Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/21**

Paper 2 Multiple Choice (Extended) **October/November 2020**

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.
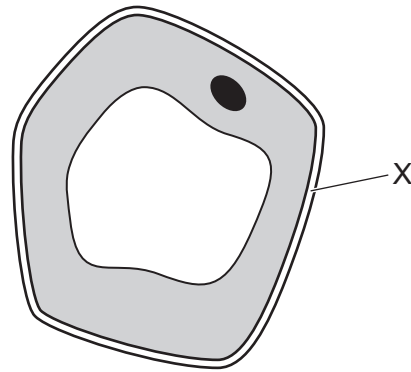- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.

[Turn over

1   The diagram shows a cell.

What is the function of X?

A   contains the genetic information

B   controls substances entering and leaving the cell

C   maintains the shape of the cell

D   photosynthesis

2   What is the function of ciliated cells in the bronchi?

A   absorption of oxygen

B   movement of mucus

C   production of mucus

D   transport of oxygen

3   The diagram shows how the activity of an enzyme changes with temperature.
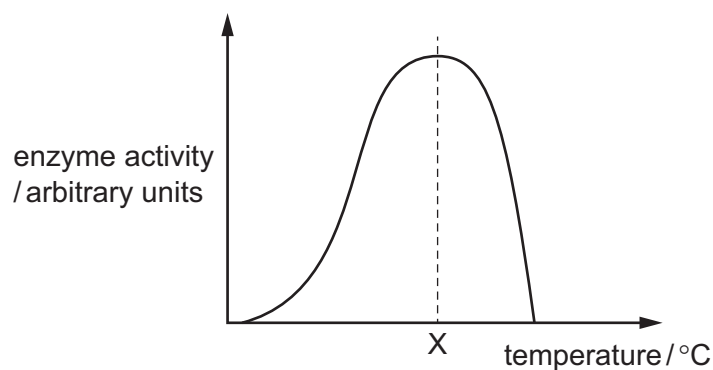
This enzyme works in the human body.

What is the most likely value of temperature X?

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

4 What is necessary for photosynthesis?

     1   carbon dioxide

     2   chlorophyll

     3   glucose

     4   light

     5   oxygen

     6   water

A 1, 2, 4 and 6

B 1, 3, 4 and 6

C 2, 3, 4 and 5

D 3, 4, 5 and 6

5 Deficiencies in vitamin D and in iron can cause diseases.

Which statement is correct?

A Vitamin D deficiency can cause anaemia.

B Vitamin D deficiency can cause rickets.

C Iron deficiency can cause rickets.
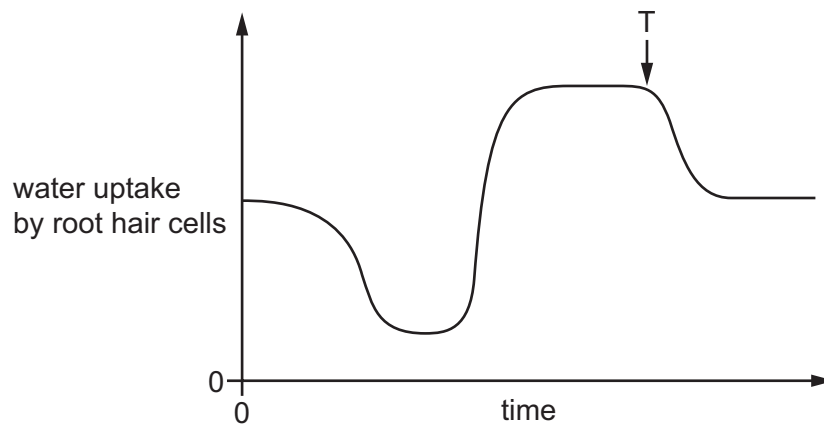
D Iron deficiency can cause scurvy.

6 Which enzymes are secreted from the pancreas?

     1   amylase

     2   lipase

     3   protease

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

7   The graph shows the uptake of water by root hair cells over many hours during a day.

What could have caused the change in the rate of uptake at T?

A   decrease in temperature

B   decrease in humidity

C   increase in light intensity

D   increase in temperature

8   How does mucus benefit the gas exchange system?

A   It absorbs carbon monoxide before it reaches the alveoli.

