Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/21**

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

1 The cytoplasm of a plant cell contains a 15% sugar solution. The plant cell is placed in sugar solutions of different concentrations.

In which solution would there be a net diffusion of water out of the cell?

A 5% sugar solution

B 10% sugar solution

C 15% sugar solution

D 20% sugar solution

2 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

3 Which condition could result from a shortage of fibre in the diet?

A constipation

B obesity

C scurvy

D starvation

4 Which row correctly matches the enzyme to the products?

	enzyme	products
A	lipase	amino acids only
B	lipase	glycerol and fatty acids
C	protease	fatty acids only
D	protease	glycerol and amino acids

5 Which features are found in a typical animal cell?

	cell membrane	cell wall	chloroplast	cytoplasm	nucleus	vacuole
A	✓	✓	✓	✓	✗	✗
B	✓	✗	✗	✓	✓	✓
C	✓	✗	✗	✓	✓	✗
D	✗	✓	✓	✗	✗	✓

6 Which feature of red blood cells allows them to transport oxygen?

A contain haemoglobin

B large size

C surface hairs

D thick cell membrane

7 How does auxin cause a plant shoot to bend to the right?

A Cells elongate more on the left side of the shoot than on the right side.

B Cells elongate more on the right side of the shoot than on the left side.

C Cells shrink on the left side of the shoot.

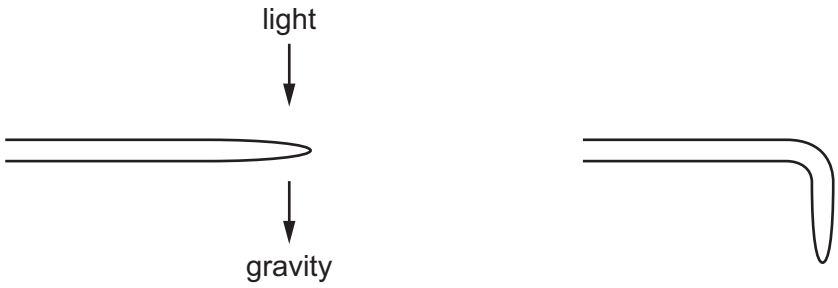
D Cells shrink on the right side of the shoot.

8 Four people have the same resting pulse rate and the same blood glucose concentration. The table shows their pulse rates and blood glucose concentrations later on the same day.

Which person has the highest concentration of adrenaline in their blood?

	pulse rate / beats per minute	blood glucose concentration /mg per dm^3
A	70	65
B	70	100
C	120	65
D	120	100

9 The diagram shows the root of a plant exposed to light and gravity, and the same root a day later.



Light does **not** influence the growth of roots in this plant.

Which row shows how the root has responded?

	gravitropism	phototropism
A	grows away from the stimulus	no response
B	grows towards the stimulus	no response
C	no response	grows away from the stimulus
D	no response	grows towards the stimulus

10 The diagram shows pollen grains from two different plants.

1 2

How are the two pollen grains dispersed?

	pollen grain 1	pollen grain 2
A	insect	insect
B	insect	wind
C	wind	insect
D	wind	wind

11 Which part of the male reproductive system in humans produces sperm?

A penis

B scrotum

C testes

D urethra

12 What is defined as all of the organisms and their environment interacting together in a given area?

A ecosystem

B food chain

C food web

D trophic levels

13 The list describes six events involved in the eutrophication of fresh water.

P death of organisms that need dissolved oxygen in water

Q increased aerobic respiration by decomposers

R increased availability of nitrate and other ions

S increased decomposition after death of producers

T increased growth of producers

U reduction in dissolved oxygen in water

What is the normal sequence of events leading to eutrophication of a body of fresh water?

A Q → S → R → U → T → P

B R → T → S → Q → U → P

C Q → T → S → R → U → P

D R → S → Q → U → T → P

14 In which change of state do the particles gain kinetic energy and remain tightly packed?

A gas to liquid

B liquid to gas

C liquid to solid

D solid to liquid

15 Salt, sand and water are stirred together in a beaker.

The salt dissolves in the water.

What does the beaker contain?

