



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**COMBINED SCIENCE**

**0653/12**

Paper 1 Multiple Choice

**October/November 2013**

**45 minutes**

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

\* 0 4 7 5 6 5 3 4 6 4 \*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

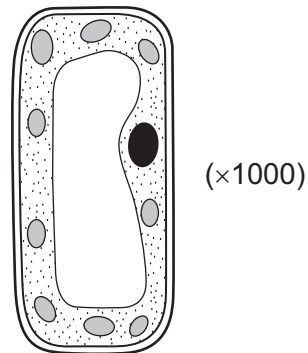
Electronic calculators may be used.

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



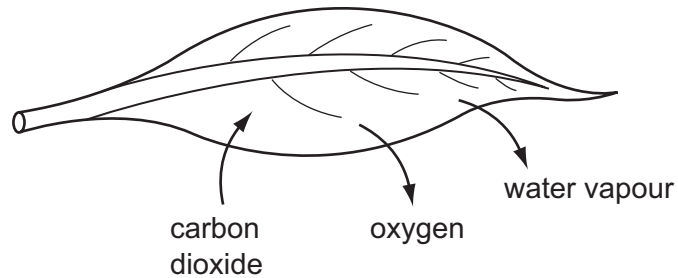
2

- 1 The plant cell in the diagram has a width of 30 mm when it is magnified by a factor of 1000 (magnification shown in brackets).



What is the actual width of the cell?

- A** 0.003 mm      **B** 0.03 mm      **C** 0.3 mm      **D** 30 mm
- 2 The diagram shows a leaf in sunlight and some of the substances that diffuse into and out of it.

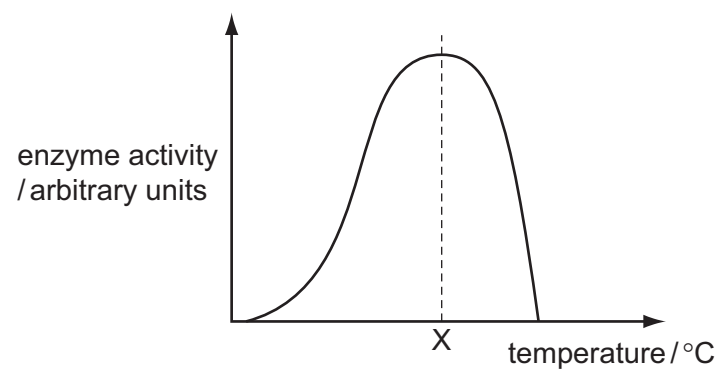


Which of the following has a higher concentration outside the leaf than inside the leaf?

- A** carbon dioxide only  
**B** carbon dioxide and oxygen  
**C** oxygen and water vapour  
**D** water vapour only

3

3 The diagram shows how the activity of an enzyme changes with temperature.



This enzyme works in the human body.

What is the most likely value of temperature X?

- A** 10°C
- B** 40°C
- C** 70°C
- D** 100°C

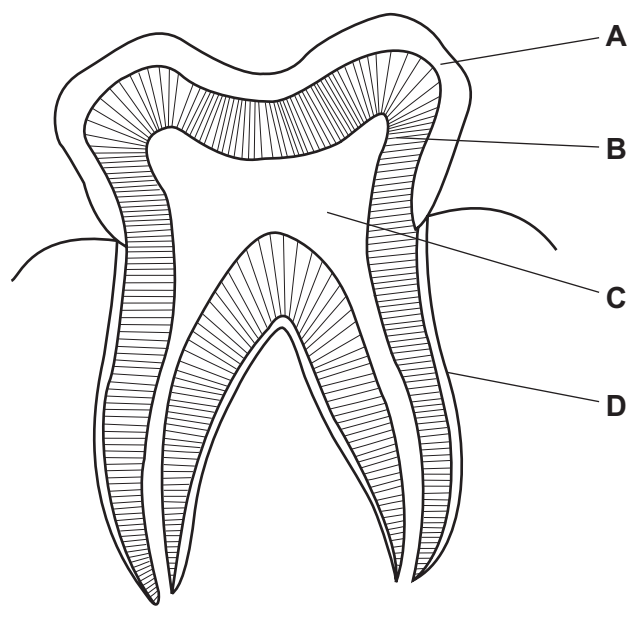
4 What must be present for photosynthesis to occur?

	chlorophyll	light	oxygen	water
<b>A</b>	✓	✓	✓	✓
<b>B</b>	✓	✓	x	✓
<b>C</b>	x	✓	✓	x
<b>D</b>	x	x	x	✓

key  
 ✓ = is necessary  
 x = not necessary

5 The diagram shows a section through a human tooth.

Which part is made of the hardest material?



