



Cambridge IGCSE™

COMBINED SCIENCE

0653/11

Paper 1 Multiple Choice (Core)

May/June 2022

45 minutes

You must answer on the multiple choice answer sheet.

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

INSTRUCTIONS

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

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 What is the outermost layer of an animal cell and a plant cell?

	animal cell	plant cell
A	cell membrane	cell membrane
B	cell membrane	cell wall
C	cell wall	cell membrane
D	cell wall	cell wall

- 2 Most cars burn fossil fuels to release energy for their movement.

Which characteristic of living organisms is similar to this?

- A** excretion
- B** growth
- C** nutrition
- D** respiration

- 3 The table shows the results of tests carried out on a food sample.

test carried out	final colour
Benedict's	orange
biuret	blue
ethanol emulsion	milky white
iodine	brown

What is present in the food sample?

- A** oil and protein
 - B** oil and reducing sugar
 - C** protein and starch
 - D** reducing sugar and starch
- 4 Which statement about enzymes is correct?
- A** Enzymes are biological catalysts.
 - B** Enzymes are made of glycerol.
 - C** Enzymes are not affected by changes in pH.
 - D** Enzymes are not affected by changes in temperature.

- 5 A plant that lives in water is exposed to sunlight. After a short period of time, bubbles of gas are given off from the plant.

Which gas do the bubbles contain, and which process produces this gas?

	gas	process
A	carbon dioxide	photosynthesis
B	carbon dioxide	respiration
C	oxygen	photosynthesis
D	oxygen	respiration

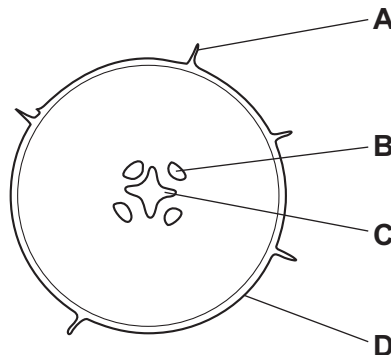
- 6 Which foods are rich in carbohydrate?

- 1 eggs
- 2 meat
- 3 potatoes
- 4 rice

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

- 7 The diagram shows a cross-section of a dicotyledonous root.

Which label correctly identifies the xylem?



- 8 Physical activity affects our rate and depth of breathing.

What happens during **increased** physical activity?

	rate of breathing	depth of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

9 Which responses occur as a result of adrenaline secretion?

	increased breathing rate	decreased pupil diameter	increased pulse rate
A	✓	✗	✗
B	✓	✗	✓
C	✗	✓	✓
D	✗	✓	✗

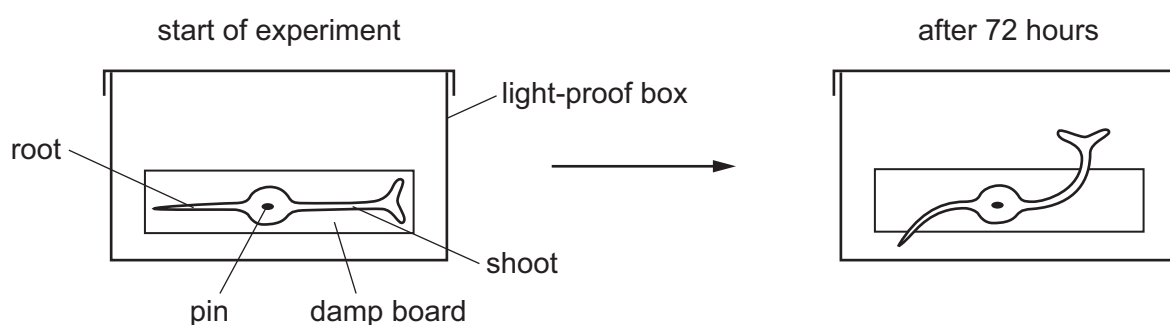
key

✓ = does occur

✗ = does not occur

10 A plant seedling is pinned horizontally onto a damp board inside a light-proof box.

The diagrams show the seedling at the start of the experiment and after 72 hours.

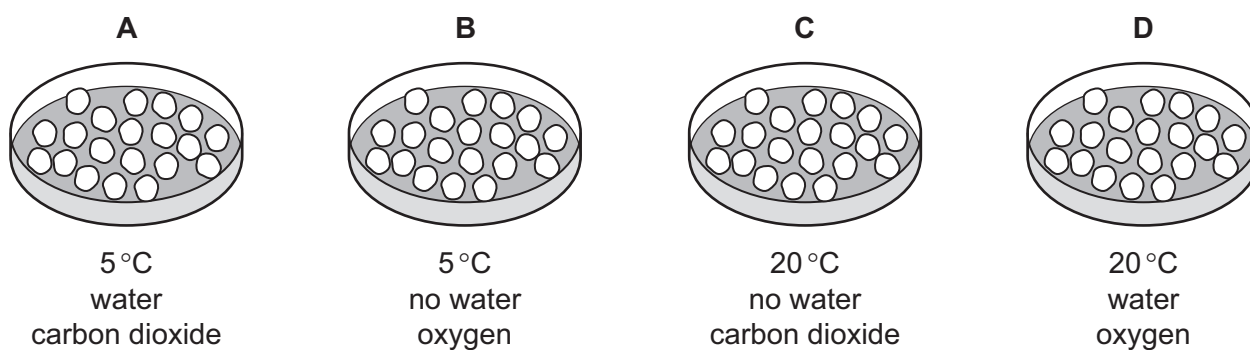


Which response is shown by the root and the shoot?

	root	shoot
A	gravitropism	gravitropism
B	gravitropism	phototropism
C	phototropism	gravitropism
D	phototropism	phototropism

11 A student investigates germination in bean seeds.

In which set of conditions will the seeds germinate?



12 Two food chains are shown.

wheat → vole → fox → tick

grass → rabbit → fox → flea

What are the vole and rabbit classified as in these food chains?

- A primary consumers
- B producers
- C secondary consumers
- D tertiary consumers

13 Which process in the carbon cycle releases carbon into the environment?

- A feeding
- B fossilisation
- C photosynthesis
- D respiration

14 What happens to water molecules when water freezes?

- A They become arranged more regularly.
- B They become smaller.
- C They move much closer together.
- D They move faster.

