



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 1 Multiple Choice

0653/11

May/June 2016

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.

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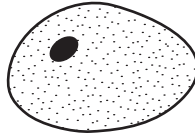
A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This document consists of **16** printed pages.



- 1 What are characteristics of all living organisms?
- A breathing, photosynthesis and transpiration
 - B circulation, excretion and nutrition
 - C digestion, growth and movement
 - D respiration, reproduction and sensitivity
- 2 The diagram shows an animal cell. The maximum diameter of the diagram is 25 mm.

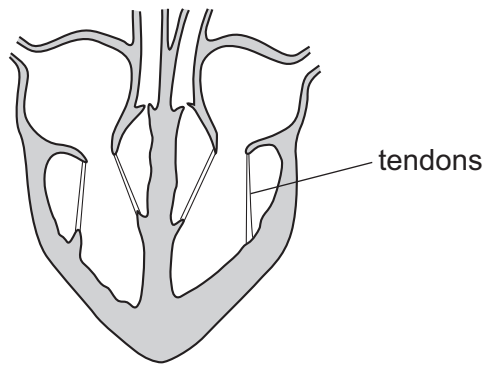


The maximum diameter of the actual cell was 0.02 mm.

What is the magnification of the drawing?

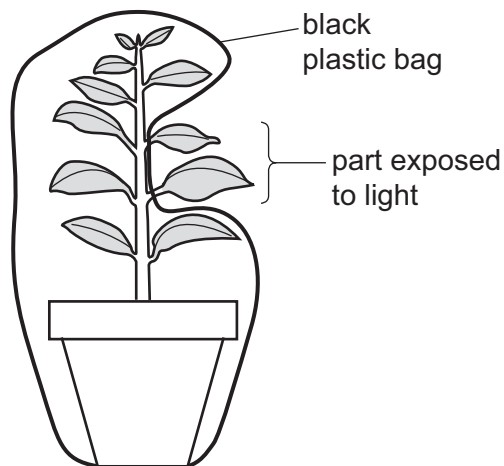
- A $\times 25$ B $\times 200$ C $\times 1250$ D $\times 2500$
- 3 Which statement about diffusion of water is **not** correct?
- A Diffusion of water takes place only in liquids.
 - B Diffusion of water relies on the random movement of the water molecules.
 - C Water molecules are small enough to diffuse through cell membranes.
 - D Water molecules are small enough to diffuse through cell walls.
- 4 What describes an enzyme?
- A a protein that acts as a catalyst
 - B a protein that acts as a hormone
 - C a vitamin that acts as a catalyst
 - D a vitamin that acts as a hormone
- 5 Which part of a leaf contains the pigment needed for photosynthesis?
- A cuticle
 - B mesophyll cells
 - C phloem cells
 - D stomata

- 6 The diagram shows a section through the human heart.



Which structures are joined by the tendons?

- A atrium wall and septum
 - B atrium wall and valve
 - C septum and ventricle wall
 - D valve and ventricle wall
- 7 The diagram shows a green plant. Most of the plant is enclosed in a black plastic bag. Only one part is exposed to the light and can photosynthesise.



How is the sugar, produced by the exposed part, transported to the rest of the plant?

- A in the phloem, downwards only
- B in the xylem, upwards only
- C upwards and downwards in the phloem
- D upwards and downwards in the xylem

8 What is the purpose of respiration?

- A to enrich the atmosphere with oxygen
- B to release energy for the organism
- C to supply water for the organism
- D to take oxygen into the lungs

9 Where does most of the oxygen enter the blood?

- A an alveolus
- B a bronchiole
- C a bronchus
- D the trachea

10 Four people have the same resting pulse rate and the same blood glucose concentration. The table shows their pulse rates and blood glucose concentrations later on the same day.

Which person has the highest concentration of adrenaline in their blood?

	pulse rate / beats per minute	blood glucose concentration / mg per dm ³
A	70	65
B	70	100
C	120	65
D	120	100

11 Which statement about sexual reproduction is **always** correct?

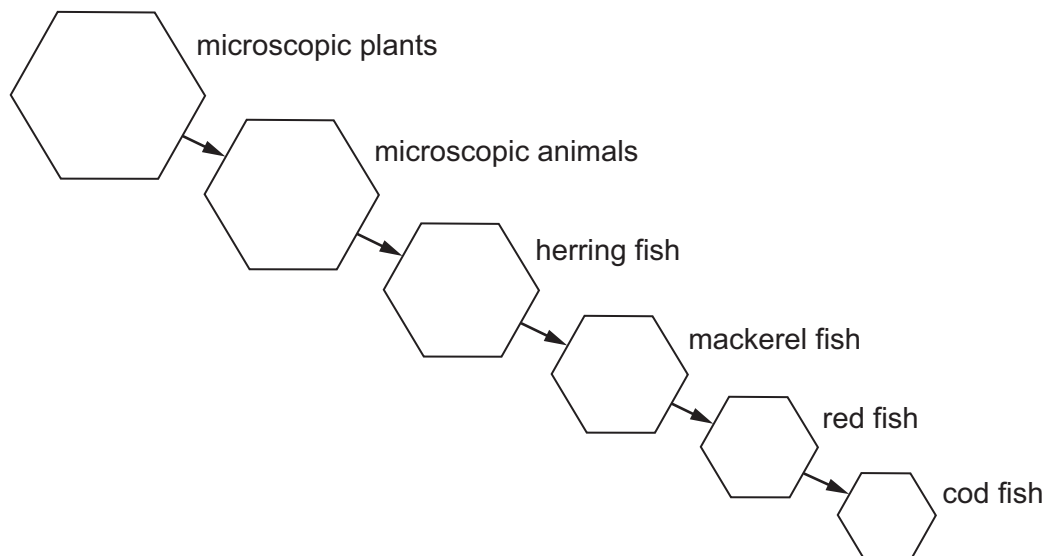
- A It involves only one parent.
- B It involves the fusion of nuclei.
- C It produces genetically identical offspring.
- D It takes place only in animals.

- 12 A woman with a regular 28 day menstrual cycle has a blocked right oviduct. An egg is released from the right ovary.

When is the next time that sexual intercourse is **most** likely to result in fertilisation?

- A immediately
- B one week later
- C 5 days after the beginning of the next menstruation
- D 14 days after the beginning of the next menstruation

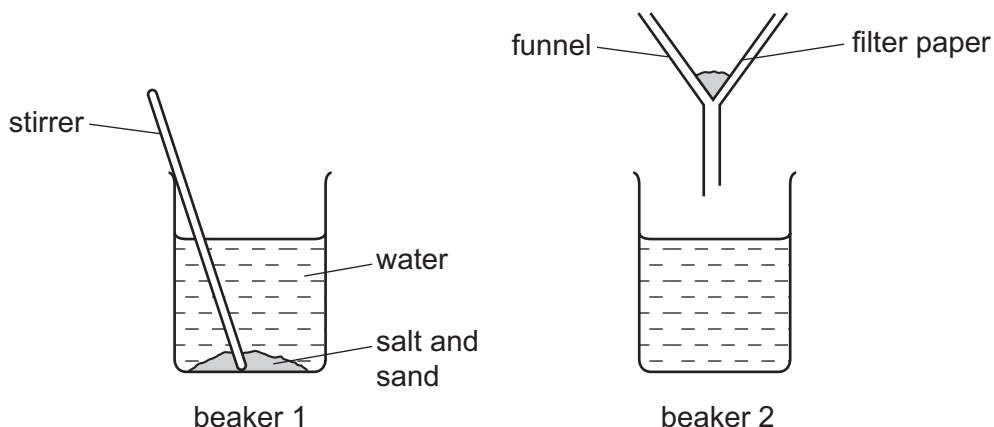
- 13 The diagram represents a food chain found in the sea.



How many consumer levels are there?

- A 1
- B 4
- C 5
- D 6

14 The apparatus used to remove sand from a mixture of salt and sand is shown.



The contents of beaker 1 are stirred and then poured into the funnel above beaker 2.

What is in beaker 2?

- A a mixture of an element and a compound
- B a mixture of two compounds
- C one compound only
- D one element only

15 Which types of substance do the chemical symbols C, CO₂ and O₂ represent?

	C	CO ₂	O ₂
A	compound	compound	element
B	compound	element	compound
C	element	compound	element
D	element	element	compound

16 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.

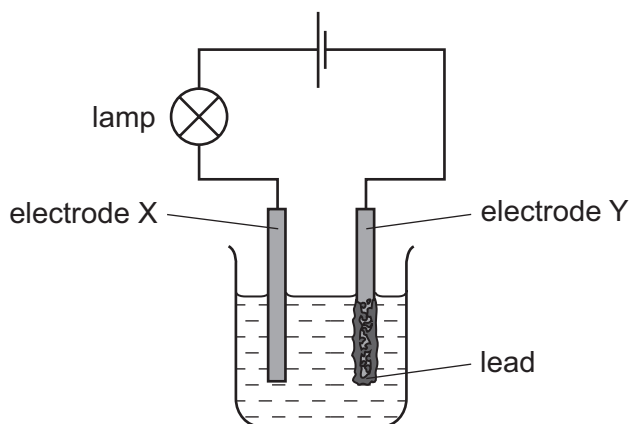
	I	II															III	IV	V	VI	VII	VIII
	P	Q																			R	S
	T																					

Which element forms an ionic compound with element P?