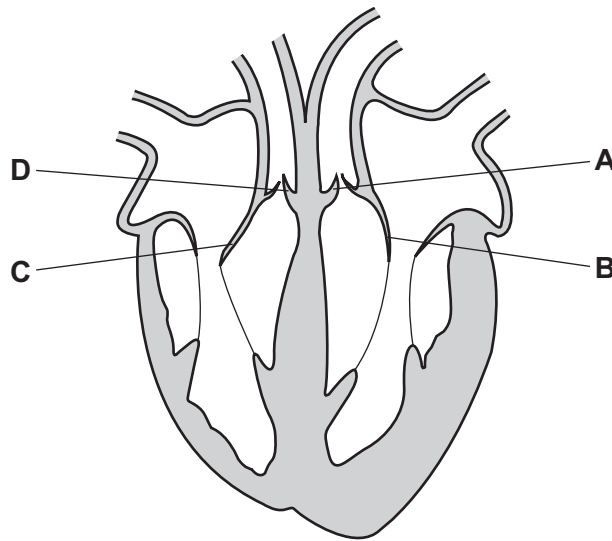
4

6 Which word equation represents aerobic respiration?

- A carbon dioxide + water  $\rightarrow$  glucose
- B carbon dioxide + water  $\rightarrow$  glucose + oxygen
- C glucose  $\rightarrow$  carbon dioxide + water
- D glucose + oxygen  $\rightarrow$  carbon dioxide + water

7 The diagram shows a section through the human heart.

Which structure is the tricuspid valve?



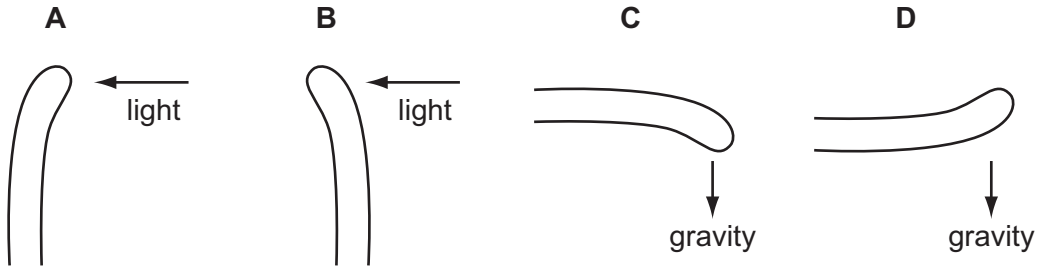
8 A healthy plant has been in the light. A leaf is taken from it, decolourised and then tested with iodine solution.

What colour does the iodine solution become?

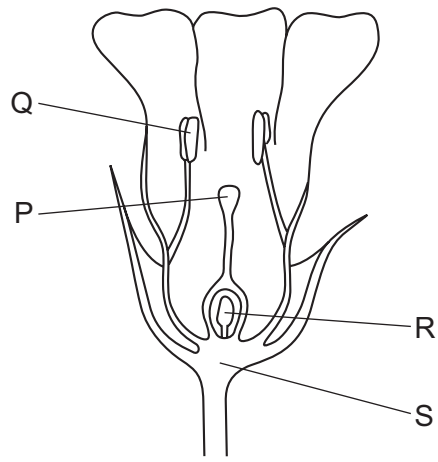
- A black
- B brick red
- C green
- D pale blue

9 The diagrams show shoots of maize seedlings.

Which shoot shows a geotropic response in which it grows away from the stimulus?



10 The diagram shows a section through a flower.



In which parts of the flower are pollen grains produced and received?

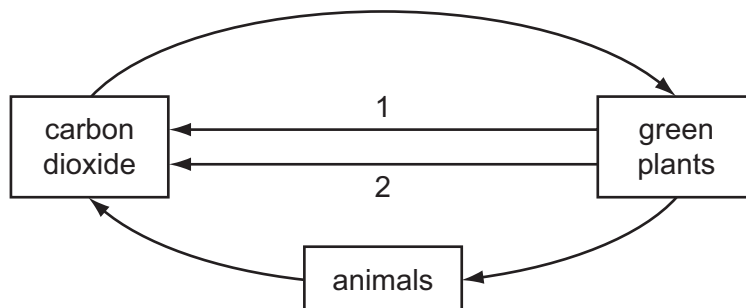
	pollen grains produced	pollen grains received
<b>A</b>	P	S
<b>B</b>	Q	P
<b>C</b>	R	Q
<b>D</b>	S	R