B   It prevents friction between the air and the trachea.

C   It removes the nicotine in cigarette smoke.

D   It traps pathogens.

9   Which statement about adrenaline is correct?

A   It is produced by a gland.

B   It is transported in the red blood cells.

C   It only has one target organ.

D   It reduces the size of the pupils.

10 Which row shows the correct descriptions for the anther and stigma of a wind-pollinated flower?

	anther position	stigma position	stigma description
A	inside flower	inside flower	smooth
B	exposed	exposed	feathery
C	exposed	inside flower	smooth
D	inside flower	exposed	feathery

11 Which row describes asexual reproduction?

	number of parents	a zygote is produced	offspring identical to the parent
A	1	no	yes
B	1	yes	no
C	2	no	yes
D	2	yes	no

12 The diagram shows a placenta and umbilical cord.
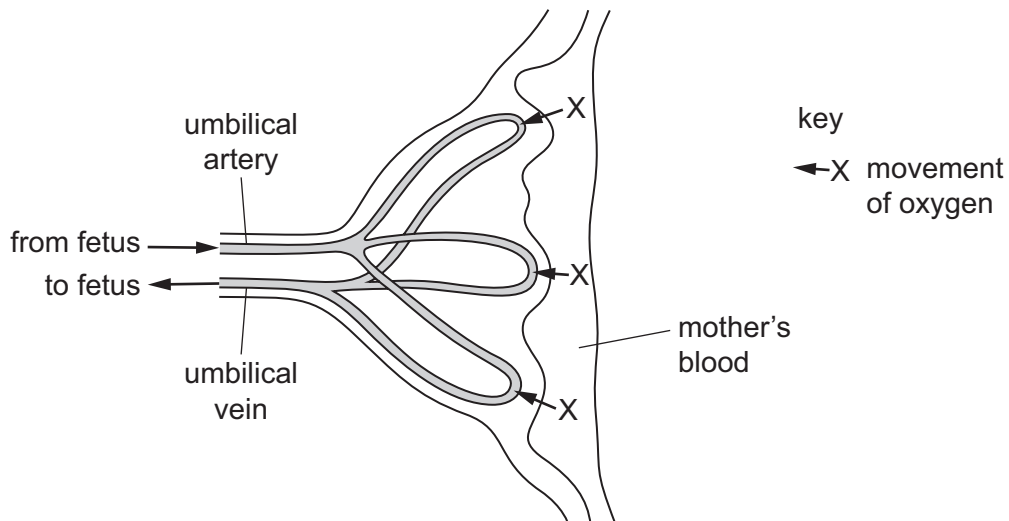
Which row is correct?

	high oxygen concentration present	low oxygen concentration present	name of process X
A	umbilical artery	umbilical vein	diffusion
B	umbilical artery	umbilical vein	osmosis
C	umbilical vein	umbilical artery	diffusion
D	umbilical vein	umbilical artery	osmosis

13 Eutrophication results in the death of aquatic organisms.

What is a stage in this process?

A   reduced aerobic respiration by decomposers

B   reduced decomposition after death of producers

C   reduced growth of producers

D   reduced levels of dissolved oxygen

14 Which term describes ammonia, NH_3?

A   element

B   ion

C   atom

D   molecule

15 Two different dyes are analysed using chromatography.

Each dye produces only one coloured spot on the chromatogram.

The R_f values of the coloured spots are shown.

coloured spot	R_f value
red	0.2
blue	0.4

The two different dyes are then mixed together to make a purple dye.

What is observed on the chromatogram of the purple dye?

A one spot with R_f value 0.3

B one spot with R_f value 0.6

C two spots with R_f values 0.2 and 0.4

D three spots with R_f values 0.2, 0.3 and 0.4

16 Which statement describes a mixture?

A It contains molecules made from the same type of atom.

B It contains only one type of atom.

C It contains two different types of atom joined by chemical bonds.

D It contains two different types of atom that can be separated by physical processes.

17 Aqueous lead(II) nitrate, $Pb(NO_3)_2$, reacts with potassium iodide to make a precipitate of lead(II) iodide.

What is the ionic equation for this reaction?