15 Which row describes a chemical change?

	test	result
A	one end of a piece of aluminium is heated	the other end gets hot
B	calcium carbonate is heated	carbon dioxide is made
C	a piece of iron is heated	it becomes more malleable
D	a beaker of water is heated	steam is made

16 What describes a solvent?

- A a solid that dissolves in a liquid
- B the amount of solid that dissolves in a liquid
- C the liquid in which a solid dissolves
- D the mixture formed when a solid dissolves in a liquid

17 Which groups of the Periodic Table form compounds containing covalent bonds?

- A Group I and Group 0
- B Group I and Group VII
- C Group V and Group 0
- D Group V and Group VII

18 What is the chemical formula of nitric acid?

- A HCl B HNO₃ C H₂SO₄ D NH₃

19 Which type of substance undergoes electrolysis?

- A molten covalent compounds
- B solid ionic compounds
- C gaseous covalent compounds
- D aqueous solutions of ionic compounds

20 Which row shows what happens during an endothermic reaction?

	reaction mixture temperature	thermal energy transfer
A	decreases	from the surroundings
B	decreases	to the surroundings
C	increases	from the surroundings
D	increases	to the surroundings

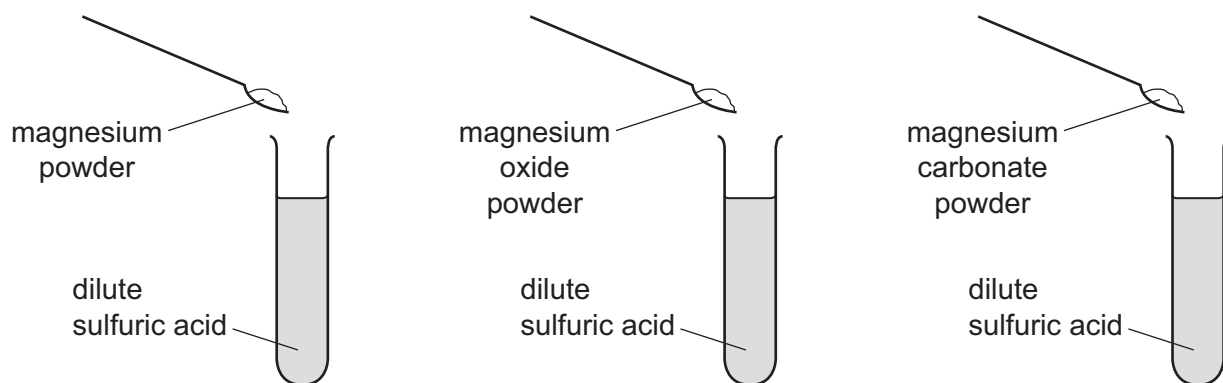
21 Carbon reacts with carbon dioxide at high temperatures.



Which statement about the reaction is correct?

- A Both carbon and carbon dioxide are oxidised.
- B Both carbon and carbon dioxide are reduced.
- C The carbon is oxidised and the carbon dioxide is reduced.
- D The carbon is reduced and the carbon dioxide is oxidised.

22 Three powders are added to dilute sulfuric acid, as shown.



Which powders react to produce water?

	magnesium	magnesium oxide	magnesium carbonate
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = does produce water

✗ = does not produce water

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

test	result
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

24 Which row describes a transition element?

	density	coloured compounds	acts as a catalyst
A	high	no	no
B	high	yes	yes
C	low	no	yes
D	low	yes	no

25 Which substance does **not** react with chlorine?

- A** H_2 **B** Kr **C** Li **D** NaBr

26 Which statement about a chemical test for water is correct?

- A** Anhydrous cobalt(II) chloride turns blue.
B Anhydrous cobalt(II) chloride turns white.
C Anhydrous copper(II) sulfate turns blue.
D Anhydrous copper(II) sulfate turns white.

27 Methane, ethane and propane are all alkanes. Their formulae are shown.

methane, CH_4

ethane, C_2H_6

propane, C_3H_8

Which statement is **not** correct?

- A** All three compounds are hydrocarbons.
B All three compounds burn.
C Methane is the main constituent of natural gas.
D Propane burns completely to form carbon dioxide and hydrogen.

28 The mass of a solid object is 1.6 kg and the volume of the object is 80 cm^3 .

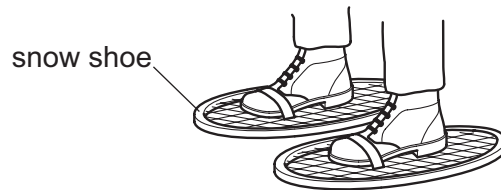
What is the density of the object?

- A** 0.020 kg/cm^3
B 0.20 kg/cm^3
C 5.0 kg/cm^3
D 50 kg/cm^3

29 Which statement about forces is always correct?

- A A resultant force is needed to keep an object moving at constant speed in a straight line.
- B Air resistance acting on an object falling in still air causes its speed to increase.
- C Friction on an object sliding along rough ground acts in the opposite direction to its motion.
- D No forces act on any object that is at rest.

30 A man walking on snow in normal shoes sinks into the snow. The man puts on snow shoes and does not sink into the snow.



Which row explains why this happens?

	area of contact with snow	weight of man
A	decreased	decreased
B	decreased	unchanged
C	increased	decreased
D	increased	unchanged

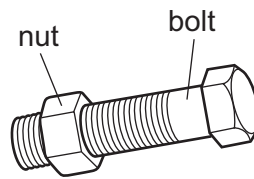
31 Which two energy sources are both renewable?

- A coal and waves
- B geothermal and nuclear
- C oil and tides
- D wind and solar

32 Which process is the escape of more-energetic molecules from the surface of a liquid?

- A condensation
- B convection
- C evaporation
- D radiation

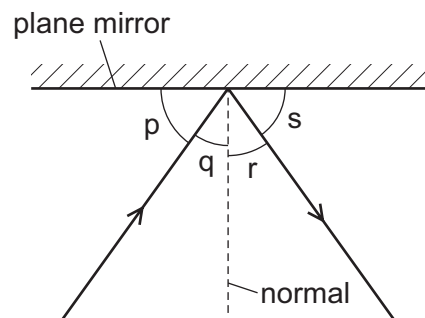
- 33** A mechanic cannot remove a large steel nut from a steel bolt because it is too tight.



What does the mechanic do to help remove the nut?

- A** cool the nut and heat the bolt
 - B** heat the bolt only
 - C** heat the nut and the bolt through the same temperature rise
 - D** heat the nut only
- 34** The diagram shows a ray of light being reflected from a plane mirror.

Four angles are labelled p, q, r and s.

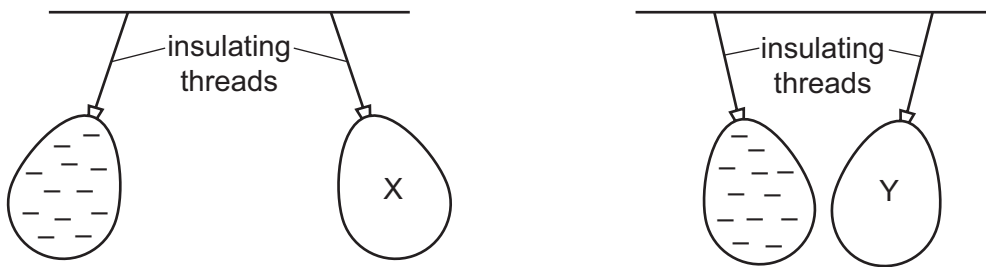


Which angles are the angle of incidence and the angle of reflection?

	angle of incidence	angle of reflection
A	p	r
B	p	s
C	q	r
D	q	s

- 35** Which region of the electromagnetic spectrum is used in remote controllers to control a television?
- A** microwaves
 - B** infrared
 - C** ultraviolet
 - D** visible light

