Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/21**

Paper 2 Multiple Choice (Extended) **October/November 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.

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[Turn over

1 What are characteristics of all living organisms?

A breathing, excretion, nutrition

B excretion, growth, nutrition

C reproduction, respiration, germination

D secretion, growth, sensitivity

2 Which row describes a correct structural adaptation for red blood cells and for cells lining the trachea?

	red blood cells	cells lining the trachea
A	nucleus absent	cilia present
B	nucleus present	cilia present
C	nucleus absent	small surface area
D	nucleus present	small surface area

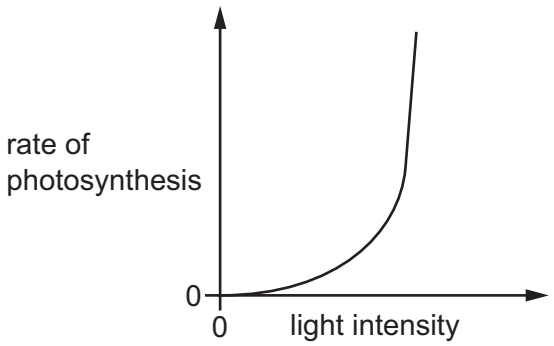
3 A student tests samples of four different foods.

Which row is the correct result for a sample containing only fat and starch?

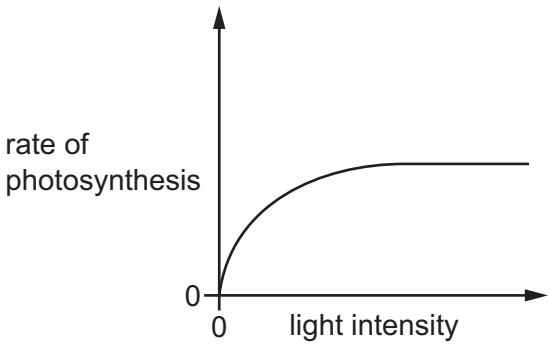
	Benedict's solution	biuret test	ethanol emulsion	iodine solution
A	blue	purple	clear	blue-black
B	blue	blue	cloudy	blue-black
C	red	purple	clear	brown
D	red	blue	cloudy	brown

4 Which graph correctly shows the effect of varying light intensity on the rate of photosynthesis?

A



B



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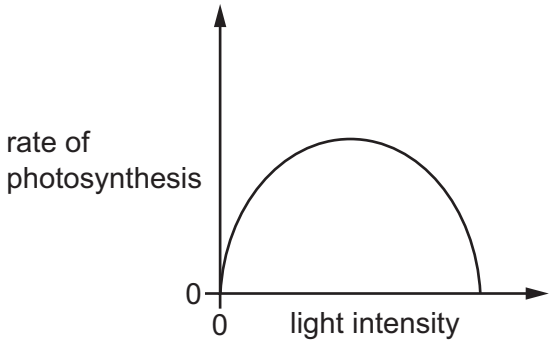

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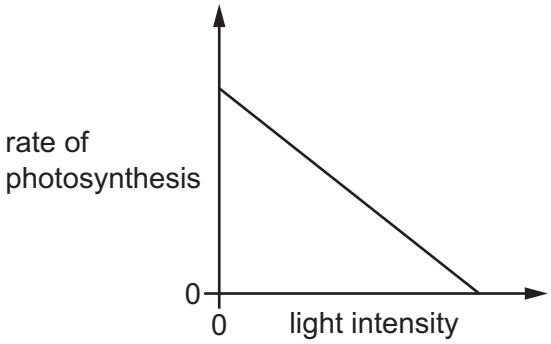


5 Which row correctly matches the type of digestion to its effect on the food particles?

	type of digestion	makes smaller	makes soluble
A	chemical	no	yes
B	chemical	yes	yes
C	mechanical	no	no
D	mechanical	yes	yes

[Turn over

6 A student investigates factors affecting the rate of transpiration in a plant.

Which row shows the correct effects on the rates of transpiration?

	increase temperature	decrease humidity
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

7 Which structures in the circulatory system ensure the one-way flow of blood?

A arteries

B atria

C valves

D ventricles

8 When at rest, a student measures his rate of breathing and the volume of air inspired.

number of breaths per minute	volume of air inspired per minute / dm^3
12	6.0

He then runs 400 m and immediately measures his breathing again.