- A Q
- B R
- C S
- D T

- 17 The diagram shows the apparatus used for the electrolysis of lead(II) bromide using inert electrodes X and Y.

Lead is formed at electrode Y.

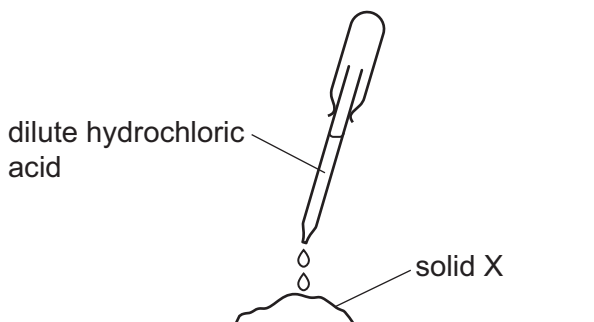


Which statement about the electrolysis is correct?

- A A green gas is given off at electrode X.
 - B Electrode Y is the anode.
 - C Only a physical change takes place when a current is passed.
 - D The electrolyte is in the molten state.
- 18 What happens during **all** endothermic changes?
- A A gas is produced.
 - B Solids melt.
 - C The temperature decreases.
 - D There is a colour change.
- 19 Which statement describes a redox reaction?
- A An acid reacts with a base.
 - B Only oxidation takes place.
 - C Oxygen is transferred from one substance to another.
 - D Two substances are both reduced.

20 Dilute hydrochloric acid is added to solid X.

Hydrogen gas is produced.



What is X ?

- A** zinc
- B** zinc carbonate
- C** zinc hydroxide
- D** zinc oxide

21 Which test is used to identify ammonia?

- A** A glowing splint relights.
- B** Damp blue litmus paper is bleached.
- C** Damp red litmus paper turns blue.
- D** Limewater turns milky.

22 A soft metal reacts vigorously with cold water.

What is the position of this metal in the Periodic Table?

A 4x12 grid representing a periodic table. The grid is divided into four rows and twelve columns. The labels A, B, C, and D are placed in the following cells:

- A is in the second row, first column.
- B is in the third row, third column.
- C is in the fourth row, tenth column.
- D is in the fourth row, twelfth column.

There is an additional empty square box located above the grid, centered between the third and fourth columns.

23 Which statement describes a transition element?

- A a metal that forms white compounds
- B a metal with a high melting point
- C a metal with a low density
- D a non-metal that forms coloured compounds

24 P, Q, R and S are four metals.

P forms bubbles of gas with dilute acid but does not react with cold water.

Q reacts slowly with cold water.

R does not react with dilute acid.

S reacts rapidly with cold water.

What is the order of reactivity from most to least reactive?

- A $R \rightarrow P \rightarrow Q \rightarrow S$
- B $R \rightarrow Q \rightarrow P \rightarrow S$
- C $S \rightarrow P \rightarrow Q \rightarrow R$
- D $S \rightarrow Q \rightarrow P \rightarrow R$

25 A colourless liquid is tested with blue cobalt chloride paper.

The paper turns pink.

Which statement about the liquid **must** be correct?

- A It contains water.
- B It is acidic.
- C It is anhydrous.
- D It is pure water.

26 Which reaction involves combustion?

- A $\text{calcium carbonate} \rightarrow \text{calcium oxide} + \text{carbon dioxide}$
- B $\text{methane} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$
- C $\text{sodium carbonate} + \text{hydrochloric acid} \rightarrow \text{sodium chloride} + \text{water} + \text{carbon dioxide}$
- D $\text{sodium hydroxide} + \text{hydrochloric acid} \rightarrow \text{sodium chloride} + \text{water}$

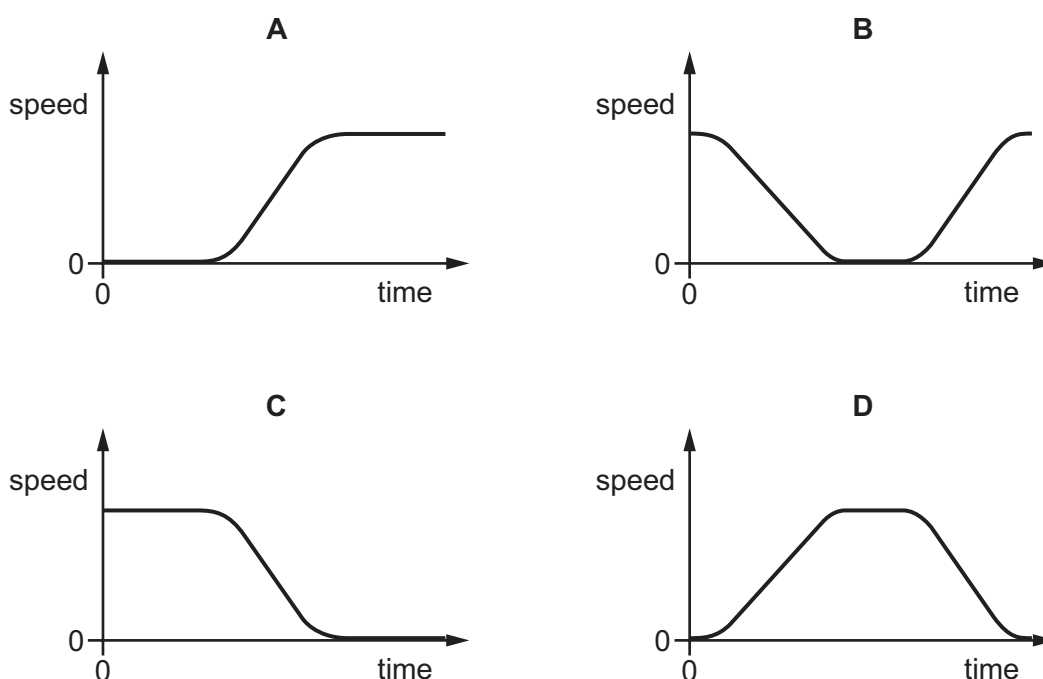
27 What is the name of the type of compound containing only carbon and hydrogen?

- A carbohydrate
- B carbonate
- C hydrocarbon
- D hydroxide

28 A train takes passengers from a railway station to an airport.

The train accelerates as it leaves the railway station, then travels at a steady speed, and finally stops at the airport.

Which graph shows the speed of the train during the whole journey?



29 A cube of metal has a mass of 2700 g and a density of 2.7 g/cm^3 .

What is the length of each side of the cube?

- A 1.0 cm
- B 10 cm
- C 100 cm
- D 1000 cm

30 The Sun is the original source of many of our energy resources.

For which energy resource is the Sun **not** the original source?

- A hydroelectric
- B natural gas
- C nuclear
- D waves

- 31 When a liquid evaporates, molecules escape from its surface and the temperature of the remaining liquid changes.

Which row is correct for the escaping molecules and for the temperature change of the remaining liquid?

	the molecules escaping from the surface have	the temperature of the remaining liquid
A	the highest energy	decreases
B	the highest energy	increases
C	the lowest energy	decreases
D	the lowest energy	increases

- 32 Benzene and glycerine are two substances.

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

	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
benzene	5.4	80
glycerine	18	290

At which temperature are both benzene and glycerine liquid?

- A** 0°C **B** 50°C **C** 90°C **D** 300°C

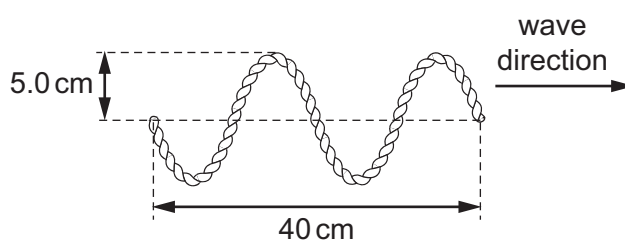
- 33 The diagram shows a heater in a room.



What happens to the air as it is heated by the heater?

- A** Its density decreases and it falls.
B Its density decreases and it rises.
C Its density increases and it falls.
D Its density increases and it rises.

- 34 A student vibrates the end of a horizontal rope and sends a wave along the rope. The wave is shown in the diagram.

