit is greater.



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## The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	VIII	
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	<b>Key</b> atomic number atomic symbol name relative atomic mass										5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16	9 <b>F</b> fluorine 19	10 <b>Ne</b> neon 20	
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24											1 <b>H</b> hydrogen 1	13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84	
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131	
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —	
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	114 <b>Fl</b> flerovium —	116 <b>Lv</b> livermorium —	—	—	—	—	—

lanthanoids	57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium —	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
actinoids	89 <b>Ac</b> actinium —	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium —	94 <b>Pu</b> plutonium —	95 <b>Am</b> americium —	96 <b>Cm</b> curium —	97 <b>Bk</b> berkelium —	98 <b>Cf</b> californium —	99 <b>Es</b> einsteinium —	100 <b>Fm</b> fermium —	101 <b>Md</b> mendelevium —	102 <b>No</b> nobelium —	103 <b>Lr</b> lawrencium —

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).