Which set of results does he obtain?

	number of breaths per minute	volume of air inspired per minute / dm^3
A	12	6.0
B	12	12.5
C	30	6.0
D	30	12.5

9 What is the word equation for aerobic respiration?

A carbon dioxide + chlorophyll → glucose + oxygen

B carbon dioxide + glucose → oxygen + water

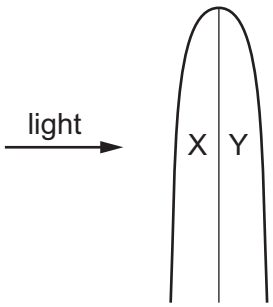
C glucose + oxygen → carbon dioxide + water

D oxygen + light energy → carbon dioxide + water

10 Which row shows the correct changes when the hormone adrenaline is secreted?

	blood glucose	breathing rate	pulse rate
A	decreases	decreases	decreases
B	increases	decreases	increases
C	decreases	increases	decreases
D	increases	increases	increases

11 Light shines on a shoot tip from the direction shown.



After three days, the shoot tip has bent towards the light.

What is the reason for this change?

A Auxin moves away from the light causing cell elongation in area Y.

B Auxin moves away from the light preventing cell elongation in area Y.

C Auxin moves towards the light causing cell elongation in area X.

D Auxin moves towards the light preventing cell elongation in area X.

[Turn over

12 Which environmental conditions are necessary for seeds to germinate?

	oxygen	suitable temperature	sunlight	water
A	yes	yes	yes	no
B	yes	yes	no	yes
C	no	no	yes	yes
D	no	yes	no	yes

13 What is the function of amniotic fluid?

A to cushion the fetus

B to remove carbon dioxide

C to supply nutrients

D to supply oxygen

14 Which particles are present in the nuclei of hydrogen atoms, ${}_{1}^{1}H$?

A electrons and neutrons

B electrons only

C protons and neutrons

D protons only

15 Which statement explains the difference in boiling point between ionic and covalent compounds?

A The boiling point of covalent compounds is higher because covalent bonds are stronger than ionic bonds.

B The boiling point of covalent compounds is higher because the attractive forces between covalent molecules are stronger than the attractive forces between ions.

C The boiling point of ionic compounds is higher because the attractive forces between ions are stronger than covalent bonds.

D The boiling point of ionic compounds is higher because the attractive forces between ions are stronger than the attractive forces between covalent molecules.

16 Aqueous sodium hydroxide is added to aqueous aluminium sulfate.

A white precipitate of aluminium hydroxide is formed.

The ionic equation for this reaction is shown.

$$Al^{3+}(aq) + 3OH^{-}(aq) \rightarrow Al(OH)_3(s)$$

What is the full symbol equation for this reaction?

A $AlSO_4(aq) + 3NaOH(aq) \rightarrow Al(OH)_3(s) + Na_3SO_4(aq)$

B $Al_2(SO_4)_3(aq) + NaOH(aq) \rightarrow Al(OH)_3(s) + Na_2SO_4(aq)$

C $Al_2(SO_4)_3(aq) + 6NaOH(aq) \rightarrow 2Al(OH)_3(s) + 3Na_2SO_4(aq)$

D $Al_3(SO_4)_2(aq) + 9NaOH(aq) \rightarrow 3Al(OH)_3(s) + 2Na_2SO_4(aq)$

17 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which statement is correct?

A Chloride ions lose electrons at the cathode.

B Hydrogen ions gain electrons at the cathode.

C Oxide ions gain electrons at the anode.

D Sodium ions gain electrons at the cathode.

18 Which statements explain why the rate of a reaction increases when the temperature is increased?

1 More of the colliding molecules have enough energy to react.

2 The molecules are closer together, so they collide more frequently.

3 The molecules are further apart, so they collide less frequently.

4 The molecules are moving faster, so they collide more frequently.

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

[Turn over

19 The word equation represents the reaction between substance J and hydrochloric acid.

substance J + hydrochloric acid → magnesium chloride + hydrogen

What is substance J?