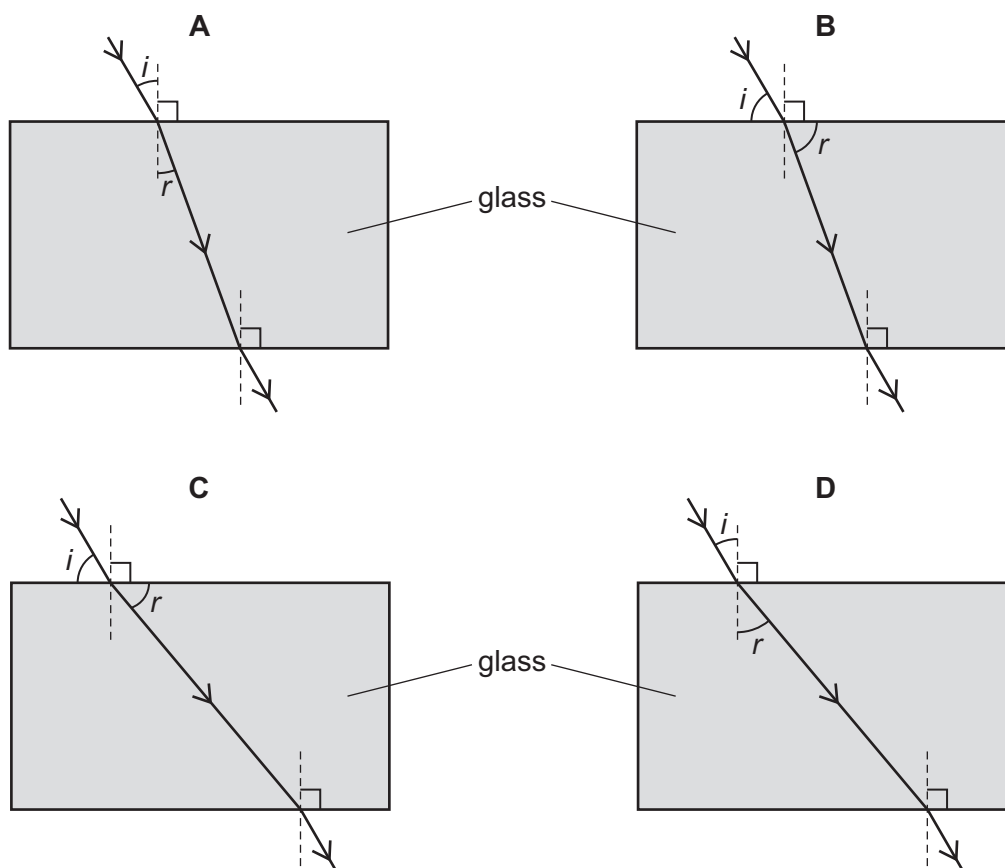


What is the amplitude of the wave, and what is the wavelength of the wave?

	amplitude / cm	wavelength / cm
A	5.0	10
B	5.0	20
C	10	10
D	10	20

- 35 A ray of light passes from air into a rectangular glass block and back into the air again.

Which diagram shows the path of the light, the angle of incidence labelled i and the angle of refraction labelled r ?



36 Which type of wave is used by television remote controllers?

- A infra-red
- B microwaves
- C radio
- D ultraviolet

37 A student determines the speed of sound in air. She measures the time between making a sound and hearing the echo from a cliff.

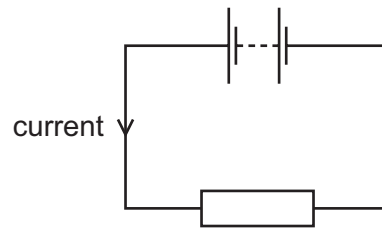


She uses the equation: $\text{speed} = \frac{\text{distance}}{\text{time}}$.

Which type of sound does she make and which distance does she use in her calculation?

	type of sound	distance used
A	continuous sound	$2 \times \text{distance to cliff}$
B	continuous sound	$\frac{1}{2} \times \text{distance to cliff}$
C	short, sharp sound	$2 \times \text{distance to cliff}$
D	short, sharp sound	$\frac{1}{2} \times \text{distance to cliff}$

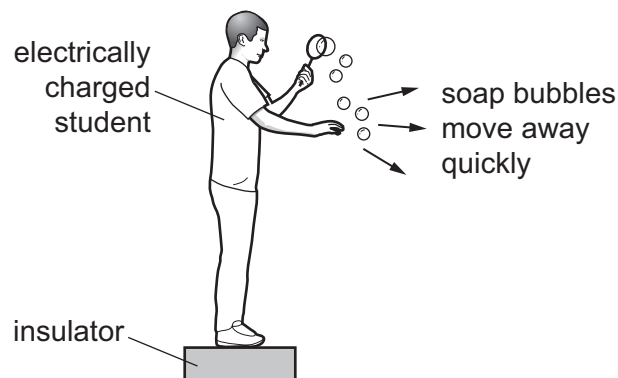
- 38 A battery is connected to a resistor.



Which changes to the resistance of the resistor, and to the potential difference across the resistor, **must** produce a smaller current?

	resistance	potential difference
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

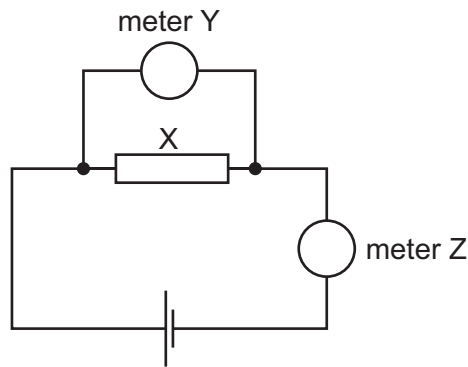
- 39 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.



For this movement of the bubbles to happen, which statement is correct?

- A** The bubbles must be negatively charged.
- B** The bubbles must be positively charged.
- C** The bubbles must have the opposite charge to the charge on the student.
- D** The bubbles must have the same charge as the charge on the student.

40 The circuit shown contains a component X and two meters Y and Z.



Which unit is used when stating the value of X, and which units are used when stating the readings on Y and Z?

	X	Y	Z
A	amp	ohm	volt
B	amp	volt	ohm
C	ohm	amp	volt
D	ohm	volt	amp

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The Periodic Table of Elements

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

lanthanoids

actinoids

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)



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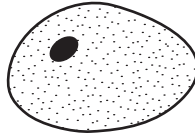
This document consists of **16** printed pages.



1 Which is a characteristic of all living things?

- A breathing
- B eating
- C photosynthesis
- D respiration

2 The diagram shows an animal cell. The maximum diameter of the diagram is 25 mm.



The maximum diameter of the actual cell was 0.02 mm.

What is the magnification of the drawing?

- A $\times 25$ B $\times 200$ C $\times 1250$ D $\times 2500$

3 Which process depends on diffusion?

- A egestion
- B fertilisation
- C phagocytosis
- D transpiration

4 To which class of compound do enzymes belong?

- A carbohydrates
- B fats
- C proteins
- D vitamins

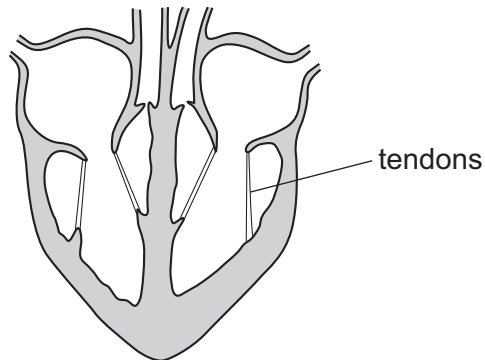
5 Which word equation represents photosynthesis?

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

6 What are the functions of phloem?

	transports mineral ions	transports sugars
A	✓	✓
B	✓	x
C	x	✓
D	x	x

7 The diagram shows a section through the human heart.



Which structures are joined by the tendons?

- A** atrium wall and septum
- B** atrium wall and valve
- C** septum and ventricle wall
- D** valve and ventricle wall

8 How do the contents of **inspired** air differ from those of expired air?

	carbon dioxide	oxygen
A	less	less
B	less	more
C	more	less
D	more	more

- 9 Glucose is involved in the metabolic reaction shown below.



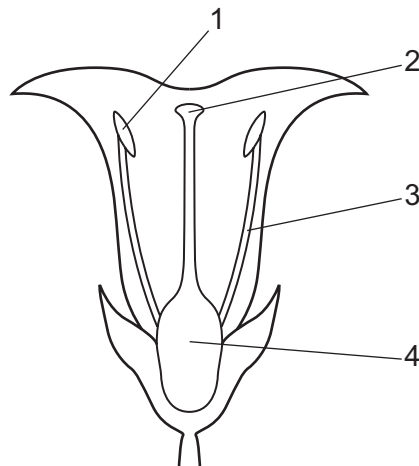
What are P, Q and R?

	P	Q	R
A	carbon dioxide	oxygen	water
B	carbon dioxide	water	oxygen
C	oxygen	water	carbon dioxide
D	water	carbon dioxide	oxygen

- 10 What are the stimuli for geotropism and phototropism?

	geotropism	phototropism
A	gravity	light
B	heat	water
C	light	gravity
D	water	heat

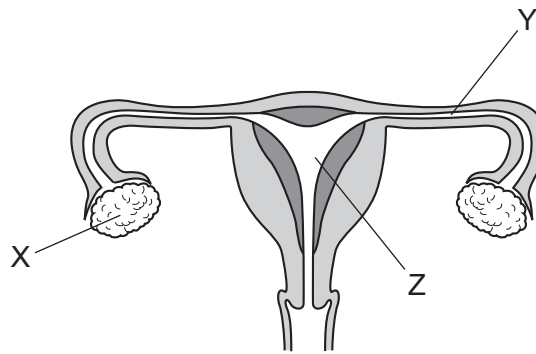
- 11 The diagram shows a section through a flower.



