Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/23**

Paper 2 Multiple Choice (Extended) **May/June 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

1 Which are characteristics of all living organisms?

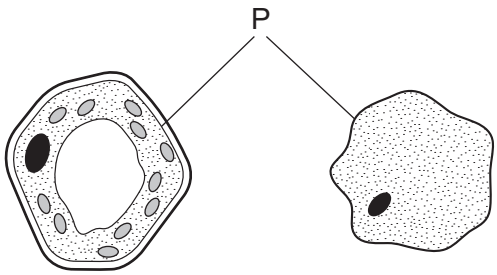
A excretion, breathing and sensitivity

B excretion, movement and respiration

C gas exchange and muscle contraction

D muscle contraction and sensitivity

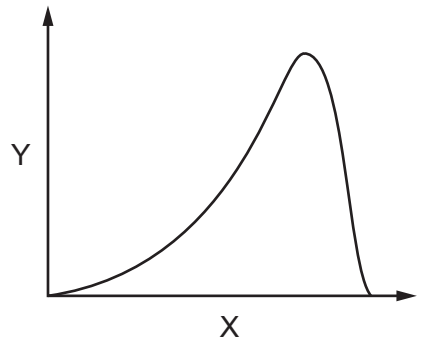
2 The diagram shows a plant cell and an animal cell.



What is structure P and what is one of its functions?

	structure	function
A	cell membrane	controls the entry of glucose into the cell
B	cell membrane	supports the cell
C	cell wall	controls the entry of glucose into the cell
D	cell wall	supports the cell

3 The graph shows the effect of one variable on amylase activity.



What are the labels X and Y?

	X	Y
A	amylase activity	pH
B	amylase activity	temperature
C	pH	amylase activity
D	temperature	amylase activity

4 The equation summarises a process that occurs in living organisms.

$$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$$

Which molecule contains the greatest amount of chemical energy?

A H_2O **B** CO_2 **C** $C_6H_{12}O_6$ **D** O_2

5 Which row matches the part of the alimentary canal to its function?

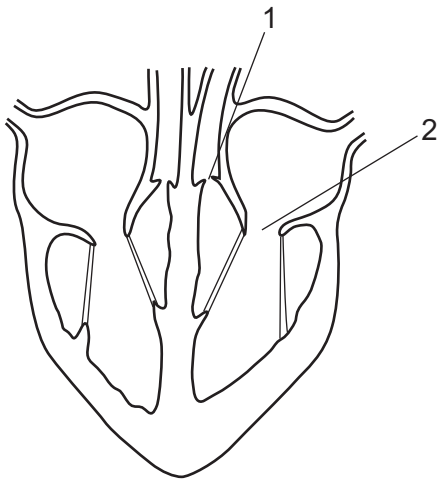
	part of the alimentary canal	function of part
A	colon	absorption of digested food
B	ileum	egestion
C	mouth	mechanical digestion
D	pancreas	production of bile

[Turn over

6 Which row matches the adaptation of a root hair cell to its function?

	adaptation	function
A	large surface area	uptake of water and glucose
B	large surface area	uptake of water and ions
C	small surface area	uptake of water and glucose
D	small surface area	uptake of water and ions

7 The diagram shows a section through the heart.

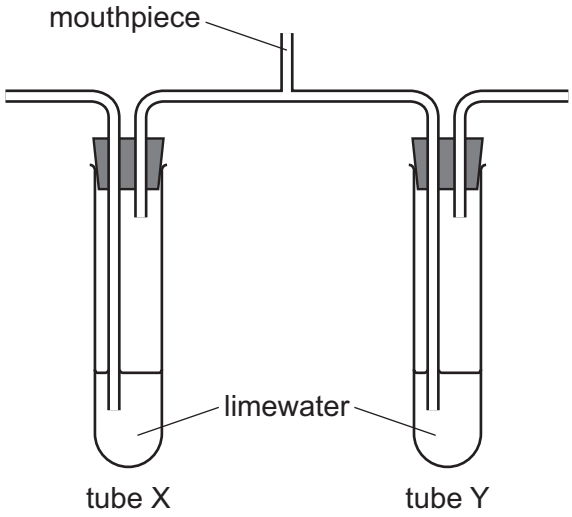


The ventricles contract and blood is forced into the arteries.

What is the state of valves 1 and 2 when this happens?

	valve 1	valve 2
A	closed	closed
B	closed	open
C	open	closed
D	open	open

8 The diagram shows apparatus at the start of a breathing experiment.



A person breathes in and out through the mouthpiece for a short time.