A magnesium

B magnesium carbonate

C magnesium hydroxide

D magnesium oxide

20 Which pair of gases can be identified using damp litmus paper and limewater?

A carbon dioxide and hydrogen

B chlorine and carbon dioxide

C chlorine and oxygen

D hydrogen and chlorine

21 Aqueous potassium halides are mixed with aqueous halogens as listed.

1 potassium bromide + iodine

2 potassium chloride + bromine

3 potassium iodide + chlorine

4 potassium iodide + bromine

Which mixtures produce a chemical reaction?

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

22 Which properties are shown by transition elements?

1 They form coloured compounds.

2 They have low melting points.

3 They have low densities.

4 They can act as catalysts.

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

23 Which statement about reactions in the blast furnace is **not** correct?

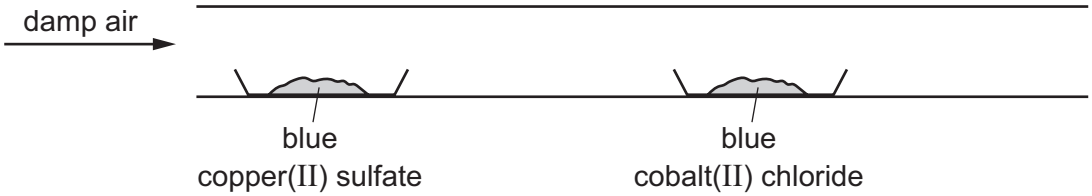
A Carbon is oxidised by oxygen.

B Carbon is oxidised by carbon dioxide.

C Carbon dioxide is reduced by iron oxide.

D Iron oxide is reduced by carbon monoxide.

24 Damp air is passed through a tube containing blue copper(II) sulfate and blue cobalt(II) chloride.



What is observed?

	copper(II) sulfate	cobalt(II) chloride
A	turns white	turns pink
B	turns white	no change
C	no change	turns pink
D	no change	no change

25 Naphtha and diesel oil are two fractions obtained from the fractional distillation of petroleum.

Which statement about naphtha and diesel oil is correct?

A Molecules in naphtha are smaller than molecules in diesel oil.

B Naphtha has a higher boiling point range than diesel oil.

C Naphtha is less volatile than diesel oil.

D Naphtha is removed from the fractionating column at a lower level than diesel oil.

26 The formula of the hydrocarbon octane is C_8H_{18}.

What are the products of the complete combustion of octane?

A carbon and hydrogen

B carbon and water

C carbon dioxide and water

D carbon monoxide and water

[Turn over

27 Which process is an example of thermal decomposition?

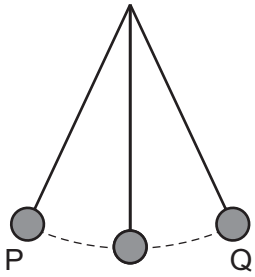
A cracking an alkane

B electrolysis of molten lead(II) bromide

C extraction of iron in the blast furnace

D fractional distillation of petroleum

28 A pendulum swings repeatedly from P to Q and back to P.



A stop-watch is used to find the period of the pendulum.

Which method gives the most accurate value for the period?

A timing how long it takes to go from P to Q

B timing how long it takes to go from P to Q to P

C timing how long it takes to go from P to Q to P 10 times, and dividing this time by 10

D timing how long it takes to go from P to Q to P 10 times, and multiplying this time by 10

29 When a spring is stretched by a force of 20 N, its length increases from 3.2 cm to 5.4 cm.

What is the spring constant of the spring?

A 0.11 N / cm **B** 0.27 N / cm **C** 3.7 N / cm **D** 9.1 N / cm

30 The diagram shows a tank containing a liquid.

The base of the tank is rectangular and has dimensions 0.20 m by 0.50 m.

The mass of the liquid is 60 kg and its depth is 0.10 m.

Gravitational field strength g = 10 N / kg.

What is the pressure exerted on the base of the tank by the liquid?