Which numbers identify anther and ovary?

	anther	ovary
A	1	2
B	1	4
C	2	4
D	3	2

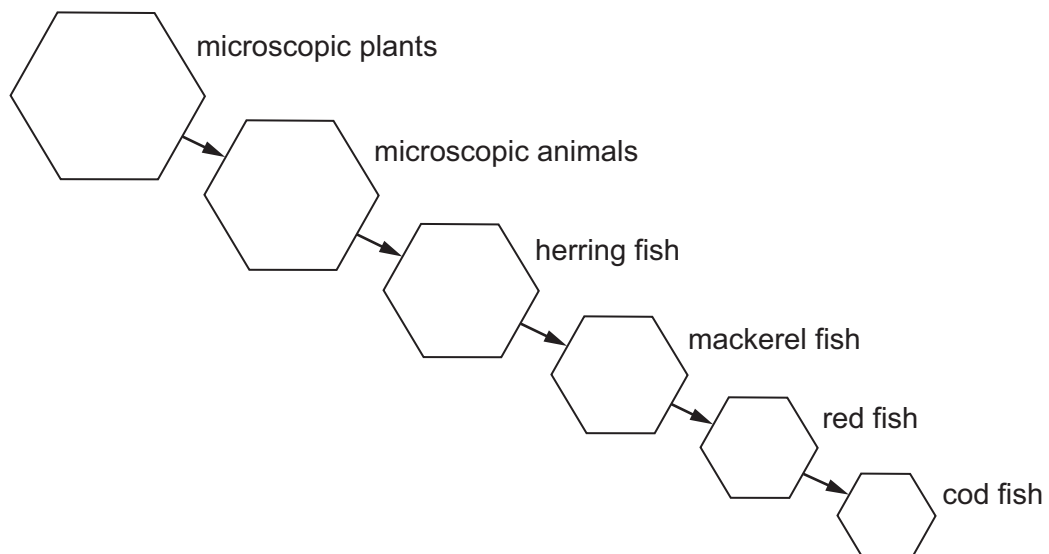
12 The diagram shows the female reproductive system.



Which labelled structures are the ovary and the uterus?

	ovary	uterus
A	X	Y
B	X	Z
C	Z	X
D	Z	Y

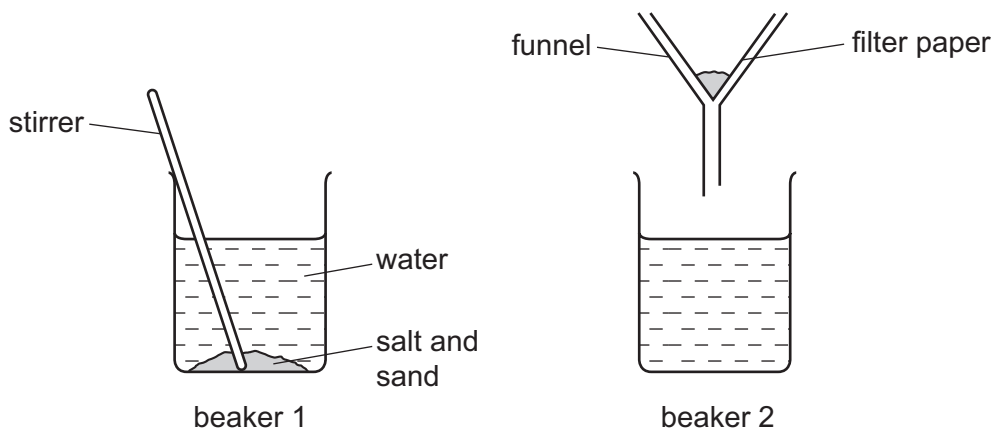
13 The diagram represents a food chain found in the sea.



How many consumer levels are there?

- A** 1 **B** 4 **C** 5 **D** 6

- 14 The apparatus used to remove sand from a mixture of salt and sand is shown.



The contents of beaker 1 are stirred and then poured into the funnel above beaker 2.

What is in beaker 2?

- A** a mixture of an element and a compound
B a mixture of two compounds
C one compound only
D one element only
- 15 The positions of elements P, Q, R, S and T in the Periodic Table are shown.

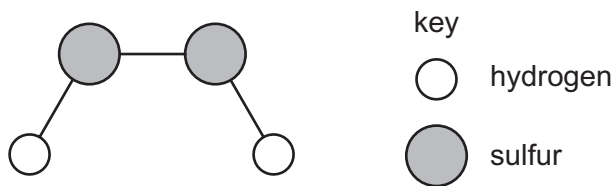
The letters are **not** the symbols for the elements.

I II												III	IV	V	VI	VII	VIII
P	Q															R	S
T																	

Which element forms an ionic compound with element P?

- A** Q **B** R **C** S **D** T

16 A model of a molecule is shown.

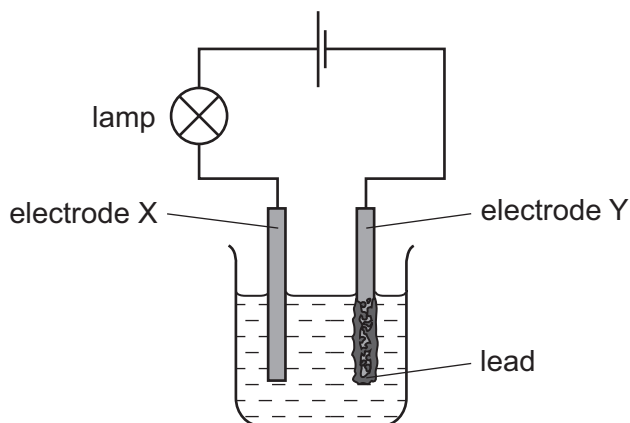


Which row describes this molecule?

	formula	type of substance
A	HS	compound
B	HS	mixture
C	H ₂ S ₂	compound
D	H ₂ S ₂	mixture

17 The diagram shows the apparatus used for the electrolysis of lead(II) bromide using inert electrodes X and Y.

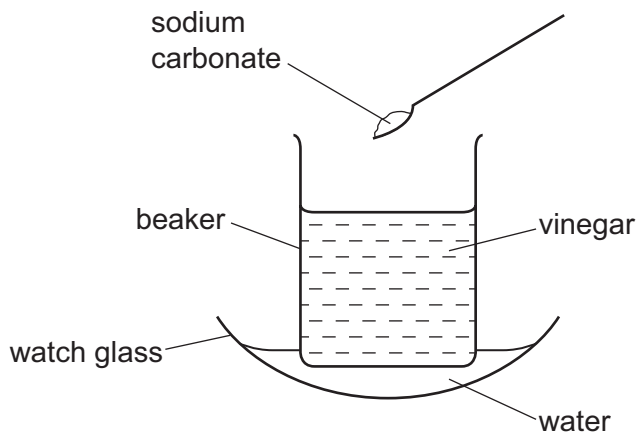
Lead is formed at electrode Y.



Which statement about the electrolysis is correct?

- A** A green gas is given off at electrode X.
- B** Electrode Y is the anode.
- C** Only a physical change takes place when a current is passed.
- D** The electrolyte is in the molten state.

- 18 Solid sodium carbonate is added to vinegar in a beaker and stirred.



The water in the watch glass freezes.

Which statement about the reaction explains why the water freezes?

- A It is a redox reaction.
 - B It is an endothermic reaction.
 - C It is catalysed by sodium carbonate.
 - D It is thermal decomposition.
- 19 Carbon dioxide reacts with carbon.



Which row describes what happens to the carbon dioxide and to the carbon during the reaction?

	carbon dioxide	carbon
A	oxidised	oxidised
B	oxidised	reduced
C	reduced	oxidised
D	reduced	reduced

- 20 Which element reacts with dilute sulfuric acid to form a salt?

- A carbon
- B copper
- C sulfur
- D zinc

21 The results of two tests on substance Q are shown.

tests	results
add dilute hydrochloric acid to solid Q	bubbles of colourless gas, R, which turns limewater milky
add aqueous sodium hydroxide to a solution of Q	green precipitate

Which cation is present in Q and what is gas R?

	cation present in Q	gas R
A	iron(II)	carbon dioxide
B	iron(II)	chlorine
C	iron(III)	carbon dioxide
D	iron(III)	chlorine

22 A soft metal reacts vigorously with cold water.

What is the position of this metal in the Periodic Table?

[illegible]

23 What are two properties of transition metals?

- A** act as catalysts and form white compounds
- B** high densities and low boiling points
- C** high melting points and form coloured compounds
- D** low densities and their compounds act as catalysts

24 Which metal reacts with dilute hydrochloric acid but does **not** react with cold water?

- A** copper
- B** calcium
- C** sodium
- D** zinc

25 What is a chemical test for water?

- A It boils at 100 °C.
- B It turns blue cobalt chloride paper pink.
- C It turns blue copper sulfate crystals white.
- D It turns pink litmus paper blue.