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

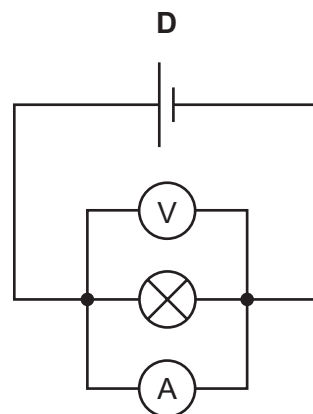
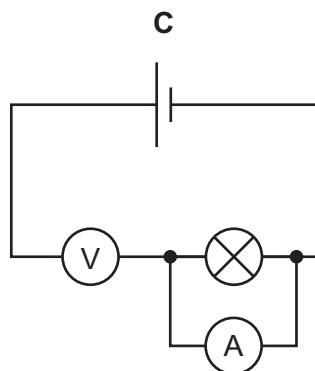
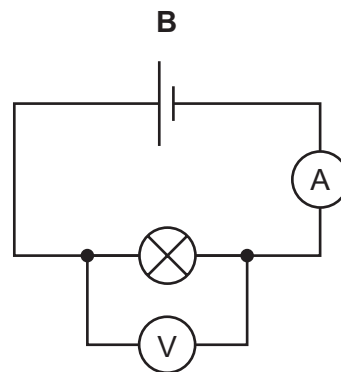
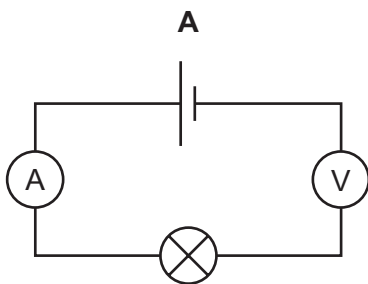


What is the charge on balloon X and what is the charge on balloon Y?

	balloon X	balloon Y
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

- 37** A student sets up a circuit to measure the current in a lamp and the potential difference (p.d.) across it.

Which circuit shows the correct connection of the ammeter and the voltmeter?



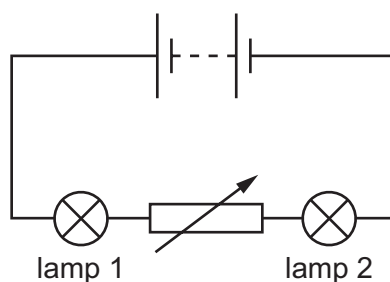
- 38 The diagram shows a label on the side of a lamp.

12 V
3.0 A
36 W

What is the resistance of the lamp when it is operating normally?

- A** $0.25\ \Omega$ **B** $0.33\ \Omega$ **C** $3.0\ \Omega$ **D** $4.0\ \Omega$

- 39 A circuit contains two lamps and a variable resistor.



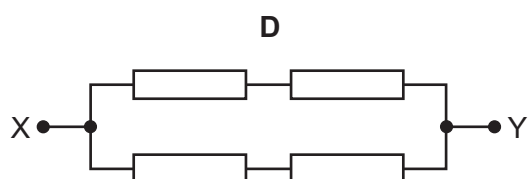
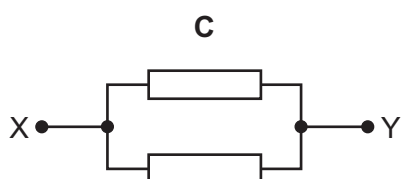
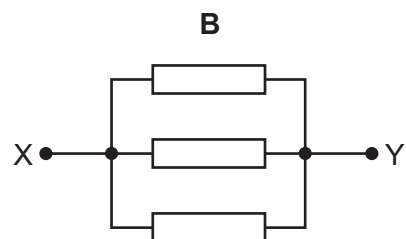
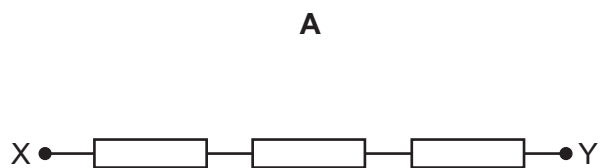
The resistance of the variable resistor is increased.

What happens to the brightness of lamp 1 and what happens to the brightness of lamp 2?

	brightness of lamp 1	brightness of lamp 2
A	decreases	decreases
B	decreases	increases
C	no change	decreases
D	no change	increases

40 Identical resistors are connected together in different arrangements.

Which arrangement has the greatest resistance between points X and Y?



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The Periodic Table of Elements

Group																			
I	II											III	IV	V	VI	VII	VIII		
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										1 H hydrogen 1							
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							9 F fluorine 19	8 O oxygen 16	7 N nitrogen 14			
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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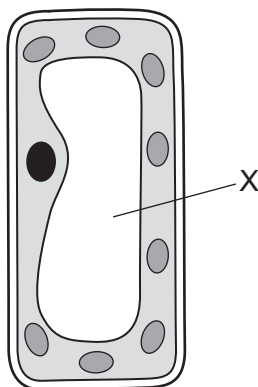
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	animal cell	plant cell
A	cell membrane	cell membrane
B	cell membrane	cell wall
C	cell wall	cell membrane
D	cell wall	cell wall

- 2 Most cars burn fossil fuels to release energy for their movement.

Which characteristic of living organisms is similar to this?

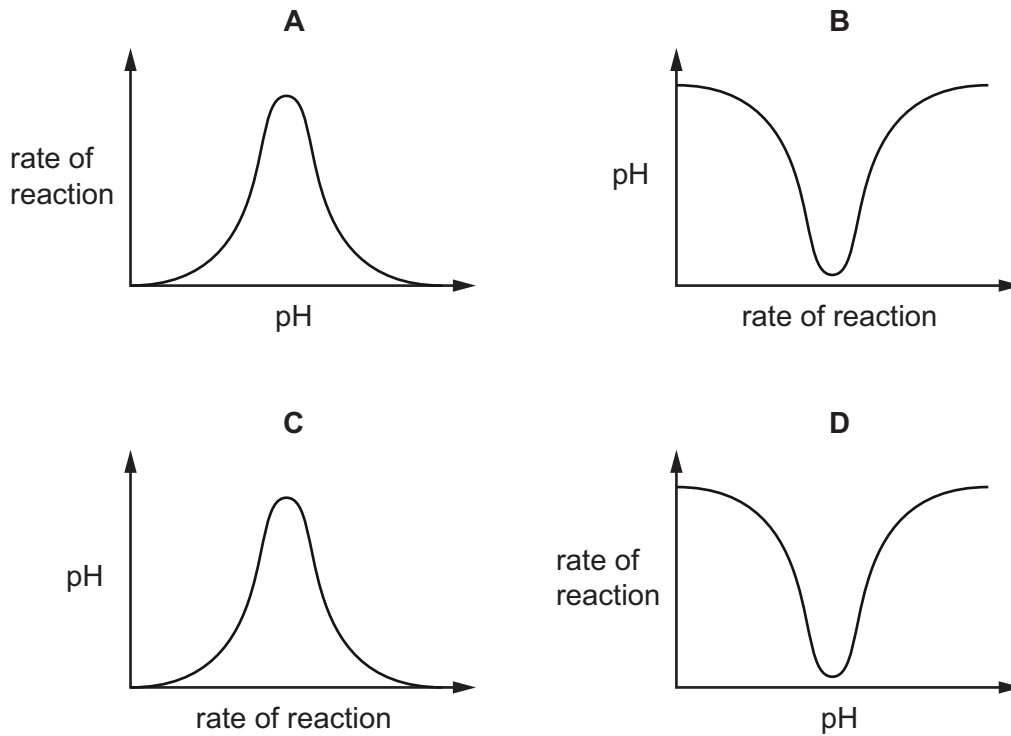
- A** excretion
B growth
C nutrition
D respiration
- 3 The diagram shows a plant palisade mesophyll cell.