A 60 Pa **B** 600 Pa **C** 6000 Pa **D** 60 000 Pa

31 A piece of scientific equipment is taken from the Earth to a distant planet.

Which row describes the properties of the equipment on the distant planet?

	mass	weight
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = the same as on Earth

✗ = different on each planet

32 For which energy resource is energy stored as gravitational potential energy?

A geothermal energy

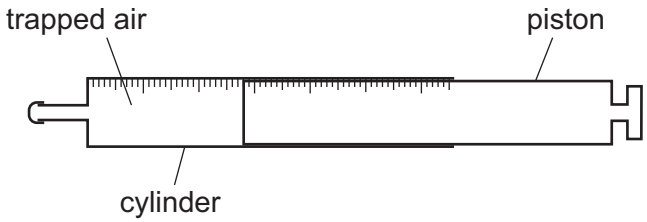
B hydroelectric energy

C nuclear fission

D wind energy

[Turn over

33 Air is trapped in a cylinder by a piston. The piston is moved so that the volume of the trapped air decreases. The pressure of the trapped air increases but the temperature of the trapped air does not change.



What happens to the average speed of the air particles and what happens to the average distance between them?

	average speed of particles	average distance between particles
A	does not change	decreases
B	does not change	increases
C	increases	decreases
D	increases	increases

34 In which states of matter is thermal energy transferred because of changes in the density of the medium?

A solids and liquids only

B liquids and gases only

C gases and solids only

D solids, liquids and gases

35 Light takes 500 s to travel from the Sun to the Earth.

What is the distance from the Sun to the Earth?

A 1.7×10^5 m

B 6.0×10^5 m

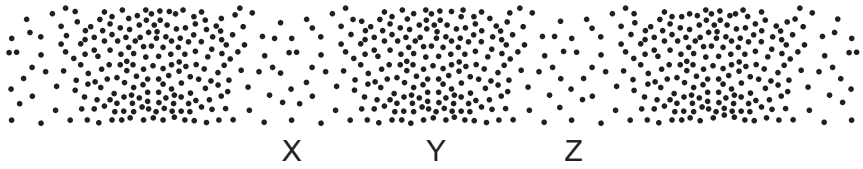
C 3.0×10^8 m

D 1.5×10^{11} m

36 A sound wave passes through air.

The diagram shows the arrangement of the air particles at one moment.

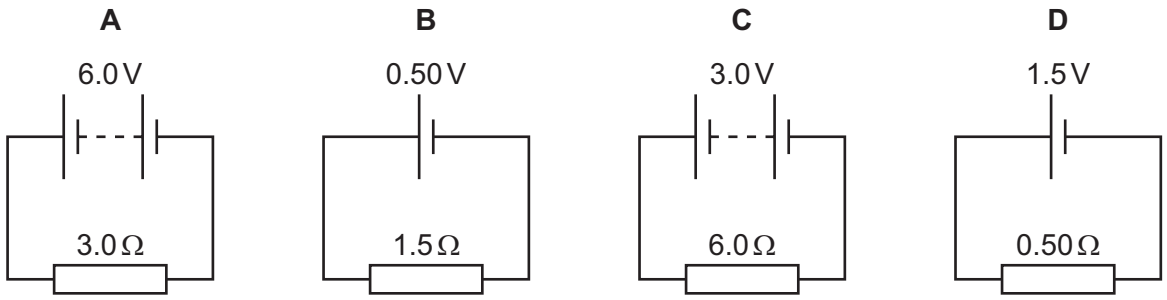
Three regions are labelled X, Y and Z.



In which region is there a rarefaction and which distance is equal to the wavelength of the sound wave?

	rarefaction	wavelength
A	X	XY
B	X	XZ
C	Y	XY
D	Y	XZ

37 In which circuit is there a current of 2.0 A?



38 The resistance of a wire depends on its length and on its diameter.

Which row shows two changes that **both** increase the resistance of the wire?

	change to length	change to diameter
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

[Turn over

39 A 20 V power supply provides a current of 5.0 A for 1.0 minute.

How much energy does the power supply transfer?

A 4.0 J **B** 100 J **C** 240 J **D** 6000 J

40 Why is the electricity supply to a mains circuit fitted with a fuse?

A to increase the current in the circuit

B to increase the resistance of the circuit

C to maintain a constant current in the circuit

D to prevent overheating of the cables in the circuit

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
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 –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	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
actinoids	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 dm^3 at room temperature and pressure (r.t.p.).