26 Which reaction involves combustion?

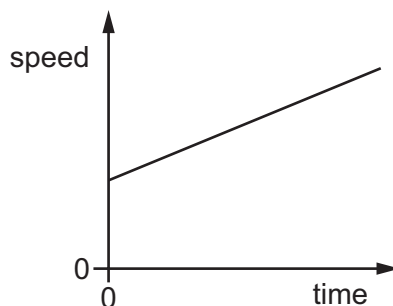
- A calcium carbonate $\rightarrow$ calcium oxide + carbon dioxide
- B methane + oxygen $\rightarrow$ carbon dioxide + water
- C sodium carbonate + hydrochloric acid $\rightarrow$ sodium chloride + water + carbon dioxide
- D sodium hydroxide + hydrochloric acid $\rightarrow$ sodium chloride + water

27 Petroleum is a mixture of hydrocarbon molecules.

Which row describes the method of separation of petroleum and the type of bond in hydrocarbon molecules?

	method of separation	type of bond
A	distillation	covalent
B	distillation	ionic
C	fractional distillation	covalent
D	fractional distillation	ionic

- 28 The graph shows how the speed of a car varies with time.



Which statement about the car is correct?

- A The car is accelerating.
 - B The car is at rest at time = 0.
 - C The car must be travelling in a straight line.
 - D The car travels equal distances in equal times.
- 29 A solid metal cube of side 5.0 cm has a mass of 250 g.
- What is the density of the metal from which the cube is made?
- A 0.50 g/cm^3 B 2.0 g/cm^3 C 10 g/cm^3 D 50 g/cm^3
- 30 In which case is work **not** being done on the object involved?
- A holding a heavy weight stationary above your head
 - B holding both ends of a spring then stretching it
 - C pushing a heavy chair over a rough, horizontal floor
 - D raising a load off the ground
- 31 A substance is easily compressed into a smaller volume.
- What is the state of the substance?
- A gas or liquid
 - B gas only
 - C liquid only
 - D solid or 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/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
benzene	5.4	80
glycerine	18	290

At which temperature are both benzene and glycerine liquid?

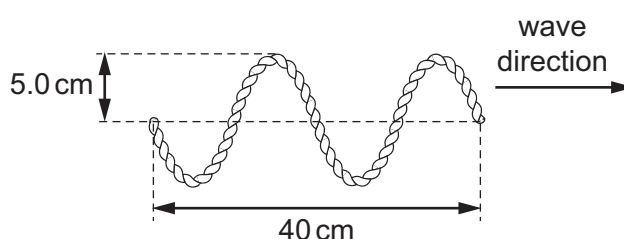
- A** 0°C **B** 50°C **C** 90°C **D** 300°C

33 A hot, solid metal block is placed in a vacuum. Its temperature decreases.

By which method is energy transferred through the vacuum?

- A** conduction
B convection
C evaporation
D radiation

34 A student vibrates the end of a horizontal rope and sends a wave along the rope. The wave is shown in the diagram.

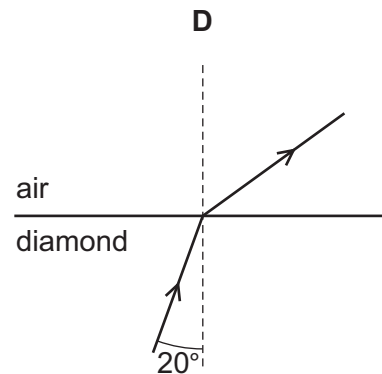
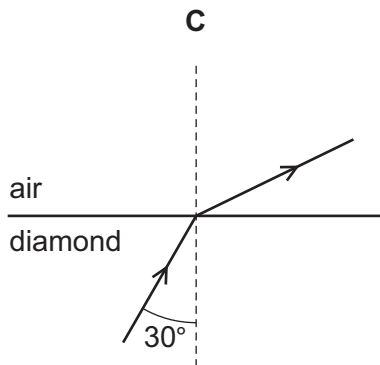
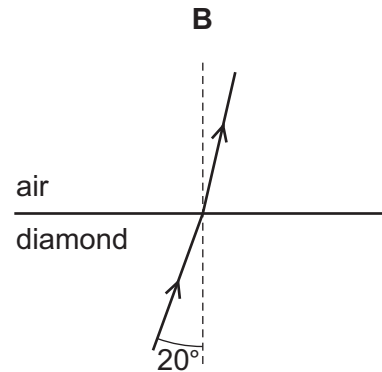
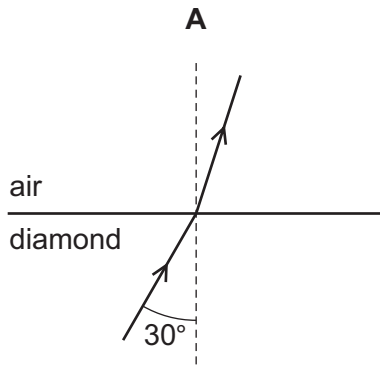


What is the amplitude of the wave, and what is the wavelength of the wave?

	amplitude / cm	wavelength / cm
A	5.0	10
B	5.0	20
C	10	10
D	10	20

35 The critical angle for diamond in air is 25° .

Which diagram shows the path of light passing from diamond (denser) into air (less dense)?



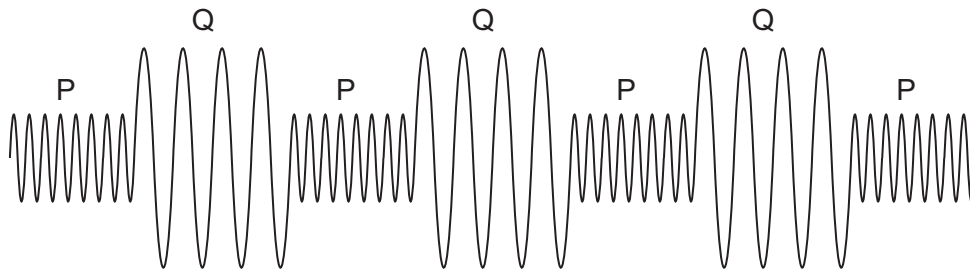
36 A worker in a hospital operates an X-ray machine.

Which is **not** a useful precaution to help protect her from the X-rays while the machine is operating?

- A** keeping a large distance away from the machine
- B** limiting for how long she operates the machine
- C** placing lead blocks between her and the machine
- D** using safety glasses when operating the machine

- 37** A police car sounds its siren when travelling to an emergency. The siren produces two different sounds P and Q, which are emitted alternately.

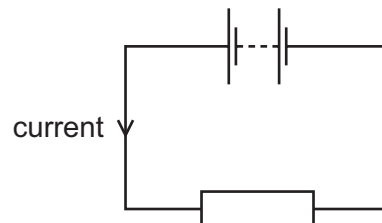
The diagram represents the sound waves emitted by the siren.



Which of the two sounds P and Q is the louder and which has the higher pitch?

	louder sound	sound with higher pitch
A	P	P
B	P	Q
C	Q	P
D	Q	Q

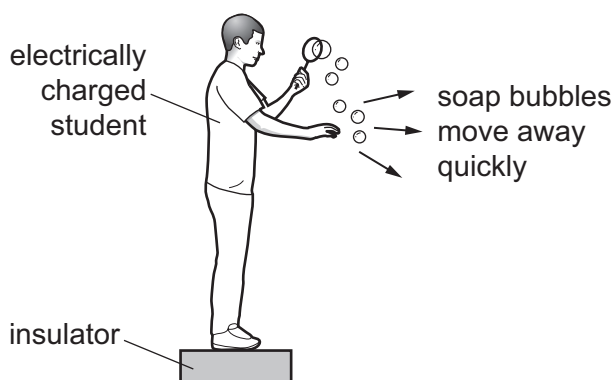
- 38** A battery is connected to a resistor.



Which changes to the resistance of the resistor, and to the potential difference across the resistor, **must** produce a smaller current?

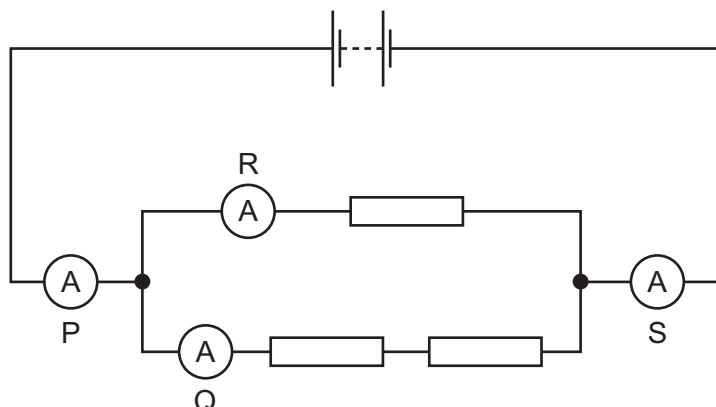
	resistance	potential difference
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

- 39 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.