What will happen to structure X if this cell is immersed in distilled water or concentrated salty water?

	structure X in distilled water	structure X in concentrated salty water
A	shrink	shrink
B	shrink	swell
C	swell	swell
D	swell	shrink

- 4 Which graph shows how the rate of an enzyme-controlled reaction varies with changes in pH?



- 5 A plant that lives in water is exposed to sunlight. After a short period of time, bubbles of gas are given off from the plant.

Which gas do the bubbles contain, and which process produces this gas?

	gas	process
A	carbon dioxide	photosynthesis
B	carbon dioxide	respiration
C	oxygen	photosynthesis
D	oxygen	respiration

- 6 Which ingredient of a cake contains the **most** protein per gram?

- A** egg
- B** flour
- C** oil
- D** sugar

7 How is water transported in plants?

- A from the leaves to the roots through the phloem
- B from the leaves to the roots through the xylem
- C from the roots to the leaves through the phloem
- D from the roots to the leaves through the xylem

8 Physical activity affects our rate and depth of breathing.

What happens during **increased** physical activity?

	rate of breathing	depth of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

9 Some examples of responses in the body are listed.

- 1 decreased pupil diameter
- 2 increased breathing rate
- 3 increased pulse rate

Which responses are caused by the secretion of adrenaline?

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

10 Some examples of how parts of a plant grow are listed.

- 1 grow away from gravity
- 2 grow away from the direction of light
- 3 grow towards gravity
- 4 grow towards the direction of light

Which growth responses are due to gravitropism?

- A 1, 2 and 4
- B 1 only
- C 1 and 3
- D 3 only

11 Which statement about asexual reproduction is correct?

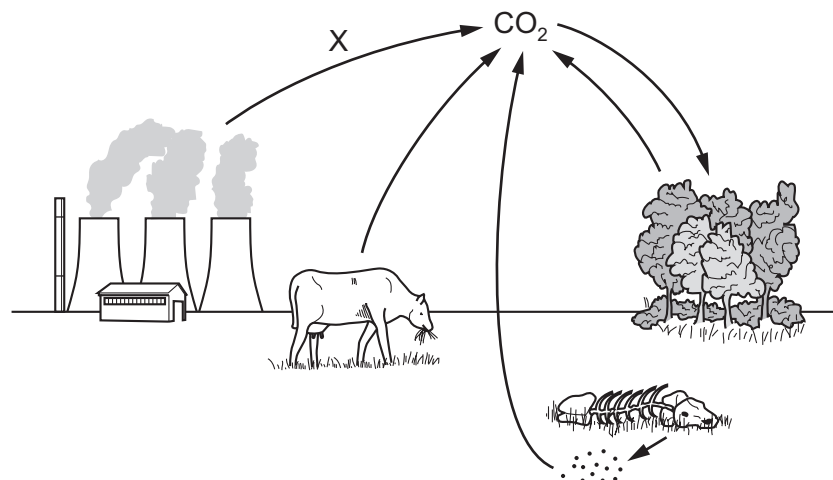
- A It produces genetically different offspring from 1 parent.
- B It produces genetically different offspring from 2 parents.
- C It produces genetically identical offspring from 1 parent.
- D It produces genetically identical offspring from 2 parents.

12 Some organisms obtain their energy from dead or waste organic matter.

Which term describes them?

- A carnivores
- B decomposers
- C herbivores
- D producers

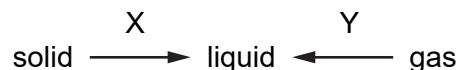
13 The diagram shows part of the carbon cycle.



Which process is the arrow marked X?

- A combustion
- B fossilisation
- C photosynthesis
- D respiration

14 Some changes of state are shown.



What are changes X and Y?

	X	Y
A	freezing	boiling
B	freezing	condensing
C	melting	boiling
D	melting	condensing

15 Three changes are listed.

- 1 Dilute hydrochloric acid is reacted with aqueous sodium hydroxide.
- 2 The mixture formed is then heated until all of the water is evaporated.
- 3 The solid that is formed is then heated until it melts.

Which row describes changes 1, 2 and 3?

	1	2	3
A	chemical	chemical	physical
B	chemical	physical	physical
C	physical	physical	chemical
D	physical	chemical	chemical

16 Substance Z exists as molecules that contain only one type of atom.

What is Z?

- A** a compound
- B** a mixture
- C** an element
- D** a noble gas

17 Which substance contains covalent bonds?

- A** CH₄
- B** KOH
- C** NaCl
- D** PbBr₂

18 Which row shows the correct formula for the named acid?

	acid	formula
A	nitric acid	HCl
B	nitric acid	HNO_3
C	sulfuric acid	HCl
D	sulfuric acid	HNO_3

19 Dilute sulfuric acid breaks down when electricity is passed through it.

What is the name of this process?

- A** cracking
- B** crystallisation
- C** distillation
- D** electrolysis

20 Which statements describe an endothermic reaction?

- 1 Energy is given out.
- 2 Energy is taken in.
- 3 The temperature of the reaction mixture decreases.
- 4 The temperature of the reaction mixture increases.

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

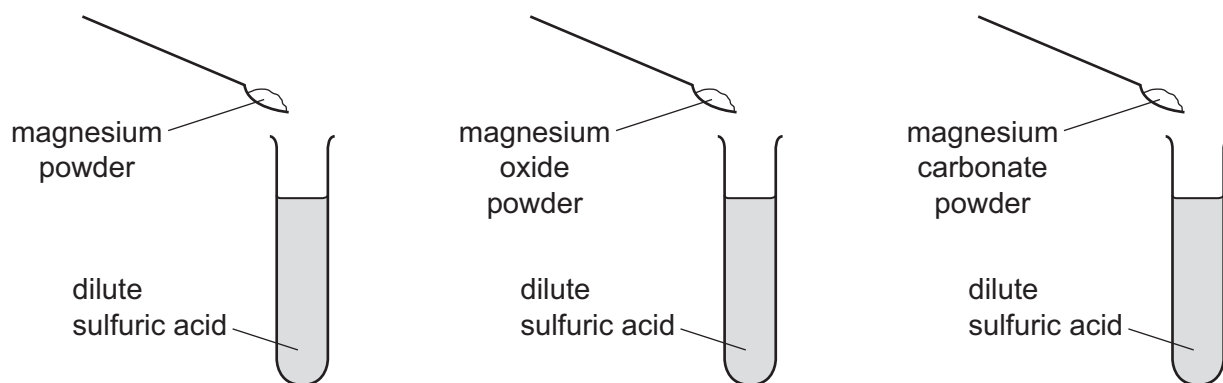
21 Carbon reacts with carbon dioxide at high temperatures.



Which statement about the reaction is correct?

- A** Both carbon and carbon dioxide are oxidised.
- B** Both carbon and carbon dioxide are reduced.
- C** The carbon is oxidised and the carbon dioxide is reduced.
- D** The carbon is reduced and the carbon dioxide is oxidised.

22 Three powders are added to dilute sulfuric acid, as shown.



Which powders react to produce water?

	magnesium	magnesium oxide	magnesium carbonate
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = does produce water

✗ = does not produce water

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

test	result
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

24 Which substance does **not** react with chlorine?

A H₂

B Kr

C Li

D NaBr

25 Copper is below both carbon and hydrogen in the reactivity series.

How is copper extracted?