Which row shows the results?

	limewater in tube X	limewater in tube Y
A	stays clear	stays clear
B	stays clear	turns cloudy
C	turns cloudy	stays clear
D	turns cloudy	turns cloudy

9 Which component of tobacco smoke increases the risk of lung cancer?

A carbon dioxide

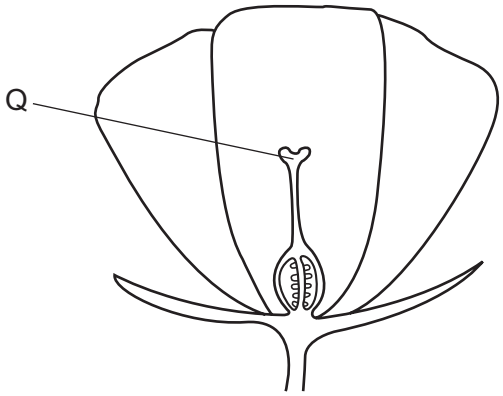
B carbon monoxide

C nicotine

D tar

[Turn over

10 The diagram shows a section through a flower.



Which row correctly identifies structure Q and the method of pollination in the flower?

	structure Q	method of pollination
A	anther	insect
B	anther	wind
C	stigma	insect
D	stigma	wind

11 What effect does HIV have on the components of blood?

A Blood does not clot as quickly.

B Plasma can no longer carry hormones.

C Red blood cells carry less oxygen.

D White blood cells make fewer antibodies.

12 Which statement about decomposers is **not** correct?

A They are the final stage of food chains.

B They break down dead organic matter.

C They produce oxygen.

D They release heat energy into the environment.

13 What is an undesirable effect of overuse of fertilisers in agriculture?

A acid rain

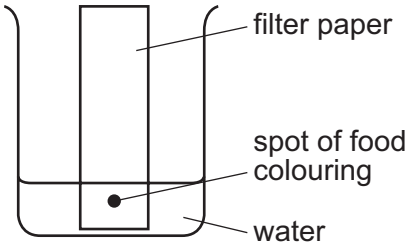
B deforestation

C eutrophication

D global warming

14 Which diagram shows how a mixture of dyes in a food colouring are separated?

A



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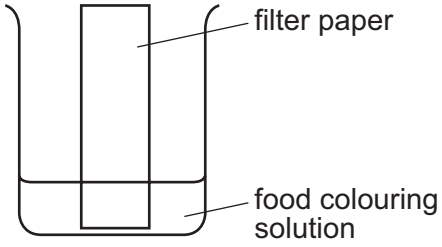

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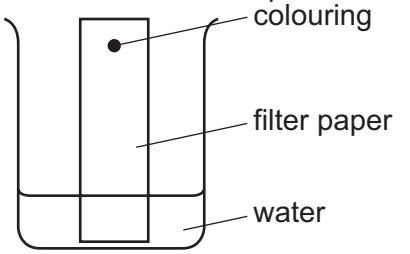

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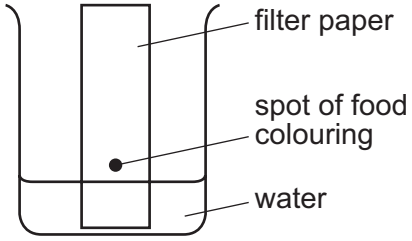


15 Which elements react together to give positive ions and negative ions that have the same electronic structure as argon?

A calcium and chlorine

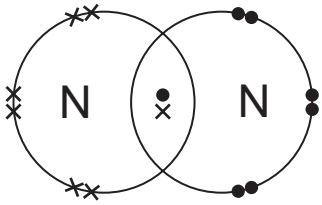
B calcium and fluorine

C magnesium and chlorine

D magnesium and fluorine

16 Which dot-and-cross diagram represents the arrangement of outer-shell electrons in a molecule of nitrogen?

A



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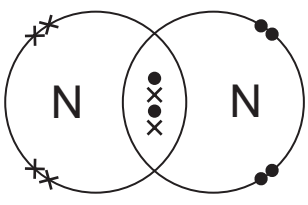
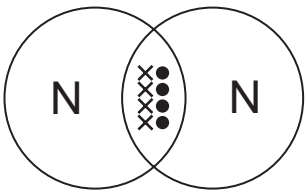


C



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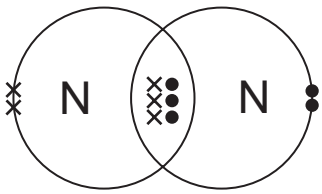


17 Aluminium ions have the formula Al^{3+}.

Oxide ions have the formula O^{2-}.