11 How often is an egg usually released from the ovaries of a woman?

- A** once a week
- B** once every 14 days
- C** once every 28 days
- D** once every 9 months

6

12 The diagram shows part of the carbon cycle.

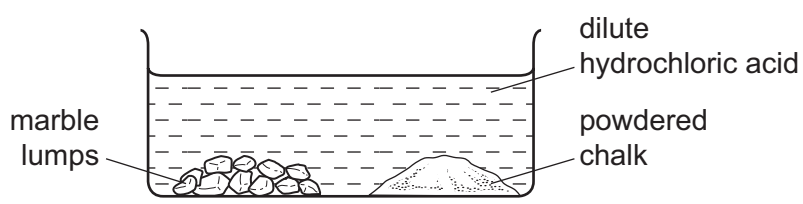


What are processes 1 and 2?

- A decomposition and respiration
  - B feeding and photosynthesis
  - C photosynthesis and decomposition
  - D respiration and feeding
- 13 What is the effect of cutting down large numbers of trees?
- A Flooding is less likely to occur.
  - B It increases the amount of carbon dioxide in the air.
  - C It increases the amount of methane in the air.
  - D It prevents the extinction of animal species.
- 14 Which method of separation can be used to obtain pure water from aqueous potassium chloride?
- A chromatography
  - B crystallisation
  - C distillation
  - D filtration
- 15 Which reaction involves combustion?
- A calcium carbonate  $\rightarrow$  calcium oxide + carbon dioxide
  - B methane + oxygen  $\rightarrow$  carbon dioxide + water
  - C sodium carbonate + hydrochloric acid  $\rightarrow$  sodium chloride + water + carbon dioxide
  - D sodium hydroxide + hydrochloric acid  $\rightarrow$  sodium chloride + water

16 Marble and chalk are two forms of calcium carbonate.

The diagram shows equal masses of lumps of marble and powdered chalk placed in dilute hydrochloric acid.

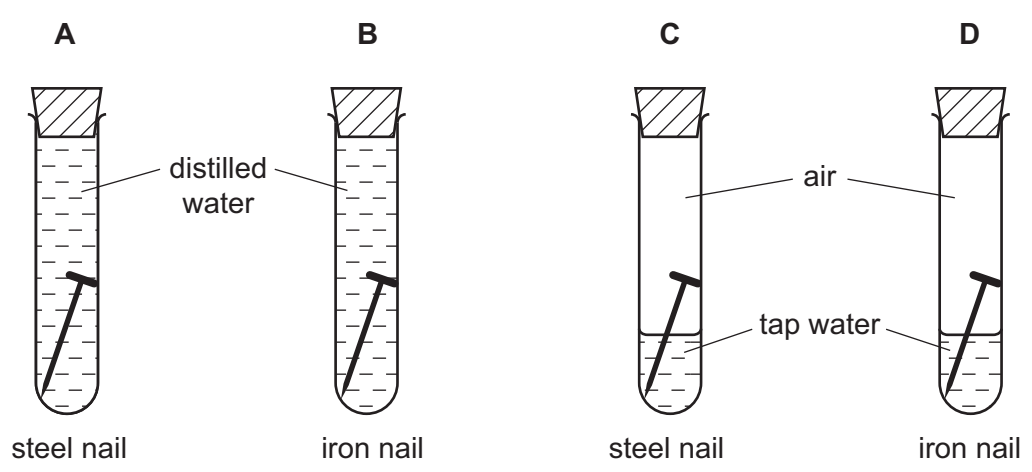


The marble takes longer than the chalk to dissolve in the acid.

Why is this?

- A Marble is more reactive than chalk.
- B Marble is more soluble than chalk.
- C The marble has the smaller surface area.
- D The marble is more basic.

17 In which test-tube does rusting occur most quickly?

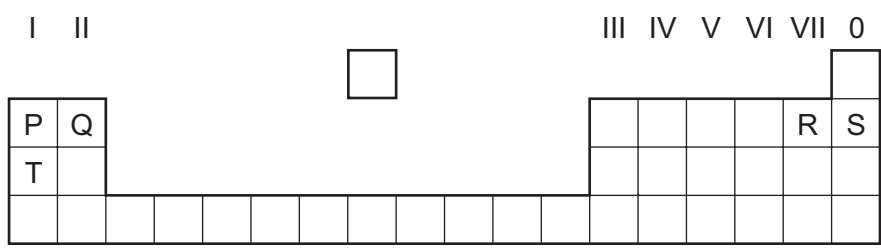


18 The table shows the properties of four substances.

Which substance is an alkali?

	solubility in water	reaction with an acid
A	insoluble	reacts
B	insoluble	does not react
C	soluble	reacts
D	soluble	does not react

19 The positions of elements P, Q, R, S and T in the Periodic Table are shown.  
The letters are not the symbols for the elements.