- A Heat copper sulfate crystals.
- B Heat copper oxide with carbon.
- C Heat copper oxide with carbon dioxide.
- D Heat copper oxide with dilute hydrochloric acid.

26 Which colour change is seen when water is added to anhydrous cobalt(II) chloride?

- A blue to pink
- B blue to white
- C pink to blue
- D white to blue

27 Methane, ethane and propane are all alkanes. Their formulae are shown.

methane, CH_4

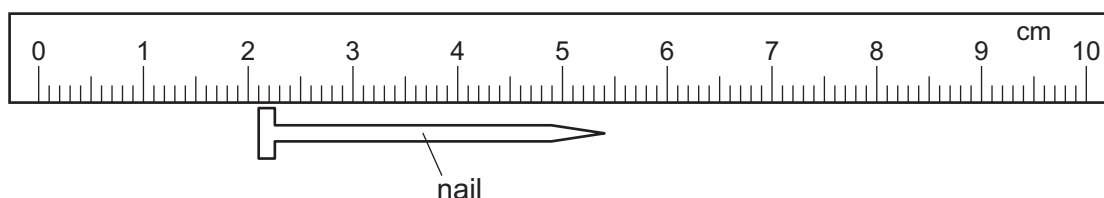
ethane, C_2H_6

propane, C_3H_8

Which statement is **not** correct?

- A All three compounds are hydrocarbons.
- B All three compounds burn.
- C Methane is the main constituent of natural gas.
- D Propane burns completely to form carbon dioxide and hydrogen.

28 A ruler is used to measure the length of a nail, as shown.



What is the length of the nail?

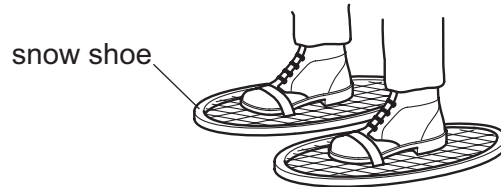
- A 2.1 cm
- B 3.3 cm
- C 5.4 cm
- D 7.5 cm

- 29** A metre rule has a mass of 120 g. The gravitational field strength g is 10 N/kg.

What is the weight of the metre rule?

- A** 1.2 N **B** 1.2 kg **C** 1200 N **D** 1200 kg

- 30** A man walking on snow in normal shoes sinks into the snow. The man puts on snow shoes and does not sink into the snow.



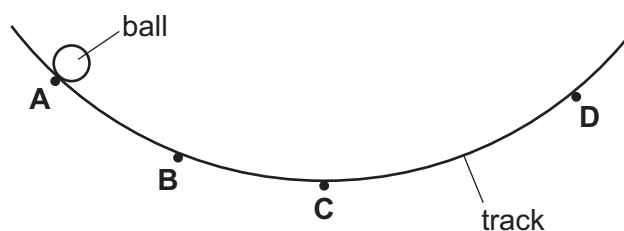
Which row explains why this happens?

	area of contact with snow	weight of man
A	decreased	decreased
B	decreased	unchanged
C	increased	decreased
D	increased	unchanged

- 31** A ball is released from rest at point **A** on a curved track.

The ball rolls along the track past points **B** and **C**, then reaches point **D**.

At which labelled point does the ball have maximum kinetic energy?



- 32** Which group of energy sources consists of only renewable sources?

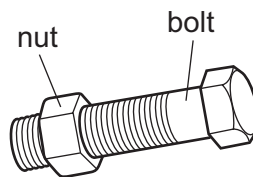
- A** geothermal, nuclear, solar
B geothermal, solar, wind
C nuclear, solar, wind
D oil, geothermal, solar

- 33** Air is trapped in a sealed glass bottle that has a fixed volume.

The temperature of the air in the bottle decreases.

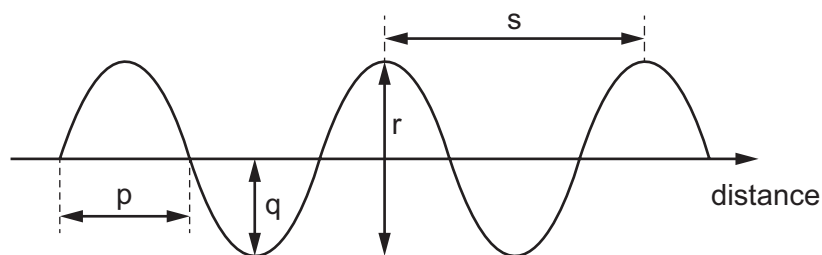
Which statement describes what happens to the air in the bottle?

- A** The average separation of the molecules decreases and the pressure decreases.
 - B** The average separation of the molecules decreases but the pressure remains the same.
 - C** The average separation of the molecules remains the same but the pressure decreases.
 - D** The average separation of the molecules remains the same and the pressure remains the same.
- 34** A mechanic cannot remove a large steel nut from a steel bolt because it is too tight.



What does the mechanic do to help remove the nut?

- A** cool the nut and heat the bolt
 - B** heat the bolt only
 - C** heat the nut and the bolt through the same temperature rise
 - D** heat the nut only
- 35** The diagram represents a wave.



Which row shows the wavelength and the amplitude of the wave?

	wavelength	amplitude
A	p	q
B	p	r
C	s	q
D	s	r

- 36** A student investigating the speed of sound stands at a distance of 50 m from a wall. The student makes a short, sharp sound and then hears an echo from the wall 0.30 s later.

Which calculation gives the speed of the sound in m/s?

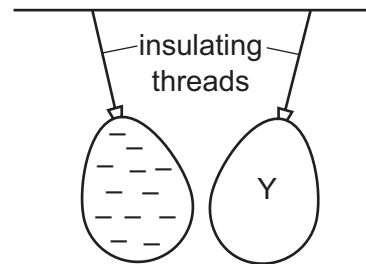
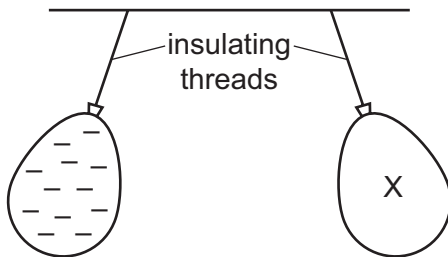
A $\frac{50}{0.60}$

B $\frac{50}{0.30}$

C $\frac{100}{0.60}$

D $\frac{100}{0.30}$

- 37** 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?