For this movement of the bubbles to happen, which statement is correct?

- A The bubbles must be negatively charged.
 - B The bubbles must be positively charged.
 - C The bubbles must have the opposite charge to the charge on the student.
 - D The bubbles must have the same charge as the charge on the student.
- 40 In the circuit shown, three identical resistors are connected with four ammeters P, Q, R and S.



Which two ammeters have the same reading?

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

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 1 Multiple Choice

0653/13

May/June 2016

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 16.

Electronic calculators may be used.

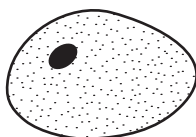
This document consists of **16** printed pages.



1 What are the characteristics of living organisms?

	excretion	growth	movement	nutrition	reproduction	respiration	sensitivity / response
A	✓	✓	✓	✓	✓	✓	✓
B	✓	✓	x	✓	✓	✓	✓
C	✓	x	x	✓	x	✓	✓
D	x	✓	✓	✓	✓	✓	x

2 The diagram shows an animal cell. The maximum diameter of the diagram is 25 mm.



The maximum diameter of the actual cell was 0.02 mm.

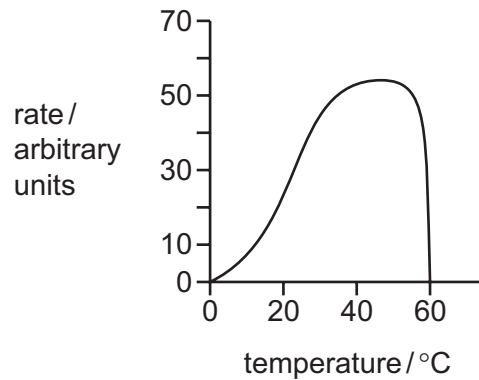
What is the magnification of the drawing?

- A** ×25 **B** ×200 **C** ×1250 **D** ×2500

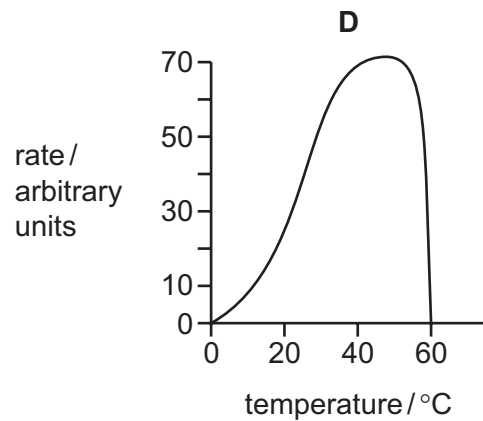
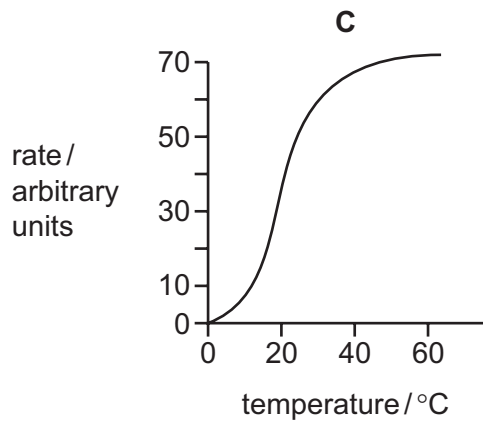
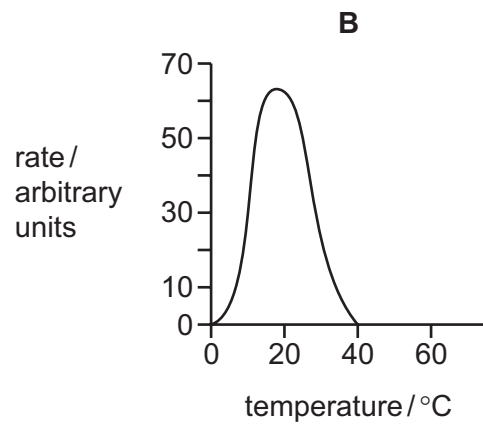
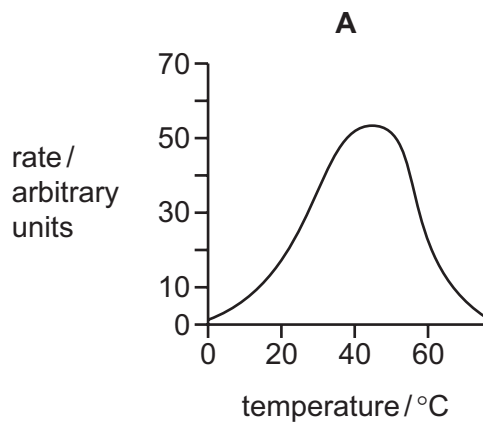
3 Which statement about diffusion is correct?

- A** Diffusion happens only in living organisms.
B Diffusion happens only through a cell wall.
C Diffusion occurs only down a concentration gradient.
D Diffusion occurs only in solution.

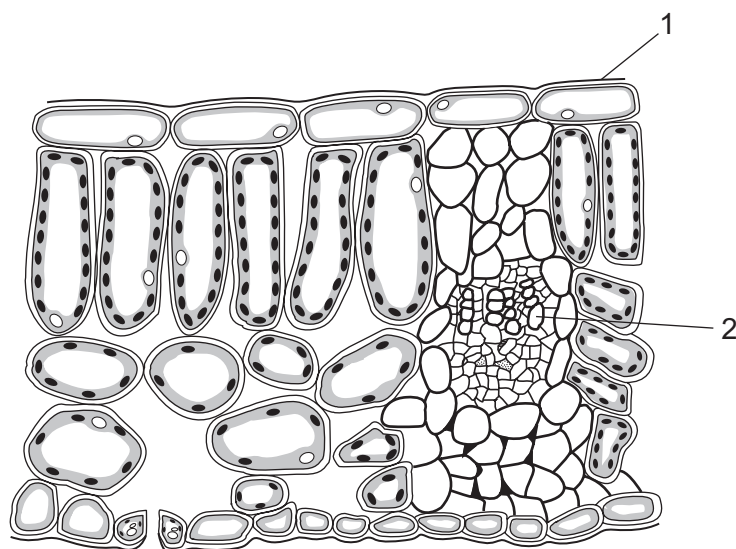
- 4 The diagram shows the effect of increasing temperature on an enzyme-controlled reaction, during which the enzyme is **not** at its optimum (best) pH.



Which shows the effect of temperature on this enzyme when it is at its optimum pH?



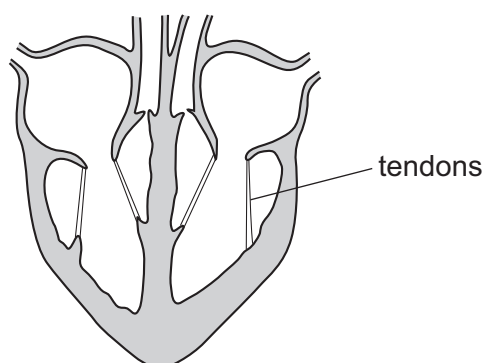
- 5 The diagram shows a section through part of a leaf as seen under a light microscope.



What are the labelled parts?

	1	2
A	cuticle	phloem
B	cuticle	xylem
C	epidermis	phloem
D	epidermis	xylem

- 6 The diagram shows a section through the human heart.



Which structures are joined by the tendons?

- A** atrium wall and septum
- B** atrium wall and valve
- C** septum and ventricle wall
- D** valve and ventricle wall

7 Where does most water enter a plant?

- A epidermal cells
- B root hair cells
- C stomata
- D xylem vessels

8 Limewater turns cloudy if a certain gas is bubbled through it.

Why will the limewater look different when expired air rather than inspired air is bubbled through it?

- A Limewater detects oxygen in the inspired air.
- B Oxygen has been taken from the expired air.
- C There is less nitrogen in the expired air.
- D There is more carbon dioxide in the expired air.

9 Which processes require energy in both plants and animals?

	cell division	protein synthesis	temperature control
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

10 What happens to adrenaline after it has had its effect?

- A It is breathed out of the lungs as vapour.
- B It is destroyed by the liver.
- C It is egested in the alimentary canal.
- D It is used in respiration.

