



Cambridge IGCSE™

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/23

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 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

- 3 The enzyme salivary amylase starts digesting starchy foods in the mouth.

This stops when the food reaches the stomach.

Why does this happen?

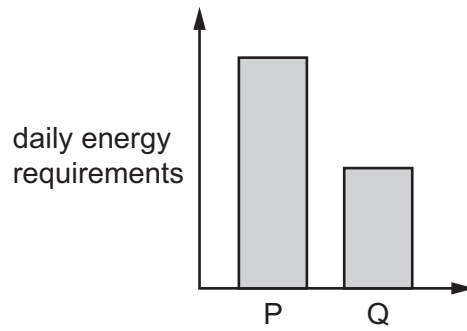
- A** The acid in the stomach slows down all reactions.
- B** The shape of the active site of the enzyme is altered by the low pH.
- C** The kinetic energy of molecules is reduced by acids.
- D** The shape of the substrate molecules is changed.

- 4 Stomata are found in the leaves of plants.

What is their main function?

- A** gas exchange
- B** structural support
- C** transport of food molecules
- D** transport of water

- 5 The graph shows the daily energy requirements for two people, P and Q.

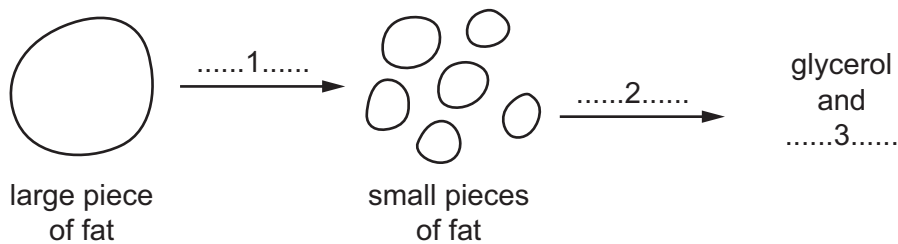


Which statements could describe P and Q?

- 1 P is a mother who is breast-feeding her baby and Q is a mother who is bottle-feeding her baby.
- 2 P is a 20-year-old adult male and Q is a 20-year-old adult female.
- 3 P is an office worker and Q is a professional cyclist.

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

- 6 The diagram shows the digestion of fat.



Which row completes gaps 1, 2 and 3 in the diagram?

	1	2	3
A	chemical digestion	chemical digestion	amino acids
B	chemical digestion	mechanical digestion	fatty acids
C	mechanical digestion	mechanical digestion	amino acids
D	mechanical digestion	chemical digestion	fatty acids

- 7 Which statement about root hair cells is correct?

- A** They are present in large numbers to increase the absorption of water.
- B** They are only present in young seedlings before major roots grow.
- C** They are branched to help prevent the wind dislodging a plant.
- D** They have a large surface area to allow carbon dioxide uptake.

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

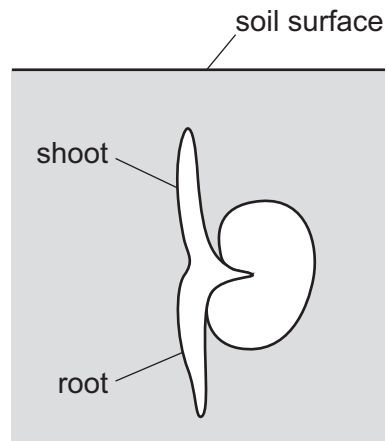
9 Some statements about adrenaline are listed.

- 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

10 The diagram shows a seed germinating in soil.

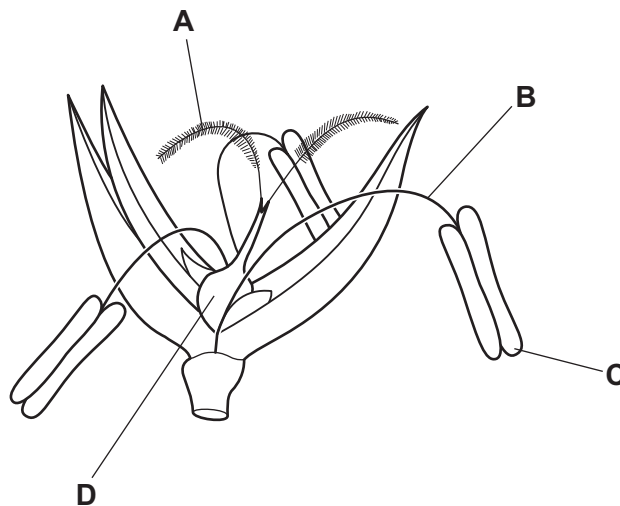


Which tropic responses are taking place in the shoot and root while they are still underground?

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

11 The diagram shows a typical wind-pollinated flower.

Which structure is the stigma?



- 12** During sexual intercourse the penis transfers sperm cells to the vagina.

What is the pathway for sperm cells from their site of production to the vagina?

- A** sperm ducts → testes → urethra → vagina
- B** testes → sperm ducts → urethra → vagina
- C** testes → urethra → sperm ducts → vagina
- D** urethra → testes → sperm ducts → vagina

- 13** The diagram shows a food chain from an ocean ecosystem.

microscopic plants → krill → small fish → tuna → shark

What is the trophic level of the tuna?