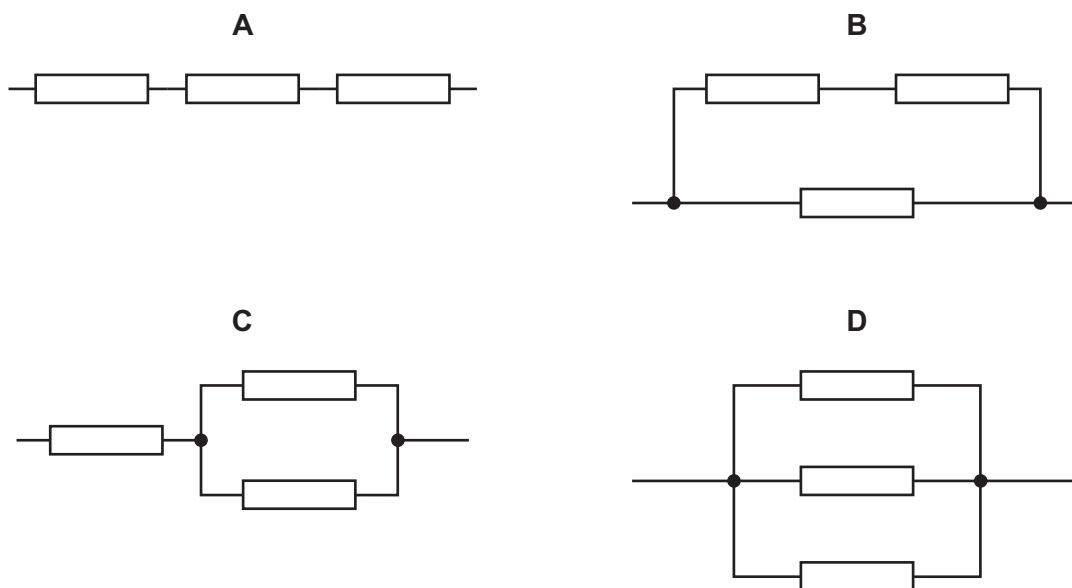
	balloon X	balloon Y
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

- 38** Which row gives the units for resistance and potential difference (p.d.)?

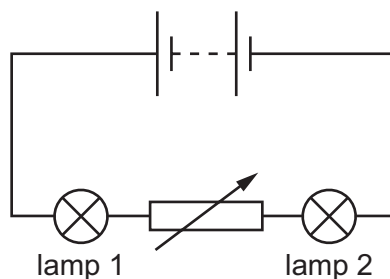
	resistance	p.d.
A	ohm	ampere
B	ohm	volt
C	volt	ampere
D	volt	volt

39 The diagrams show three identical resistors connected in different arrangements.

Which arrangement has the greatest resistance?



40 A circuit contains two lamps and a variable resistor.



The resistance of the variable resistor is increased.

What happens to the brightness of lamp 1 and what happens to the brightness of lamp 2?

	brightness of lamp 1	brightness of lamp 2
A	decreases	decreases
B	decreases	increases
C	no change	decreases
D	no change	increases

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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
	11 Na sodium 23																
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 —	118 Og oganeson —	119 Ts tennessine —	120 Nh nihonium —	121 Lr lawrencium —

lanthanoids

actinoids

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



Cambridge IGCSE™

COMBINED SCIENCE

0653/13

Paper 1 Multiple Choice (Core)

May/June 2022

45 minutes

You must answer on the multiple choice answer sheet.

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

INSTRUCTIONS

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

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 What is the outermost layer of an animal cell and a plant cell?

	animal cell	plant cell
A	cell membrane	cell membrane
B	cell membrane	cell wall
C	cell wall	cell membrane
D	cell wall	cell wall

- 2 Most cars burn fossil fuels to release energy for their movement.

Which characteristic of living organisms is similar to this?

- A** excretion
 - B** growth
 - C** nutrition
 - D** respiration
- 3 What is the definition of diffusion?
- A** the downward movement of particles in the atmosphere
 - B** the movement of particles down a concentration gradient
 - C** the movement of molecules against a concentration gradient
 - D** the movement of particles from a hotter to a cooler region
- 4 Which large molecules are made from smaller molecules of glucose?
- A** amino acids and fatty acids
 - B** glycogen and glycerol
 - C** glycerol and fatty acids
 - D** starch and glycogen

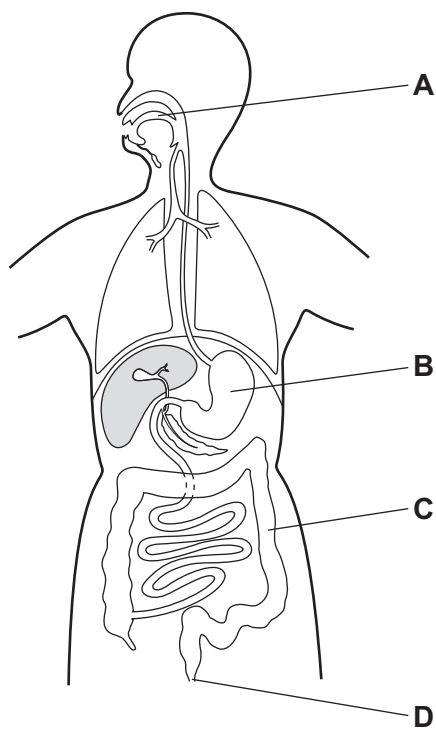
- 5 A plant that lives in water is exposed to sunlight. After a short period of time, bubbles of gas are given off from the plant.

Which gas do the bubbles contain, and which process produces this gas?

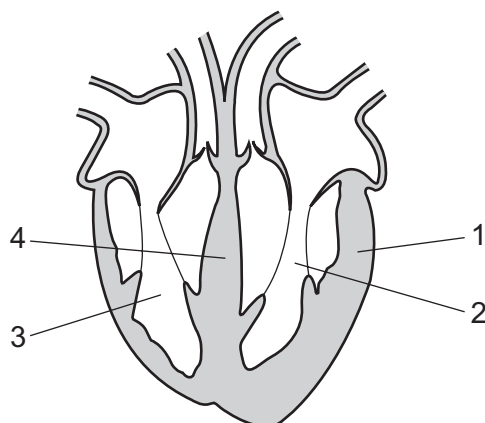
	gas	process
A	carbon dioxide	photosynthesis
B	carbon dioxide	respiration
C	oxygen	photosynthesis
D	oxygen	respiration

- 6 The diagram shows the human alimentary canal and associated organs.

Where does egestion occur?



- 7 The diagram shows a cross-section of a human heart.



Which numbers correctly identify the parts of the heart?

	muscular wall	septum	left ventricle
A	1	4	2
B	1	4	3
C	4	1	2
D	4	1	3

- 8 Which route does inspired air take to reach the alveoli?

- A** larynx → trachea → bronchi → bronchioles
B larynx → trachea → bronchioles → bronchi
C trachea → larynx → bronchi → bronchioles
D trachea → larynx → bronchioles → bronchi

- 9 Physical activity affects our rate and depth of breathing.

What happens during **increased** physical activity?

	rate of breathing	depth of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

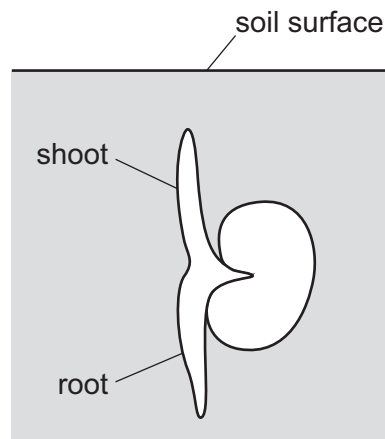
10 Some statements about adrenaline are listed.

- 1 It has one target organ.
- 2 It is a hormone.
- 3 It is produced by a gland.
- 4 It is transported in the blood.

Which statements are correct?