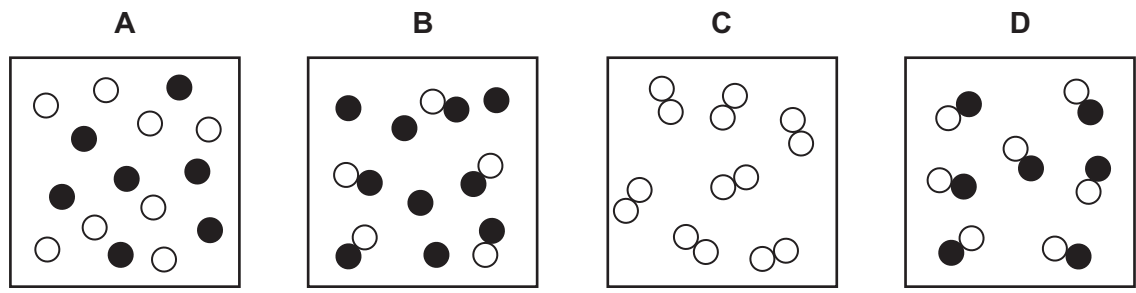


Which element forms an ionic compound with element P?

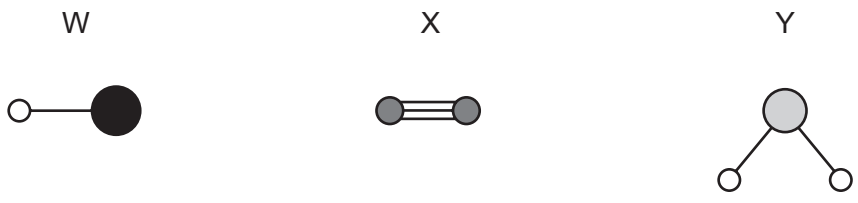
- A Q                      B R                      C S                      D T

20 In the diagrams below, ● and ○ represent different atoms.

Which diagram represents molecules of a single compound?



21 Molecules of W, X and Y are shown.

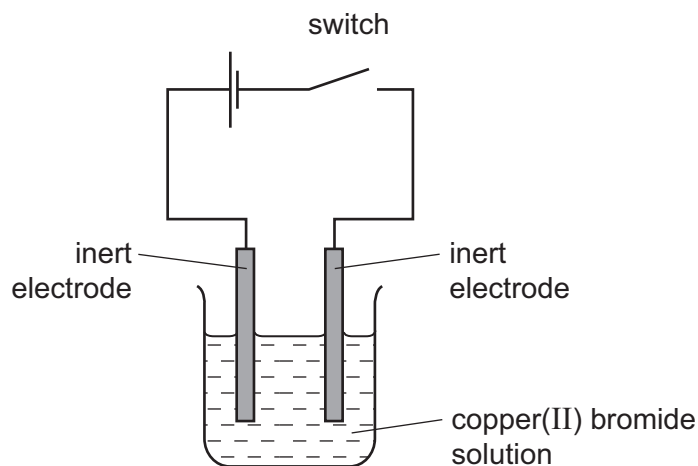


What are W, X and Y?

	W	X	Y
<b>A</b>	hydrogen chloride	nitrogen	water
<b>B</b>	hydrogen chloride	water	nitrogen
<b>C</b>	nitrogen	hydrogen chloride	water
<b>D</b>	water	nitrogen	hydrogen chloride



22 Copper(II) bromide can be electrolysed in the same way as copper(II) chloride.



Which row in the table correctly describes the products at the electrodes?

	product at anode	product at cathode
<b>A</b>	brown liquid	brown-red solid
<b>B</b>	brown-red solid	brown liquid
<b>C</b>	colourless gas	brown-red solid
<b>D</b>	silvery solid	colourless gas

23 Metal X reacts rapidly with cold water.

Metal Y does not react with dilute hydrochloric acid.