What is the formula of aluminium oxide?

A AlO **B** AlO_2 **C** Al_2O_3 **D** Al_3O_2

18 Molten sodium chloride is electrolysed.

What are the electrode products?

	at the anode	at the cathode
A	chlorine	hydrogen
B	chlorine	sodium
C	hydrogen	chlorine
D	sodium	chlorine

19 Which statement describes an exothermic reaction?

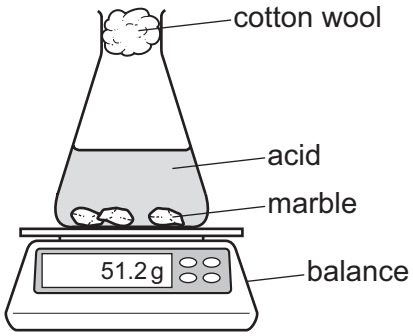
A It gives out thermal energy.

B It needs energy to start it.

C It neither gives out nor takes in energy.

D It takes in energy.

20 Apparatus used to measure the rate of a reaction, which produces a gas, is shown.



Which other piece of apparatus is needed?

A beaker

B gas syringe

C stopclock

D thermometer

21 Iron is extracted from its ore using carbon monoxide.

The word equation is shown.

$$\text{iron(III) oxide} + \text{carbon monoxide} \rightarrow \text{iron} + \text{carbon dioxide}$$

Which statement is correct?

A Carbon monoxide is oxidised by gaining oxygen.

B Carbon monoxide is reduced by losing oxygen.

C Iron(III) oxide is oxidised by losing oxygen.

D Iron(III) oxide is reduced by gaining oxygen.

22 Which method can be used to make pure solid sodium nitrate, $NaNO_3$?

A Add aqueous sodium hydroxide to a conical flask, titrate with dilute nitric acid, then crystallise.

B Dissolve solid sodium chloride in dilute nitric acid, leave for 10 minutes and then crystallise.

C Heat sodium with nitrogen and oxygen. Let the mixture cool, then collect the solid that is made.

D Mix copper nitrate and sodium chloride solutions then filter the mixture and collect the sodium nitrate from the filter paper.

[Turn over

23 Information about an element in the Periodic Table is shown.

Which row describes an element in the Periodic Table?

	group number	number of electrons in outer shell	metal / non-metal
A	I	1	metal
B	II	2	non-metal
C	VI	2	non-metal
D	VIII	8	metal

24 What is an alloy?

A a compound containing two metallic elements

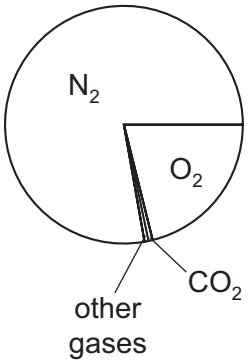
B a compound containing two non-metallic elements

C a mixture containing two metallic elements

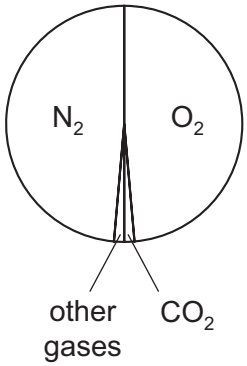
D a mixture containing two non-metallic elements

25 Which pie chart shows the proportions of gases in clean air?

A



B



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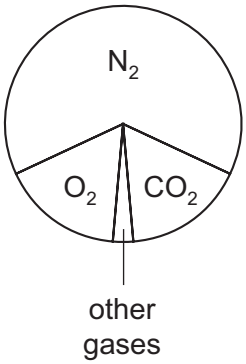

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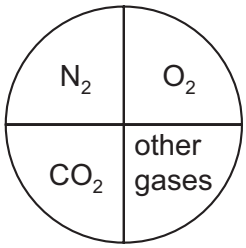


26 Which process does **not** contribute to increasing levels of carbon dioxide in the air?

A burning petrol and diesel in cars

B combustion of the sulfur compounds in petrol and diesel

C destroying rainforests

D releasing waste gases from coal-fired power stations

27 Which substance rapidly turns bromine from orange to colourless?

A ethane

B ethanol

C ethene

D methane

28 A car is travelling on a straight road at a speed of 2.0 m / s. It starts to accelerate constantly at 3.0 m / s^2.

How long does it take for the speed of the car to reach 8.0 m / s?