- A** primary consumer
- B** quaternary consumer
- C** secondary consumer
- D** tertiary consumer

- 14** 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.

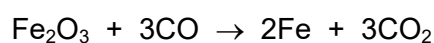
- 15** Which statement about non-metallic elements is correct?

- A** They are hard.
- B** They are malleable.
- C** They conduct electricity.
- D** They have low densities.

- 16 Which statement about the movement of particles during the electrolysis of dilute sulfuric acid is correct?
- A** Anions move to the negative electrode and lose electrons.
- B** Electrons travel through the electrolyte from the cathode to the anode.
- C** Electrons travel through the external circuit from the anode to the cathode.
- D** Positive ions move to the anode and gain electrons.
- 17 Which row describes what happens to the frequency of collisions between reacting particles and the energy of these collisions when the concentration of the reactants is decreased?

	frequency of collisions	energy of collisions
A	decreases	decreases
B	decreases	no change
C	increases	decreases
D	increases	no change

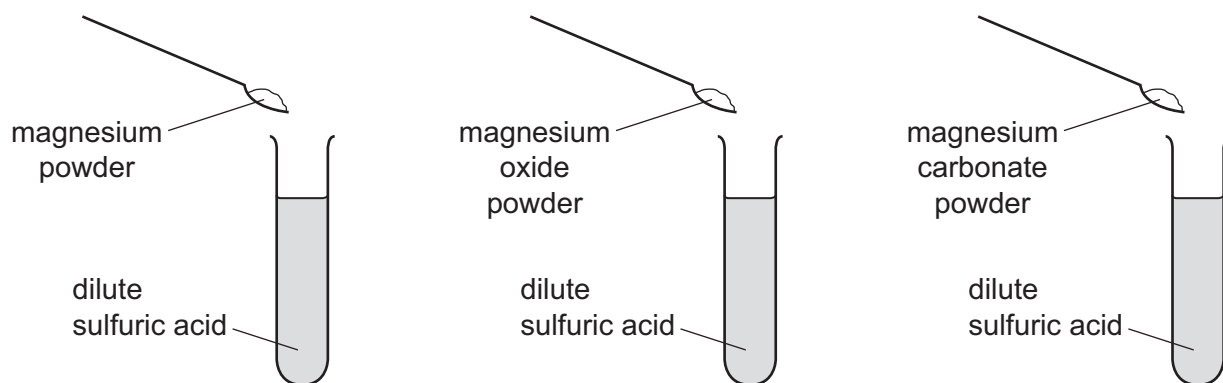
- 18 The equation for a reaction that occurs in the blast furnace is shown.



Which statement about the reaction is correct?

- A** Fe_2O_3 is the oxidising agent.
- B** CO_2 is the reducing agent.
- C** CO is reduced.
- D** Fe_2O_3 is oxidised.

19 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

20 Salt X is produced in the reaction between solid Y and acid Z.

The following method is used to prepare crystals of salt X.

- Solid Y is added to acid Z until no further reaction occurs.
- Any unreacted solid Y is removed by filtration.
- The filtrate is evaporated to the point of crystallisation and left to cool.
- Salt X crystallises.

Which row shows the substances that can be used to produce a salt by using this method?

	solid Y	acid Z	salt X
A	insoluble copper	dilute hydrochloric acid	soluble copper(II) chloride
B	insoluble lead carbonate	dilute sulfuric acid	insoluble lead sulfate
C	soluble sodium hydroxide	dilute hydrochloric acid	soluble sodium chloride
D	insoluble zinc oxide	dilute sulfuric acid	soluble zinc sulfate

21 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

22 In which mixture is the aqueous metal ion displaced by the metal?

A Cu^{2+} and Zn **B** Fe^{2+} and Cu **C** Mg^{2+} and Zn **D** Zn^{2+} and Fe

23 Iron is extracted from iron(III) oxide in the blast furnace.

Which reaction produces the heat to maintain a high temperature in the furnace?

- A** calcium carbonate $\rightarrow$ calcium oxide + carbon dioxide
B carbon + oxygen $\rightarrow$ carbon dioxide
C iron(III) oxide + carbon monoxide $\rightarrow$ iron + carbon dioxide
D silicon dioxide + calcium oxide $\rightarrow$ calcium silicate

24 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.

- 25 Which statement best describes the members of a homologous series?
- A They have different general formulae and different chemical properties.
 - B They have different general formulae and similar chemical properties.
 - C They have the same general formula and different chemical properties.
 - D They have the same general formula and similar chemical properties.

- 26 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.
- 27 Which substance rapidly turns aqueous bromine from orange to colourless?
- A ethane
 - B ethanol
 - C ethene
 - D methane

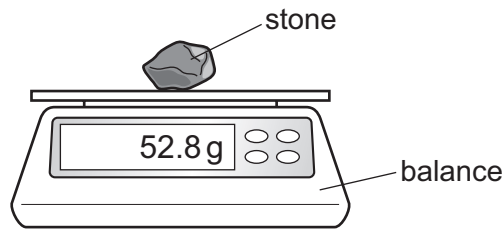
- 28 A climber climbs a mountain.