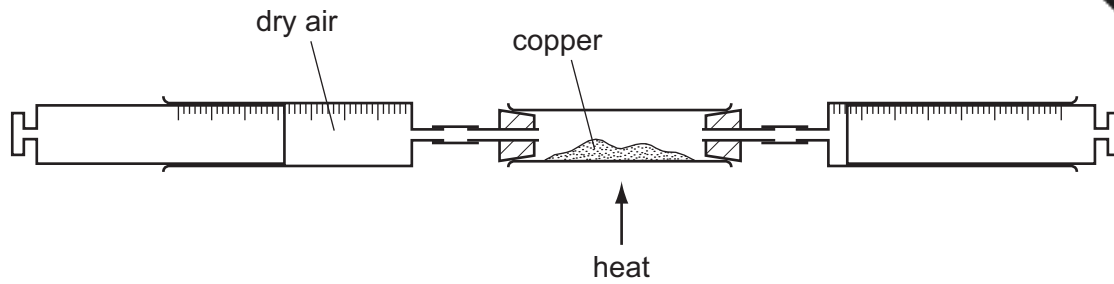
Metal Y is obtained from its oxide by heating with carbon.

Which row shows the more reactive metal and the type of reaction which metal Y oxide undergoes when it is heated with carbon?

	more reactive metal	type of reaction
<b>A</b>	X	oxidation
<b>B</b>	X	reduction
<b>C</b>	Y	oxidation
<b>D</b>	Y	reduction

10

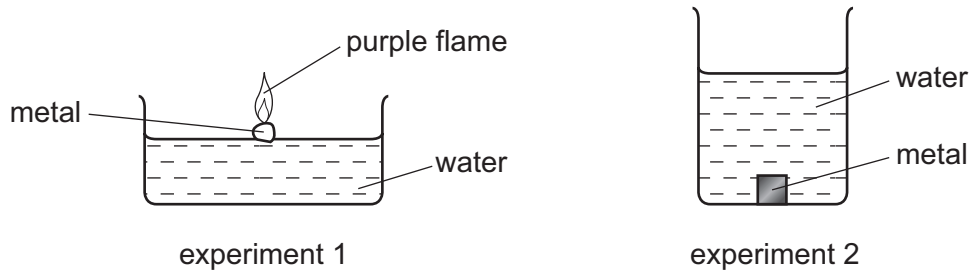
- 24 80 cm<sup>3</sup> of dry air is passed over hot copper until there is no further change in volume.



The volume of air decreases by 16 cm<sup>3</sup>.

Which gas reacts with the copper?

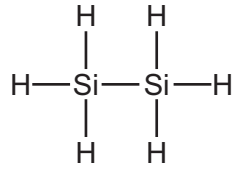
- A carbon dioxide
  - B nitrogen
  - C oxygen
  - D water vapour
- 25 The diagram shows what happens when two metals are added to water.



What are the metals?

	experiment 1	experiment 2
<b>A</b>	calcium	zinc
<b>B</b>	magnesium	copper
<b>C</b>	potassium	calcium
<b>D</b>	potassium	copper

26 The diagram shows a molecule of a compound of silicon and hydrogen.



What is the molecular formula of this compound?

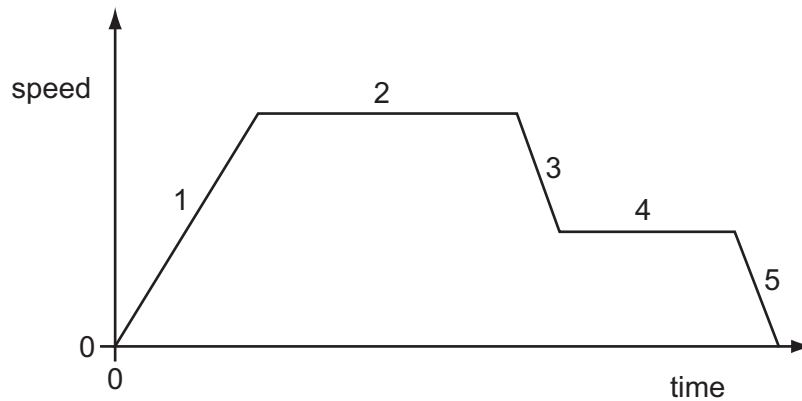
- A** SiH<sub>3</sub>      **B** SiH<sub>4</sub>      **C** Si<sub>2</sub>H<sub>6</sub>      **D** Si<sub>6</sub>H<sub>2</sub>

27 A catalyst is a substance that .....1..... a reaction and is .....2..... at the end of the reaction.

Which words correctly complete gaps 1 and 2?