A $Pb^+ + I^- \rightarrow PbI$

B $Pb^{2+} + 2I^- \rightarrow PbI_2$

C $Pb(NO_3)_2 + I^- \rightarrow PbI + 2NO_3^-$

D $Pb^{2+} + 2NO_3^- + 2I^- \rightarrow PbI_2 + 2NO_3^-$

18 Which statement about the electrolysis of a molten metal halide is correct?

A Cations move to the anode.

B Electrons flow through the electrolyte.

C Ions gain protons at the cathode.

D Ions lose electrons at the anode.

19 The energy level diagram for an endothermic reaction is shown.
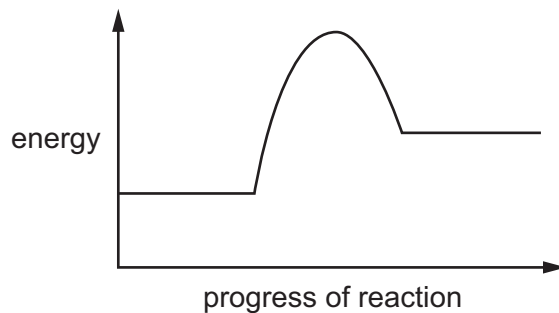
Which statement about this reaction is correct?

A The activation energy is the energy required to break bonds.

B The energy required to break bonds is less than the energy released on making new bonds.

C The activation energy is less than the energy change for the reaction.

D The final products have less energy than the reactants.

20 Iron can be obtained from iron(III) oxide by heating with aluminium powder.

The equation is shown.

$$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$$
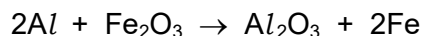
What is the oxidising agent?

A Al B Fe_2O_3 C Al_2O_3 D Fe

21 Which substances react with dilute sulfuric acid to make copper sulfate?

     1 copper

     2 copper carbonate

     3 copper hydroxide

     4 copper nitrate

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

22 Acid X reacts with metal Y.

A colourless gas is given off and a pale green solution is produced.

Two tests are carried out on the solution.

test	reagent(s) added	result
1	aqueous silver nitrate and nitric acid	white precipitate
2	aqueous sodium hydroxide	green precipitate

What are acid X and metal Y?

	acid	metal
A	hydrochloric	iron
B	hydrochloric	zinc
C	sulfuric	iron
D	sulfuric	zinc

23 Rubidium and sodium are elements in Group I of the Periodic Table.

The atomic number of sodium is 11, and the atomic number of rubidium is 37.

Rubidium has a ……1…… melting point and a ……2…… density than sodium. The reactivity of rubidium is ……3…… than the reactivity of sodium.

Which row completes gaps 1, 2 and 3?

	1	2	3
A	higher	lower	lower
B	lower	lower	higher
C	lower	higher	higher
D	higher	higher	lower

24 Ammonia, NH_3, can be made by combining the gases nitrogen, N_2, and hydrogen, H_2.

This reaction is slow.

When element Y is added, the rate of reaction increases.

What is Y?

A Al **B** Fe **C** Rb **D** I$_2$

25 Which method is used to extract copper from copper(II) oxide?

   A   dissolving copper(II) oxide in hydrochloric acid and then filtering

   B   dissolving copper(II) oxide in water and then filtering

   C   heating the copper(II) oxide

   D   heating the copper(II) oxide mixed with carbon

26 Which statement describes a hydrocarbon?

   A   a compound that burns to form carbon dioxide and hydrogen

   B   a compound that contains carbon and hydrogen only

   C   a compound that only contains ionic bonds

   D   a compound that reacts easily with metals

27 What can be produced when naphtha is cracked?

   A   alkanes, alkenes and hydrogen

   B   alkanes and alkenes only

   C   alkanes and hydrogen only

   D   alkenes only

28 What does the area under a speed–time graph represent?

   A   acceleration

   B   average speed

   C   distance travelled

   D   maximum speed

29 A satellite of mass 20 kg is in orbit around the Earth.

At the height of the satellite's orbit, the gravitational field strength is one quarter of its strength on the surface of the Earth.

The gravitational field strength on the surface of the Earth is 10 N / kg.

What is the weight of the satellite as it orbits the Earth?

   A   0 N   **B**   20 N   **C**   50 N   **D**   200 N

30 A raindrop falls vertically at a constant speed.

What is the resultant force on the raindrop as it falls?

A It is equal to the air pressure on the drop.