The gravitational field strength at the top of the mountain is less than it is at the bottom.

How do the mass and the weight of the climber at the top compare with the mass and the weight at the bottom?

	mass at top compared with mass at bottom	weight at top compared with weight at bottom
A	less	less
B	less	the same
C	the same	less
D	the same	the same

- 29** A stone is placed on a balance. The reading on the balance is shown.



The stone is lowered carefully into a measuring cylinder that contains 50 cm^3 of water. The level of the water in the measuring cylinder rises to the 72 cm^3 mark.

What is the density of the stone?

- A** 0.42 g/cm^3 **B** 0.73 g/cm^3 **C** 1.36 g/cm^3 **D** 2.40 g/cm^3
- 30** A man lifts four heavy boxes from the ground onto a high shelf, one at a time.

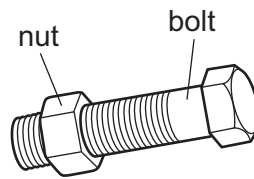
When does he develop the greatest power?

- 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
- 31** The volume of a gas decreases and the temperature of the gas increases.

Which row describes the changes to the separation and to the speed of the gas molecules?

	separation	speed
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 32** 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

- 33** What is the main method of thermal energy transfer in liquids?

- A** conduction
- B** convection
- C** absorption
- D** radiation

- 34** Light travels at a speed of 3.0×10^8 m/s in a vacuum.

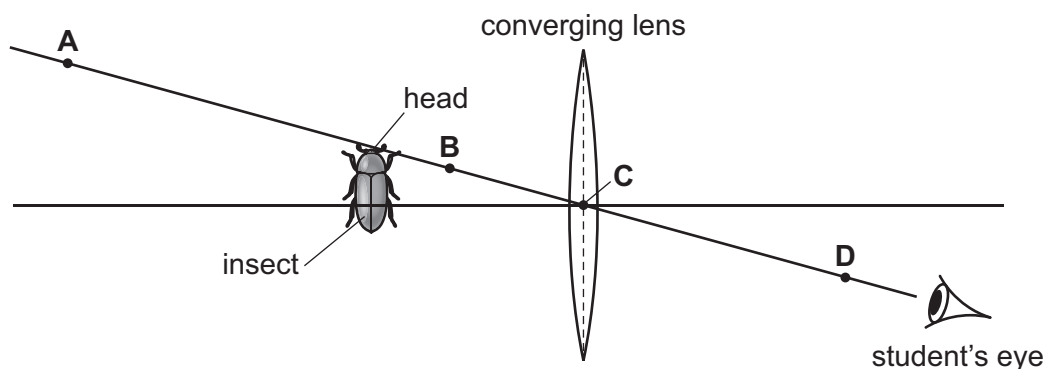
A radio station transmits radio waves at a frequency of 9.1×10^7 Hz.

What is the wavelength of the radio waves?

- A** 0.30 m
- B** 0.33 m
- C** 3.0 m
- D** 3.3 m

- 35** A student uses a converging lens as a magnifying glass to view an insect.

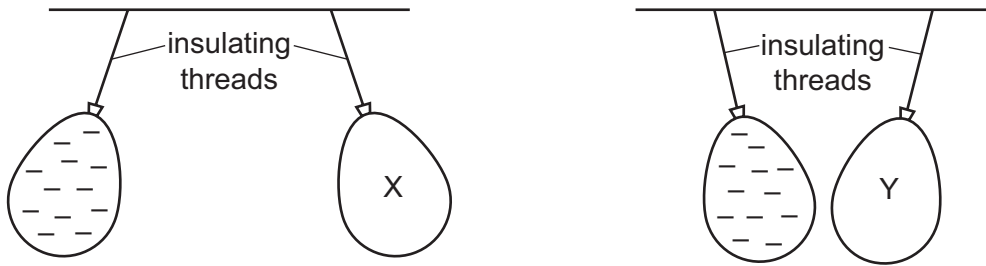
Which labelled point is a possible position for the image of the head of the insect?



36 Where does sound travel at the greatest speed?

- A in a gas
- B in a liquid
- C in a solid
- D in a vacuum

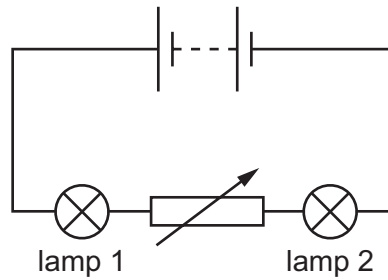
37 Two balloons X and Y are suspended by insulating threads. They are each held near a negatively charged balloon. The balloons hang as shown.



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 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

- 39 A torch (flashlight) contains a 3.0 V battery. When the torch is switched on the current in the battery is 0.50 A.

How much energy is transferred by the battery in 1.0 minute?

- A** 1.5 J **B** 6.0 J **C** 90 J **D** 360 J

- 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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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																	12 Mg magnesium 24
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 —	117 Ts tennessine —	118 Og oganesson —	119 Nh nihonium —	120 Lr lawrencium —

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.).