- A** 1, 2 and 3 only
B 1, 2 and 4 only
C 2, 3 and 4 only
D 1, 2, 3 and 4

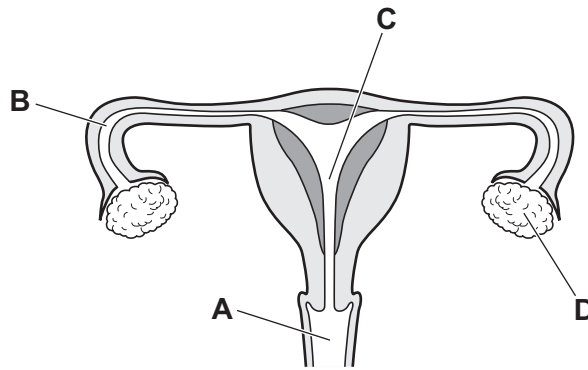
11 The diagram shows a seed germinating in soil.



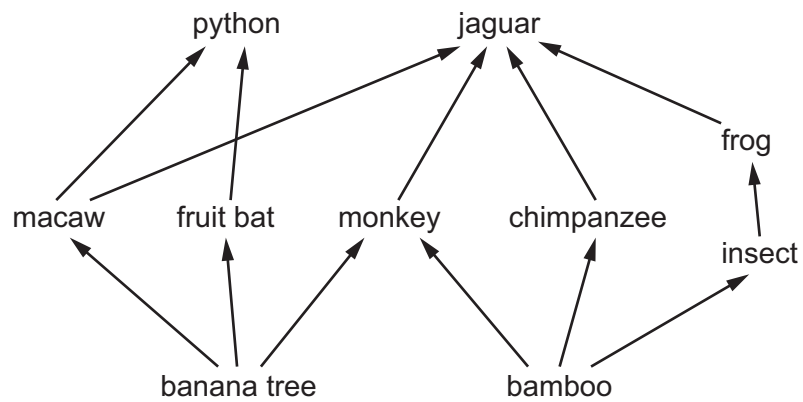
Which tropic responses are taking place in the shoot and root while they are still underground?

	shoot	root
A	gravitropism	gravitropism
B	gravitropism	phototropism
C	phototropism	gravitropism
D	phototropism	phototropism

12 In which part of the female reproductive system does fertilisation usually take place?



13 The diagram shows part of a food web.



Which type of organism is a fruit bat?

- A carnivore
- B decomposer
- C herbivore
- D producer

14 Which statement describes a molecule?

- A It consists of one nucleus surrounded by electrons.
- B It consists of two or more atoms bonded together.
- C It has a negative charge because it has gained electrons.
- D It has a positive charge because it has lost electrons.

- 15 When solid sodium carbonate is added to dilute hydrochloric acid, it dissolves and carbon dioxide is given off.

Which statement is correct?

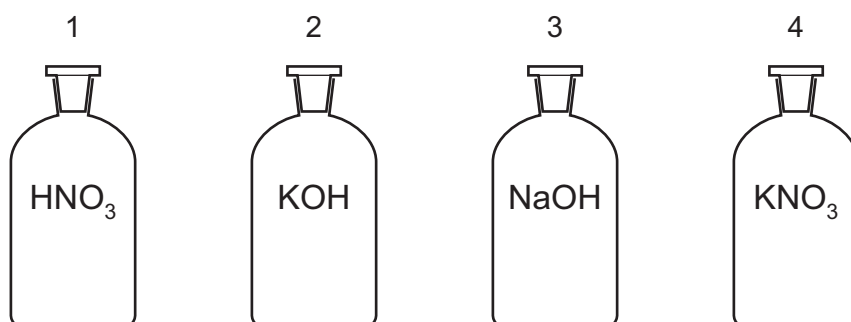
- A This is a chemical change because sodium carbonate dissolves.
 - B This is a chemical change because the acid reacts with sodium carbonate.
 - C This is a physical change because sodium carbonate dissolves.
 - D This is a physical change because the acid reacts with sodium carbonate.
- 16 Which statement about non-metallic elements is correct?
- A They are hard.
 - B They are malleable.
 - C They conduct electricity.
 - D They have low densities.

- 17 Which compound contains covalent bonds?

A HCl B NaCl C KCl D CaCl_2

- 18 Potassium nitrate can be made by the reaction of dilute nitric acid and aqueous potassium hydroxide.

Bottles containing four different aqueous solutions are shown.



Which aqueous solutions are used to make potassium nitrate?

- A 1 and 2
 - B 1 and 4
 - C 2 and 3
 - D 3 and 4
- 19 What is **not** needed for electrolysis?
- A a bulb
 - B a power supply
 - C an electrolyte
 - D electrodes

20 Which change occurs during an endothermic reaction?

- A The mass of a solid changes from 2.0 g to 2.5 g.
- B The pH of a mixture changes from 5 to 7.
- C The temperature of a mixture changes from 22 °C to 18 °C.
- D The volume of a gas changes from 2.0 dm³ to 1.0 dm³.

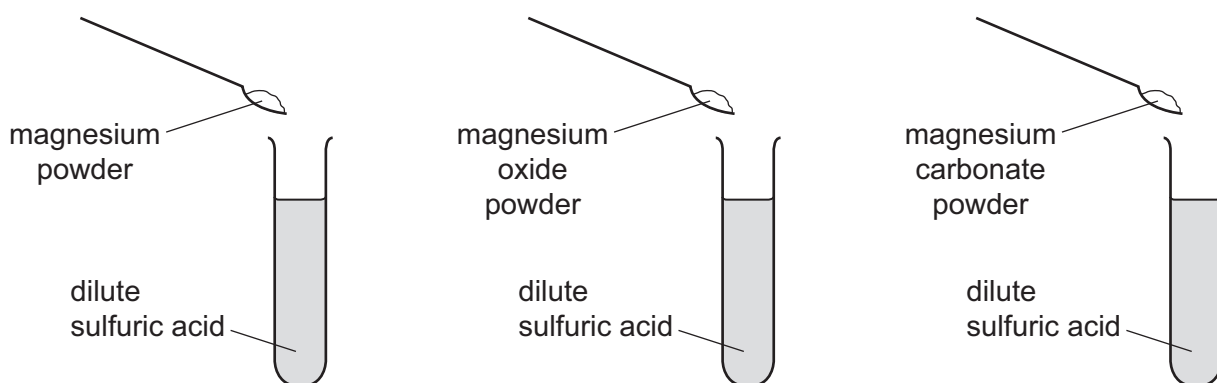
21 Carbon reacts with carbon dioxide at high temperatures.



Which statement about the reaction is correct?

- A Both carbon and carbon dioxide are oxidised.
- B Both carbon and carbon dioxide are reduced.
- C The carbon is oxidised and the carbon dioxide is reduced.
- D The carbon is reduced and the carbon dioxide is oxidised.

22 Three powders are added to dilute sulfuric acid, as shown.



Which powders react to produce water?

	magnesium	magnesium oxide	magnesium carbonate
A	✓	✓	x
B	✓	x	x
C	x	✓	✓
D	x	x	✓

key

✓ = does produce water

x = does not produce water

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

test	result
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

24 Which substance does **not** react with chlorine?

- A** H₂ **B** Kr **C** Li **D** NaBr

25 Which statement about the treatment of the water supply is correct?

- A** After filtration and chlorination, the water contains no impurities.
B Chlorine is added to remove dissolved impurities.
C Water is filtered and chlorinated to remove solids and kill bacteria.
D Water is filtered to remove dissolved impurities.