11 What are the features of sexual reproduction?

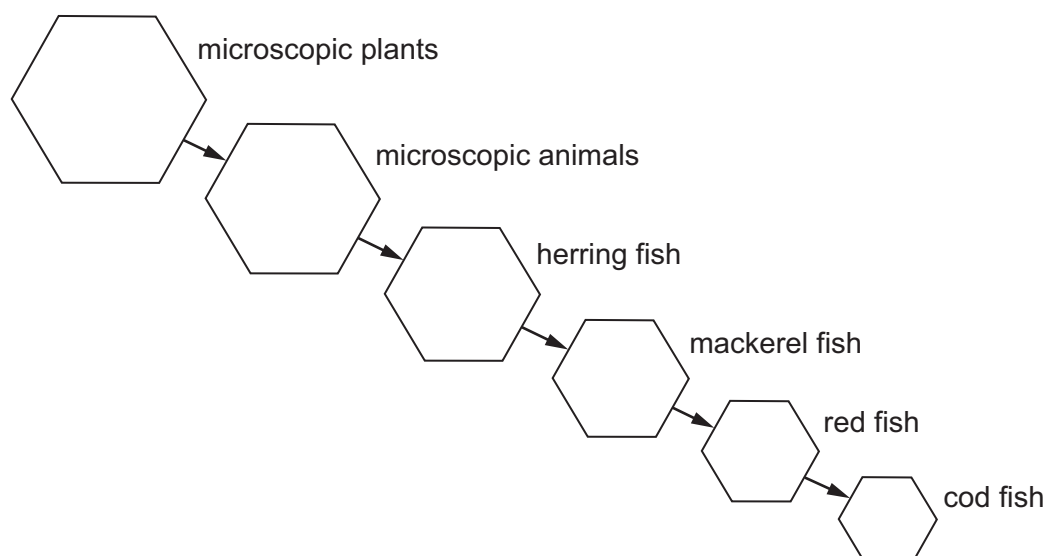
	number of parents	type of nuclei that fuse	nature of offspring
A	1	diploid	genetically dissimilar
B	1	haploid	genetically identical
C	2	diploid	genetically identical
D	2	haploid	genetically dissimilar

12 Some seeds are left in a warm place in different conditions.

Which seeds will germinate but will be able to grow only for a short time?

	light	oxygen present	water present
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

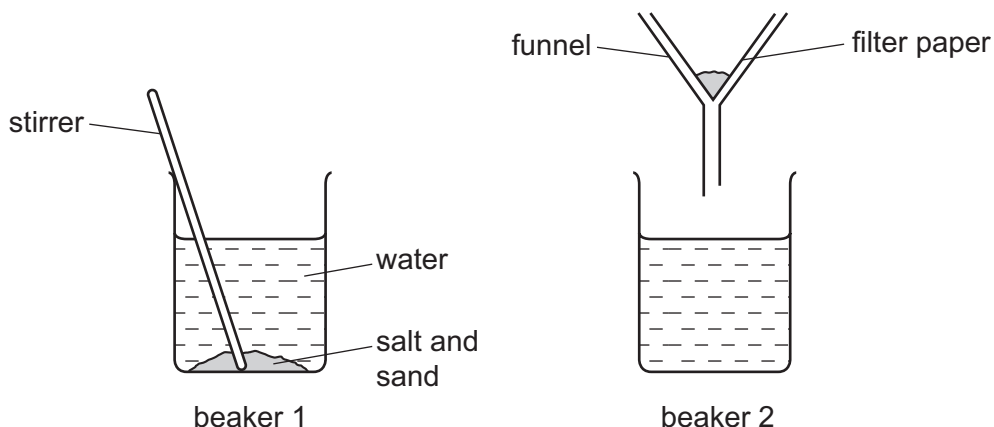
13 The diagram represents a food chain found in the sea.



How many consumer levels are there?

- A** 1 **B** 4 **C** 5 **D** 6

14 The apparatus used to remove sand from a mixture of salt and sand is shown.



The contents of beaker 1 are stirred and then poured into the funnel above beaker 2.

What is in beaker 2?

- A a mixture of an element and a compound
- B a mixture of two compounds
- C one compound only
- D one element only

15 Which row describes an element and a compound?

	an element	a compound
A	contains more than one type of atom	contains elements chemically combined
B	contains more than one type of atom	contains elements mixed together
C	contains only one type of atom	contains elements chemically combined
D	contains only one type of atom	contains elements mixed together

- 16 The positions of elements P, Q, R, S and T in the Periodic Table are shown.

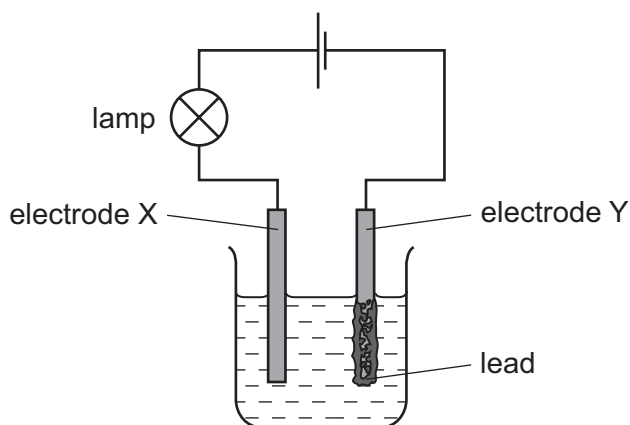
The letters are **not** the symbols for the elements.

I II												III IV V VI VII VIII
P	Q											R S
T												

Which element forms an ionic compound with element P?

- A** Q **B** R **C** S **D** T
- 17 The diagram shows the apparatus used for the electrolysis of lead(II) bromide using inert electrodes X and Y.

Lead is formed at electrode Y.



Which statement about the electrolysis is correct?

- A** A green gas is given off at electrode X.
B Electrode Y is the anode.
C Only a physical change takes place when a current is passed.
D The electrolyte is in the molten state.
- 18 Which temperature changes occur during exothermic and endothermic reactions?

	exothermic	endothermic
A	decreases	increases
B	decreases	no change
C	increases	decreases
D	increases	no change

19 What is a catalyst?

- A a substance that decreases the rate of reaction and is chemically changed at the end of the reaction
- B a substance that decreases the rate of reaction and is chemically unchanged at the end of the reaction
- C a substance that increases the rate of reaction and is chemically changed at the end of the reaction
- D a substance that increases the rate of reaction and is chemically unchanged at the end of the reaction

20 Which word equation represents the reaction of an acid with a carbonate?

- A acid + carbonate $\rightarrow$ salt + carbon dioxide
- B acid + carbonate $\rightarrow$ salt + carbon dioxide + water
- C acid + carbonate $\rightarrow$ salt + hydrogen + water
- D acid + carbonate $\rightarrow$ salt + water

21 The results of two tests on a solution of substance R are shown.

tests	results
add aqueous sodium hydroxide	red brown precipitate formed, insoluble in excess
dilute nitric acid added followed by silver nitrate solution	white precipitate formed

What is R?

- A iron(II) carbonate
- B iron(III) carbonate
- C iron(II) chloride
- D iron(III) chloride

- 22** A soft metal reacts vigorously with cold water.

What is the position of this metal in the Periodic Table?

A 10x10 grid representing a periodic table. The grid is divided into four main sections by a vertical line between the 3rd and 4th columns and a horizontal line between the 2nd and 3rd rows. The sections are labeled as follows:

- Section A:** The top-left section, consisting of the first two columns and the first two rows. It contains the label 'A' in the bottom-left cell (row 2, column 1).
- Section B:** The middle-left section, consisting of the 3rd to 8th columns and the 3rd to 4th rows. It contains the label 'B' in the top-left cell (row 3, column 3).
- Section C:** The middle-right section, consisting of the 9th to 10th columns and the 3rd to 4th rows. It contains the label 'C' in the bottom-right cell (row 4, column 10).
- Section D:** The bottom-right section, consisting of the 9th to 10th columns and the 5th to 6th rows. It contains the label 'D' in the bottom-right cell (row 6, column 10).

There are also two empty cells at the top of the grid: one at (row 1, column 3) and one at (row 1, column 10).

- 23** W, X, Y and Z are four metals.

W forms a compound that is used to speed up chemical reactions.

X forms coloured compounds.

Y has a high melting point.

Z has a low density.

Which metals are transition elements?

- A** W, X and Y
B W and X only
C X, Y and Z
D Y and Z only

- 24** Which element does **not** produce a gas when added to dilute hydrochloric acid?

- A** copper
B iron
C magnesium
D zinc

- 25** Which processes are used in the purification of the water supply?

- A** fractional distillation and chlorination
B fractional distillation and crystallisation
C filtration and chlorination
D filtration and crystallisation

26 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

27 Which fuel is **not** obtained from petroleum?

- A coal
- B gasoline
- C diesel
- D refinery gas

28 It takes 2.0 hours for a car to travel 50 km.

Which calculation gives the average speed of the car?

- A $\frac{50}{2.0}$ m/s
- B $\frac{2.0}{50}$ m/s
- C $\frac{50\,000}{(2.0 \times 60 \times 60)}$ m/s
- D $\frac{(2.0 \times 60 \times 60)}{50\,000}$ m/s

29 A bottle full of oil has a mass of 1200 g. The same bottle when empty has a mass of 450 g. The volume of the oil is 1000 cm³.

What is the density of the oil?

- A 0.45 g/cm³
- B 0.75 g/cm³
- C 1.2 g/cm³
- D 1.3 g/cm³

- 30** A motor is used to lift identical bags of flour between two floors in a windmill. The power output of the motor is doubled.

Which statement about the journey of the bags of flour between the two floors is now correct?

- A** The bags gain half as much potential energy.
- B** The bags gain twice as much potential energy.
- C** The bags travel at half the speed.
- D** The bags travel at twice the speed.