	1	2
<b>A</b>	slows down	changed
<b>B</b>	slows down	unchanged
<b>C</b>	speeds up	changed
<b>D</b>	speeds up	unchanged

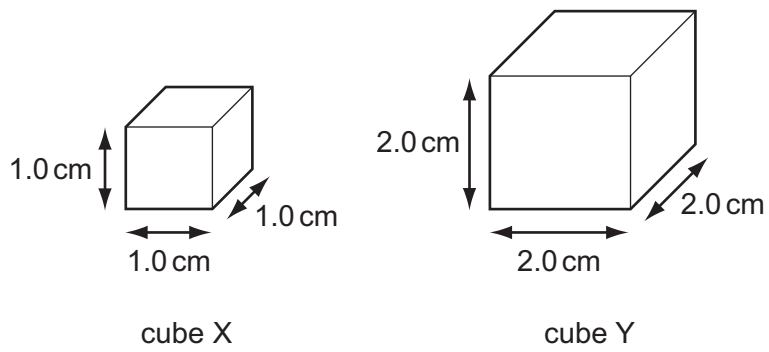
28 The speed/time graph for a car journey is shown.



During which two parts of the journey is the car moving at constant speed?

- A** 1 and 3      **B** 1 and 5      **C** 2 and 4      **D** 3 and 5

29 The diagram shows two cubes of different sizes made from the same substance.



Cube X has a density of  $1.2 \text{ g/cm}^3$ .

What is the density of cube Y?

- A**  $1.2 \text{ g/cm}^3$     **B**  $2.4 \text{ g/cm}^3$     **C**  $4.8 \text{ g/cm}^3$     **D**  $9.6 \text{ g/cm}^3$

30 Weight lifting involves a number of different stages.

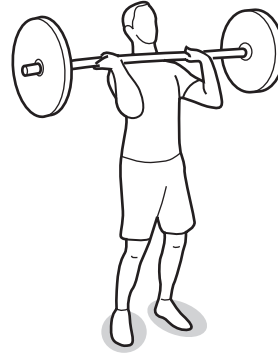
In which stage is **no** work being done on the weights?

**A**



The weights are lifted from the floor to the chest.

**B**



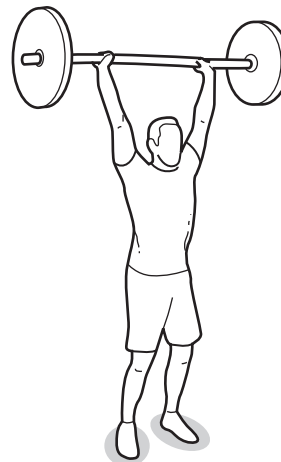
The weights are raised as the lifter stands up.

**C**



The weights are lifted above the head.

**D**



The weights are held stationary above the head.

31 A drop of liquid falls on a student's skin and evaporates quickly.

What is the effect on the skin and the reason for this effect?

- A** The skin cools because the most energetic molecules escape from the liquid.
- B** The skin cools because the most energetic molecules remain in the liquid.
- C** The skin warms because the most energetic molecules escape from the liquid.
- D** The skin warms because the most energetic molecules remain in the liquid.

32 Benzene and glycerine are two substances.

The table gives the melting point and the boiling point of benzene and of glycerine.

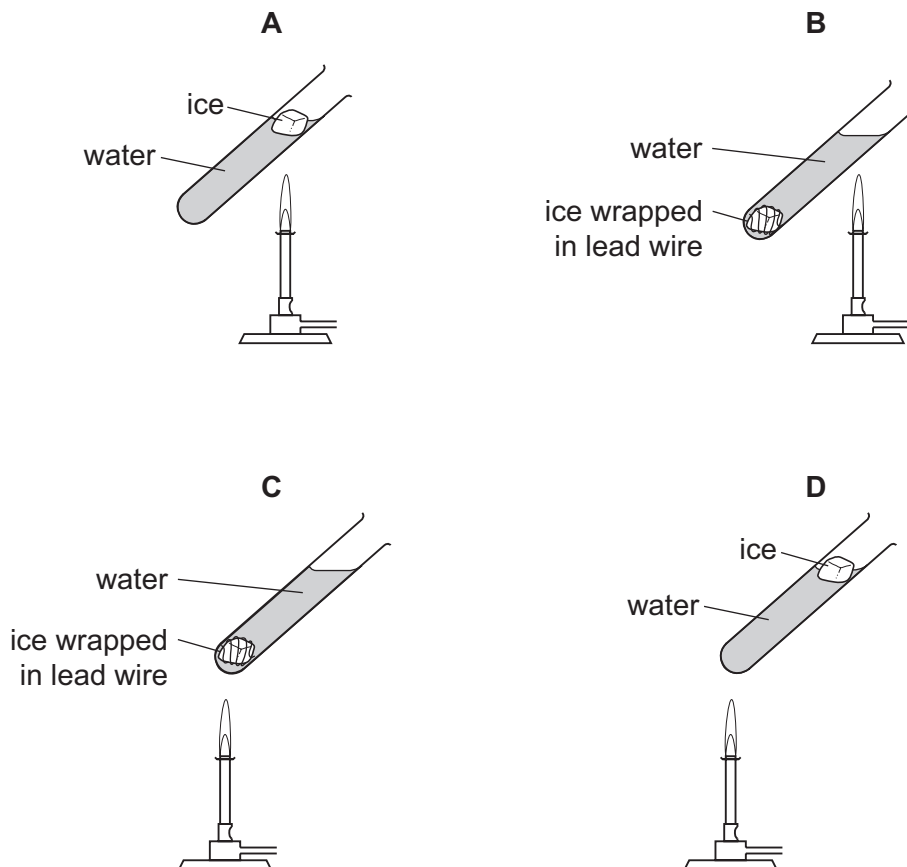
	melting point	boiling point
benzene	5.4 °C	80 °C
glycerine	18 °C	290 °C