A 0.50 s **B** 2.0 s **C** 2.7 s **D** 18 s

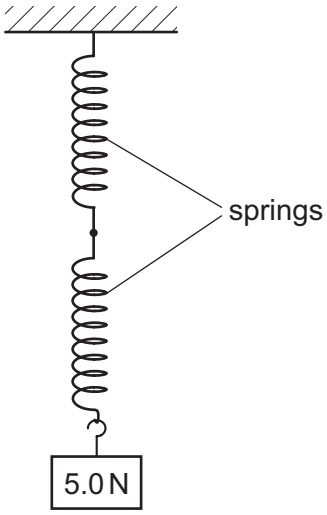
29 Which row shows the unit for force, the unit for mass and the unit for weight?

	force	mass	weight
A	kg	kg	N
B	kg	N	kg
C	N	kg	N
D	N	N	kg

[Turn over

30 A spring obeys Hooke's law. A load of 10 N hangs from the spring and causes the spring to extend by 12 mm.

Two springs, identical to the first one, are now joined as shown. A load of 5.0 N is hung from the springs.



What is the total extension of the combination of the two springs?

A 3.0 mm **B** 6.0 mm **C** 12 mm **D** 24 mm

31 A brick of mass of 3.0 kg rests on a shelf. The brick drops off the shelf. The brick hits the ground at a speed of 8.0 m / s. Air resistance can be ignored.

The acceleration of free fall g is 10 m / s^2.

How much kinetic energy did the brick have just before it hit the ground, and how much potential energy did the brick have when it was on the shelf?

	kinetic energy before hitting ground / J	potential energy on shelf / J
A	24	24
B	24	96
C	96	0
D	96	96

32 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	liquid	decreases
B	liquid	increases
C	solid	decreases
D	solid	increases

33 A solid is heated and it melts. The liquid that is produced is then heated and it boils.

What happens to the temperature of the solid while it is melting, and what happens to the temperature of the liquid while it is boiling?

	temperature of solid	temperature of liquid
A	increases	increases
B	increases	remains constant
C	remains constant	increases
D	remains constant	remains constant

34 A cooling unit is to be fitted in a tank of water to cool all the water.

What is the best position for the unit to be fitted, and what is the main method of thermal energy transfer in the water?

	position to fit cooling unit	main method of thermal energy transfer
A	at the bottom	conduction
B	at the bottom	convection
C	at the top	conduction
D	at the top	convection

[Turn over

35 A microwave oven emits radiation with a frequency of 2.5×10^9 Hz.

What is the wavelength of these waves? The speed of light is 3.0×10^8 m/s.

A 0.0075 m **B** 0.12 m **C** 7.5 m **D** 120 m

36 The diagram shows part of the electromagnetic spectrum.

gamma-rays	P	ultraviolet	Q	infra-red

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

	at P	at Q
A	radio waves	microwaves
B	radio waves	visible light
C	X-rays	microwaves
D	X-rays	visible light

37 An electronic circuit in a fire alarm makes a loudspeaker vibrate alternately at two different frequencies.

Which pair of frequencies is suitable to use in the alarm to alert people to the danger of fire?

A 1.5 Hz and 15 Hz

B 15 Hz and 150 000 Hz

C 150 Hz and 15 000 Hz

D 150 000 Hz and 15 000 000 Hz

38 The table gives the lengths and the diameters of four different wires made from the same metal.

Which wire has the smallest resistance?

	length of wire / m	diameter of wire / mm
A	3.0	3.0
B	3.0	4.0
C	4.0	3.0
D	4.0	4.0

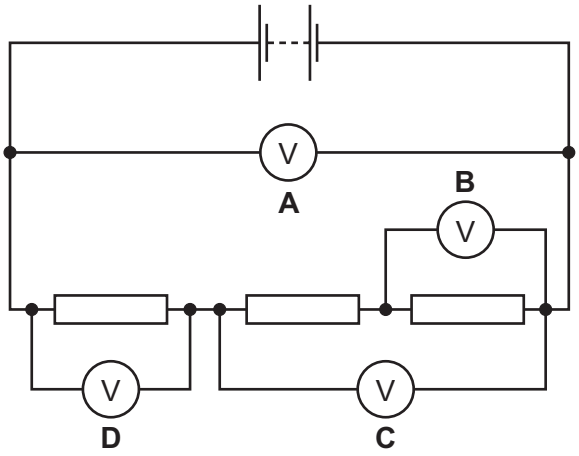
39 There is a current of 20 mA in an electrical component when there is a p.d. of 10 V across it.

How much energy is transferred by the component in 30 minutes?

A 6.0 J **B** 360 J **C** 6000 J **D** 360 000 J

40 The diagram shows a circuit containing a battery, three resistors and four voltmeters.

Which voltmeter has the greatest reading?



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.).