- 31** Which row describes the particles in a gas?

	average distance between particles	motion of particles
A	large	move randomly
B	large	vibrate about a fixed point
C	small	move randomly
D	small	vibrate about a fixed point

- 32** Benzene and glycerine are two substances.

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

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

At which temperature are both benzene and glycerine liquid?

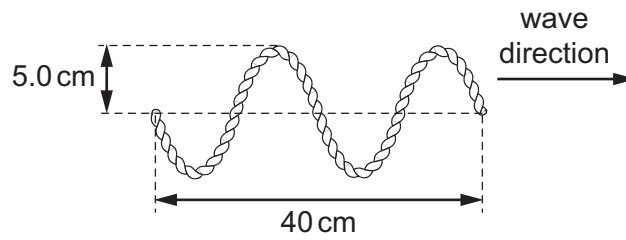
- A** 0 °C
- B** 50 °C
- C** 90 °C
- D** 300 °C

- 33** Convection is one method by which energy can be transferred thermally through a substance.

In which state(s) can convection occur?

- A** liquids and gases only
- B** liquids only
- C** solids and gases only
- D** solids, liquids and gases

- 34** A student vibrates the end of a horizontal rope and sends a wave along the rope. The wave is shown in the diagram.

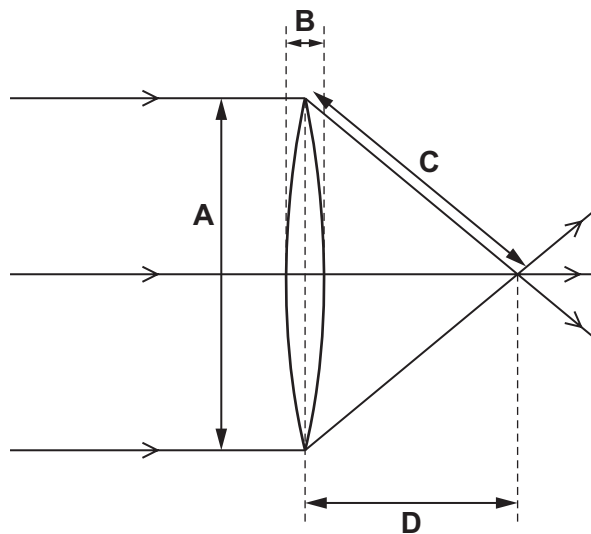


What is the amplitude of the wave, and what is the wavelength of the wave?

	amplitude / cm	wavelength / cm
A	5.0	10
B	5.0	20
C	10	10
D	10	20

- 35** The diagram shows rays of light passing through a converging lens.

Which labelled arrow represents the focal length of the lens?



- 36 The diagram shows part of the electromagnetic spectrum.

X-rays	P	visible light	Q	microwaves
--------	---	---------------	---	------------

Which row shows the missing types of radiation at P and at Q?

	at P	at Q
A	infra-red	radio waves
B	infra-red	ultraviolet
C	ultraviolet	infra-red
D	ultraviolet	radio waves

- 37 A boy stands 132 metres in front of a vertical cliff.

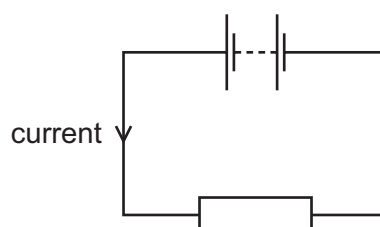
He claps his hands and then hears an echo from the cliff.

The speed of sound in air is 330 m/s.

What is the time between the boy clapping his hands and hearing the echo?

- A** 0.40 s **B** 0.80 s **C** 1.25 s **D** 2.50 s

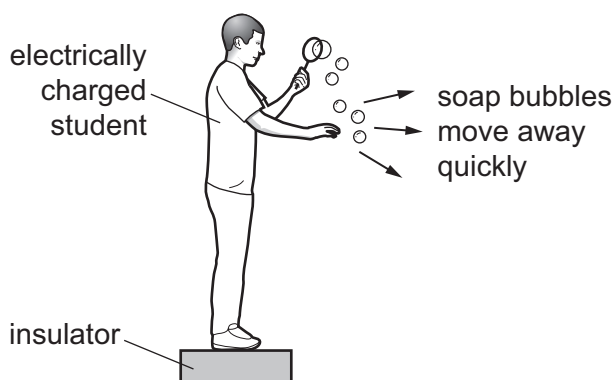
- 38 A battery is connected to a resistor.



Which changes to the resistance of the resistor, and to the potential difference across the resistor, **must** produce a smaller current?

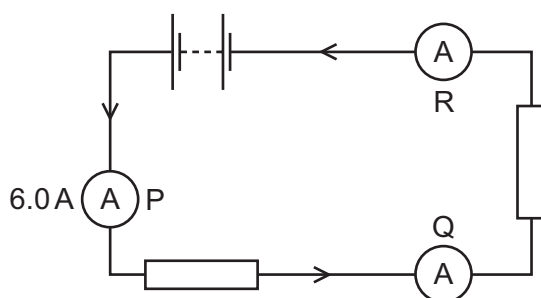
	resistance	potential difference
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

- 39 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.



For this movement of the bubbles to happen, which statement is correct?

- A The bubbles must be negatively charged.
 - B The bubbles must be positively charged.
 - C The bubbles must have the opposite charge to the charge on the student.
 - D The bubbles must have the same charge as the charge on the student.
- 40 The diagram shows two resistors in a circuit with three ammeters P, Q and R. Ammeter P reads 6.0 A.



Which row gives the reading on ammeter Q and the reading on ammeter R?

	ammeter Q / A	ammeter R / A
A	3.0	0
B	3.0	3.0
C	4.0	2.0
D	6.0	6.0

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The Periodic Table of Elements

Group																																																																																																																																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	VIII																																																																																																																
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										5 B boron 11 6 C carbon 12 7 N nitrogen 14 8 O oxygen 16 9 F fluorine 19 10 Ne neon 20 13 Al aluminium 27 14 Si silicon 28 15 P phosphorus 31 16 S sulfur 32 17 Cl chlorine 35.5 18 Ar argon 40 31 Ga gallium 70 32 Ge germanium 73 33 As arsenic 75 34 Se selenium 79 35 Br bromine 80 36 Kr krypton 84 49 In indium 115 50 Sn tin 119 51 Sb antimony 122 52 Te tellurium 128 53 I iodine 127 54 Xe xenon 131 81 Tl thallium 204 82 Pb lead 207 83 Bi bismuth 209 84 Po polonium — 116 Lv livermorium —							2 He helium 4																																																																																																														
	11 Na sodium 23																		12 Mg magnesium 24	21 Sc scandium 45		22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	37 Rb rubidium 85		38 Sr strontium 88	39 Y yttrium 89	40 Ca calcium 40	55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	112 Cn copernicium —	114 Fl flerovium —	116 Lv livermorium —	—	Rn radon —	86 Xe xenon 131	85 At astatine —	84 Po polonium —	83 Bi bismuth 209	82 Pb lead 207	81 Tl thallium 204	80 Hg mercury 201	79 Au gold 197	78 Pt platinum 195	77 Ir iridium 192	76 Os osmium 190	75 Re rhenium 186	74 W tungsten 184	73 Ta tantalum 181	72 Hf hafnium 178	71 La lanthanum 139	70 Yb ytterbium 173	69 Tm thulium 169	68 Er erbium 167	67 Tb terbium 159	66 Dy dysprosium 163	65 Ho holmium 165	64 Gd gadolinium 157	63 Eu europium 152	62 Sm samarium 150	61 Pm promethium 145	60 Nd neodymium 144	59 Pr praseodymium 141	58 Ce cerium 140	57 La lanthanum 139	56 Ba barium 137	55 Cs caesium 133	54 Xe xenon 131	53 I iodine 127	52 Te tellurium 128	51 Sb antimony 122	50 Sn tin 119	49 In indium 115	48 Cd cadmium 112	47 Ag silver 108	46 Pd palladium 106	45 Rh rhodium 103	44 Ru ruthenium 101	43 Tc technetium —	42 Mo molybdenum 96	41 Nb niobium 93	40 Zr zirconium 91	39 Y yttrium 89	38 Sr strontium 88	37 Rb rubidium 85	36 Kr krypton 84	35 Br bromine 80	34 Se selenium 79	33 As arsenic 75	32 Ge germanium 73	31 Ga gallium 70	30 Zn zinc 65	29 Cu copper 64	28 Ni nickel 59	27 Co cobalt 59	26 Fe iron 56	25 Mn manganese 55	24 Cr chromium 52	23 V vanadium 51	22 Ti titanium 48	21 Sc scandium 45	20 Ca calcium 40	19 K potassium 39	18 Ar argon 40	17 Cl chlorine 35.5	16 S sulfur 32	15 P phosphorus 31	14 Si silicon 28	13 Al aluminium 27	12 Mg magnesium 24	11 Na sodium 23	10 Ne neon 20

lanthanoids

actinoids

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)