At which temperature will both benzene and glycerine be liquid?

- A** 0 °C      **B** 50 °C      **C** 100 °C      **D** 150 °C

33 The diagrams show four identical pieces of ice that are heated in test-tubes of water. All four burners provide heat at the same rate.

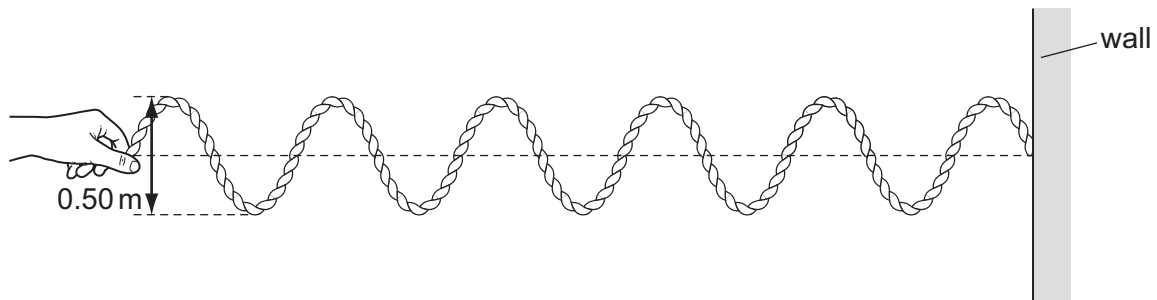
In which test-tube does the ice take the longest time to melt?



34 The diagram shows a rope with one end fixed to a wall.

The end of the rope is moved up and down through a distance of 0.50 m twice every second.

This makes a wave move along the rope.



Which line in the table shows the amplitude and the frequency of the wave?

	amplitude / m	frequency / Hz
<b>A</b>	0.25	0.50
<b>B</b>	0.25	2.0
<b>C</b>	0.50	0.50
<b>D</b>	0.50	2.0

35 A ray of light travels from glass into air. The angle of refraction is equal to the angle of incidence.

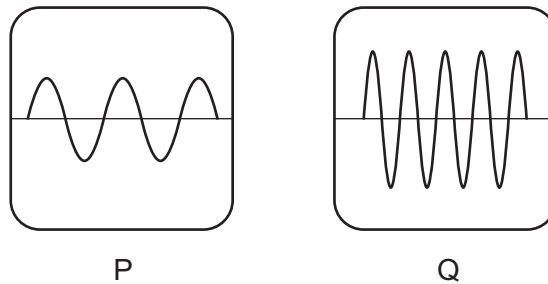
What is the angle of incidence?

- A**  $0^\circ$                       **B**  $45^\circ$                       **C**  $60^\circ$                       **D**  $90^\circ$

36 Which electromagnetic waves are found immediately either side of the visible region of the electromagnetic spectrum?

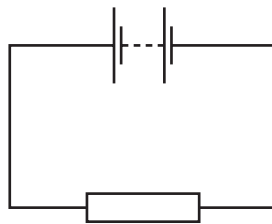
- A** infrared and ultra-violet  
**B** microwaves and infrared  
**C** microwaves and X-rays  
**D** ultra-violet and X-rays

- 37 Two sound waves P and Q are displayed on an oscilloscope. The settings on the are the same for P and Q.



Which statement correctly compares the pitch and the loudness of the two sounds?

- A** P has a higher pitch and is louder than Q.  
**B** P has a higher pitch and is quieter than Q.  
**C** P has a lower pitch and is louder than Q.  
**D** P has a lower pitch and is quieter than Q.
- 38 There is an electric current in the circuit shown.