B It is equal to the air resistance on the drop.

C It is equal to the weight of the drop.

D It is zero.

31 An apple falls to the ground.

Which form of energy decreases as the apple falls?

A chemical potential

B gravitational potential

C kinetic

D sound

32 A builder drops a brick from a height of 15 m above the ground.

The gravitational field strength g is 10 N/kg.

What is the speed of the brick as it hits the ground?

A 12 m/s   **B** 17 m/s   **C** 150 m/s   **D** 300 m/s

33 The molecules in a substance vibrate about fixed positions.

The substance is now cooled.

Which row gives the state of the substance and the effect of cooling on the distance between its molecules?

	state of substance	effect on distance between molecules
A	solid	decreases
B	solid	increases
C	liquid	decreases
D	liquid	increases

34 In which states of matter can convection occur?

	in a solid	in a liquid	in a gas
A	no	no	yes
B	no	yes	yes
C	yes	no	no
D	yes	yes	no

35 The diagram shows a section of a rope.

Four wave crests pass a point on the rope every second.

Each wave crest travels 80 cm in one second.
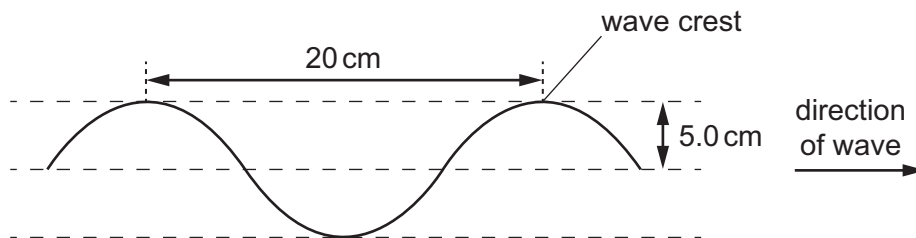
What is the speed of the wave?

A   4.0 cm / s   **B**   5.0 cm / s   **C**   20 cm / s   **D**   80 cm / s

36 A converging lens is used as a magnifying glass.

Where is the image formed and what is the nature of the image?

	position of image	nature
A	on the opposite side of the lens to the object	real
B	on the opposite side of the lens to the object	virtual
C	on the same side of the lens as the object	real
D	on the same side of the lens as the object	virtual

37 The diagram represents a wave in air. Molecules are closer together in region P than they are in region Q.
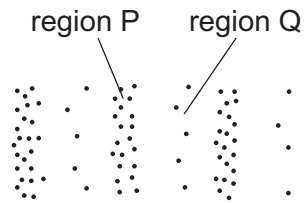
region P   region Q

What are the names of regions P and Q, and which type of wave is represented?

	region P	region Q	type of wave
A	compression	rarefaction	longitudinal
B	compression	rarefaction	transverse
C	rarefaction	compression	longitudinal
D	rarefaction	compression	transverse

38 A power supply causes a current in a circuit.

The electromotive force (e.m.f.) of the power supply and the resistance of the circuit are both changed.

Which pair of changes **must** result in a smaller current in the circuit?
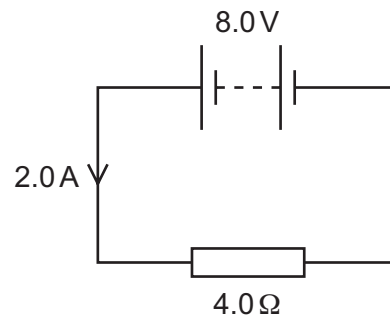
	e.m.f.	resistance
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

39 There is a current of 0.25 A in a wire.

How long does it take for 120 C of charge to pass a point in the wire?

A 0.50 minutes

B 8.0 minutes

C 30 minutes

D 480 minutes

40 The diagram shows an electric circuit.

8.0 V

2.0 A

4.0 Ω

The battery of electromotive force (e.m.f.) 8.0 V produces a current of 2.0 A in a 4.0 Ω resistor.

How much power is delivered to the resistor?

A 0.25 W **B** 4.0 W **C** 16 W **D** 64 W

15

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The Periodic Table of Elements

Group

I	II												III	IV	V	VI	VII	VIII
																		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 –							

Key

atomic number
atomic symbol
name
relative atomic mass

1 **H** hydrogen 1

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.).