26 A large quantity of damp iron filings is added to clean air in a sealed container.

The container is left for several weeks.

The composition of the air in the container changes.

Which gas decreases in composition?

- A** argon
B carbon dioxide
C nitrogen
D oxygen

27 Methane, ethane and propane are all alkanes. Their formulae are shown.

methane, CH_4

ethane, C_2H_6

propane, C_3H_8

Which statement is **not** correct?

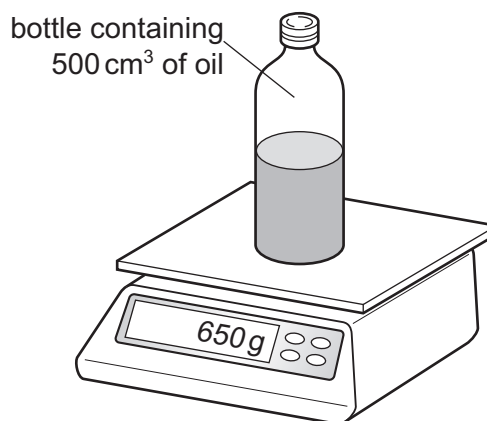
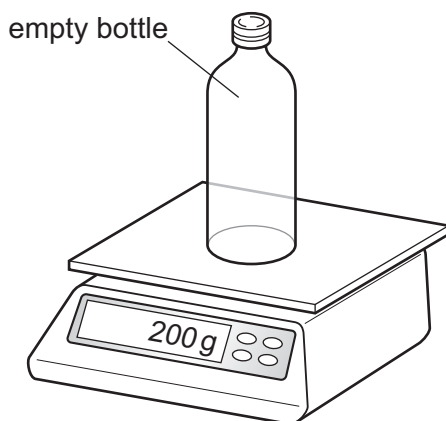
- A All three compounds are hydrocarbons.
- B All three compounds burn.
- C Methane is the main constituent of natural gas.
- D Propane burns completely to form carbon dioxide and hydrogen.

28 A student has 50 identical sheets of paper.

Which procedure is used to find the thickness of one sheet of paper?

- A Measure the thickness of 50 sheets and then add the thickness of 49 sheets.
- B Measure the thickness of 50 sheets and then divide by 50.
- C Measure the thickness of 50 sheets and then multiply by 50.
- D Measure the thickness of 50 sheets and then multiply by the thickness of 49 sheets.

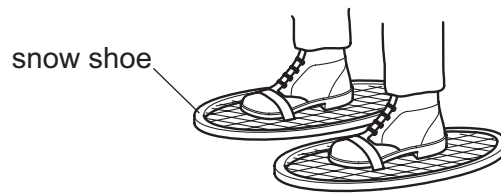
29 The mass of an empty bottle is 200 g. The mass of the bottle when it contains 500 cm^3 of oil is 650 g.



What is the density of the oil?

- A 0.40 g/cm^3
- B 0.90 g/cm^3
- C 1.3 g/cm^3
- D 1.7 g/cm^3

- 30** A man walking on snow in normal shoes sinks into the snow. The man puts on snow shoes and does not sink into the snow.



Which row explains why this happens?

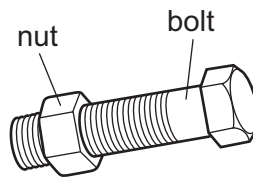
	area of contact with snow	weight of man
A	decreased	decreased
B	decreased	unchanged
C	increased	decreased
D	increased	unchanged

- 31** A man lifts four heavy boxes from the ground onto a high shelf, one at a time.

When does he develop the greatest power?

- A** lifting a box of mass 20 kg in 3.0 s
 - B** lifting a box of mass 20 kg in 4.0 s
 - C** lifting a box of mass 30 kg in 3.0 s
 - D** lifting a box of mass 30 kg in 4.0 s
- 32** Which two energy resources are both non-renewable?
- A** coal and tides
 - B** coal and wind
 - C** oil and coal
 - D** oil and tides

- 33** A mechanic cannot remove a large steel nut from a steel bolt because it is too tight.



What does the mechanic do to help remove the nut?

- A** cool the nut and heat the bolt
 - B** heat the bolt only
 - C** heat the nut and the bolt through the same temperature rise
 - D** heat the nut only
- 34** A tank is full of water. The water at the bottom of the tank is heated.

Eventually all the water in the tank becomes hot.

What is the main method of energy transfer in the water?

- A** conduction
 - B** convection
 - C** evaporation
 - D** radiation
- 35** A boat uses sound to find the depth of the ocean.

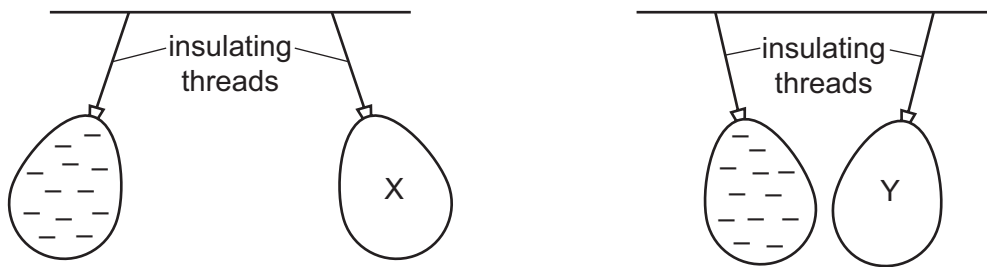
A sound wave is directed from the boat towards the ocean floor, and 4.4 s later an echo is received back at the boat.

The speed of sound in water is 1500 m/s.

How deep is the ocean under the boat?

- A** 340 m **B** 680 m **C** 3300 m **D** 6600 m

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



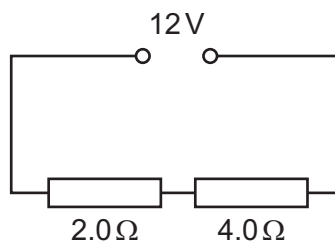
What is the charge on balloon X and what is the charge on balloon Y?

	balloon X	balloon Y
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

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

	p.d.	e.m.f.
A	ampere	newton
B	ampere	volt
C	volt	newton
D	volt	volt

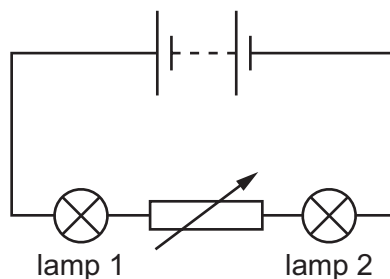
- 38 A 2.0Ω resistor and a 4.0Ω resistor are connected in series to a 12 V power supply.



What is the current in the 2.0Ω resistor?

- A** 0.50 A **B** 2.0 A **C** 3.0 A **D** 6.0 A

- 39 A circuit contains two lamps and a variable resistor.



The resistance of the variable resistor is increased.

What happens to the brightness of lamp 1 and what happens to the brightness of lamp 2?

	brightness of lamp 1	brightness of lamp 2
A	decreases	decreases
B	decreases	increases
C	no change	decreases
D	no change	increases

- 40 What is the purpose of a fuse in an electric circuit?

- A** to disconnect the circuit if the current becomes too large
- B** to increase the voltage if the current becomes too small
- C** to prevent someone cutting the insulation of the wiring
- D** to stop water getting into the circuit

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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.).