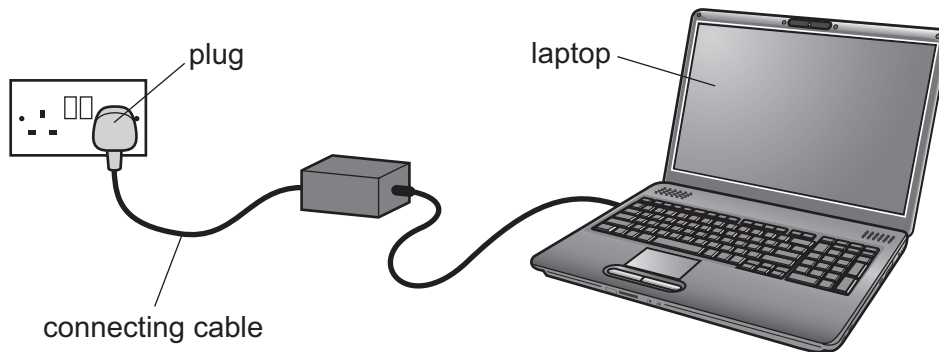


Which two changes will each increase the current?

	change 1	change 2
<b>A</b>	decrease the voltage of the battery	decrease the resistance of the resistor
<b>B</b>	decrease the voltage of the battery	increase the resistance of the resistor
<b>C</b>	increase the voltage of the battery	decrease the resistance of the resistor
<b>D</b>	increase the voltage of the battery	increase the resistance of the resistor



- 39 The charger for a laptop computer is connected by a cable to the mains supply through a plug. The plug contains a 13 A fuse. The thin wires in the cable are designed to carry a current of 5 A. A fault develops and the current in the wires rises to 5 A.



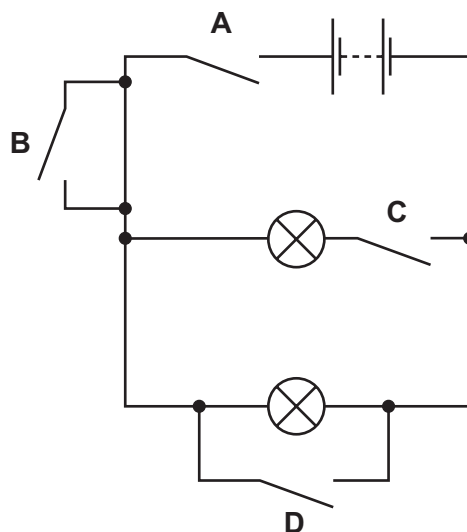
What is the danger caused by this larger current?

- A A large amount of electrical energy could be wasted.
- B Somebody might receive an electric shock.
- C The fuse could blow and start a fire.
- D The wires could overheat and start a fire.

- 40 The circuit shown contains four labelled switches.

All the switches are closed.

Which switch can be opened without changing the brightness of either bulb?







**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																										
		I	II	III	IV	V	VI	VII	VIII	IX	X																	
		1 <b>H</b> Hydrogen 1																										
7	9	<b>Li</b> Lithium 3	<b>Be</b> Beryllium 4																									
23	24	<b>Na</b> Sodium 11	<b>Mg</b> Magnesium 12																									
39	40	<b>K</b> Potassium 19	<b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	52 <b>Cr</b> Chromium 24	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36									
85	88	<b>Rb</b> Rubidium 37	<b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	96 <b>Mo</b> Molybdenum 42	101 <b>Ru</b> Ruthenium 44	101 <b>Rh</b> Rhodium 45	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	108 <b>Ag</b> Silver 47	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54									
133	137	<b>Cs</b> Caesium 55	<b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86										
87	88	<b>Fr</b> Francium 87	<b>Ra</b> Radium 88	226 <b>Ac</b> Actinium 89									†															
													*58-71 Lanthanoid series		†90-103 Actinoid series													
		a		X		a = relative atomic mass		X = atomic symbol		b = proton (atomic) number																		
		b		X		a = relative atomic mass		X = atomic symbol		b = proton (atomic) number																		
		140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	146 <b>Pm</b> Promethium 61	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	232 <b>Th</b> Thorium 90	232 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	241 <b>Pu</b> Plutonium 94	244 <b>Am</b> Americium 95	247 <b>Cm</b> Curium 96	251 <b>Bk</b> Berkelium 97	259 <b>Cf</b> Californium 98	267 <b>Es</b> Einsteinium 99	271 <b>Fm</b> Fermium 100	277 <b>Md</b> Mendelevium 101	285 <b>No</b> Nobelium 102	289 <b>Lr</b> Lawrencium 103

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

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