A a mixture of a solution and a solid

B a mixture of three elements

C only one compound and one solid

D only one compound containing three elements

16 Which ion is formed from a metal?

A Cl^- **B** H^+ **C** Na^+ **D** NH_4^+

17 Sodium burns in oxygen forming sodium oxide.

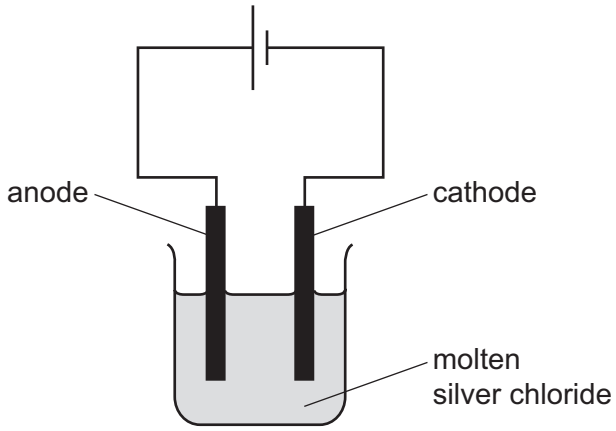
An equation for this reaction is shown.

$$xNa + yO_2 \rightarrow zNa_2O$$

What are x, y and z?

	x	y	z
A	2	1	1
B	2	2	1
C	4	1	2
D	4	2	2

18 Molten silver chloride is electrolysed using inert electrodes.

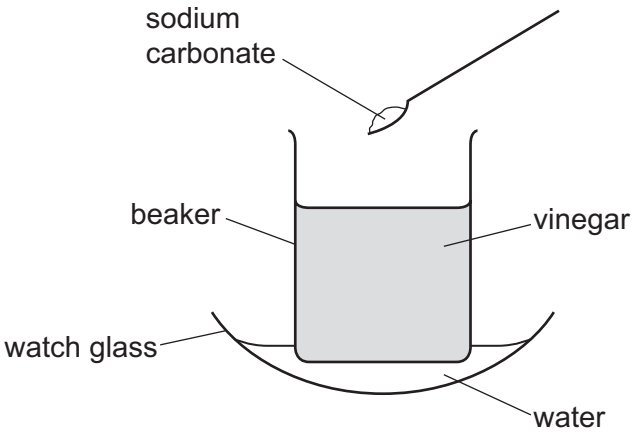


The cathode attracts .....1..... in the electrolyte where they are .....2..... .

Which words complete the gaps?

	1	2
A	chloride ions	oxidised
B	chloride ions	reduced
C	silver ions	reduced
D	silver ions	oxidised

19 Solid sodium carbonate is added to vinegar in a beaker and stirred.



The water in the watch glass freezes.

Which statement about the reaction explains why the water freezes?

A It is a redox reaction.

B It is an endothermic reaction.

C It is catalysed by sodium carbonate.

D It is thermal decomposition.

20 The rate of a reaction increases when the temperature or the concentration of the reactants increases.

Which row explains why the rate of reaction increases?

	change	activation energy	collisions per second	number of particles with energy greater than the activation energy
A	increase in concentration	increases	increases	stays the same
B	increase in concentration	stays the same	stays the same	increases
C	increase in temperature	stays the same	increases	stays the same
D	increase in temperature	stays the same	increases	increases

21 Hot carbon reacts with carbon dioxide to form carbon monoxide.

$$C(s) + CO_2(g) \rightarrow 2CO(g)$$

Which statements are correct?

1 Carbon is being oxidised.

2 The reducing agent is carbon.

3 The oxidising agent is carbon monoxide.

4 Carbon dioxide is being reduced.

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

22 Copper(II) sulfate is prepared by reacting copper(II) oxide with dilute sulfuric acid.

$$CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$$

Which statement is correct?

A Excess copper(II) oxide is used because it can be easily removed by filtration.

B Excess copper(II) oxide is used because it can be easily removed by reacting with more sulfuric acid.

C Excess sulfuric acid is used because it can be easily removed by evaporation.

D Excess sulfuric acid is used because unreacted copper(II) oxide would contaminate the product.

23 Solution X is mixed with nitric acid and aqueous barium nitrate.

A white precipitate is formed.

Which ion is present in solution X?

A carbonate

B chloride

C nitrate

D sulfate

24 Properties of some Group II elements are shown.

	atomic number	melting point / °C	reaction with cold water
Mg	12		
Ca	20	850	reacts slowly
Sr	38		reacts quickly
Ba	56	714	

Group II elements show similar trends in melting point and reactivity as Group I elements.

Which statement is correct?

A Barium reacts violently with cold water.

B Magnesium burns brightly when added to cold water.

C Magnesium has the lowest melting point.

D Strontium is the most reactive.

25 Copper can be made from copper oxide by reacting it with carbon at a high temperature.

Why is carbon used?

A It does not react with copper.

B It is a conductor of electricity.

C It is a high melting point solid.

D It is more reactive than copper.

26 Which volume of air contains about 20 cm^3 of oxygen?

A 25 cm^3 **B** 50 cm^3 **C** 80 cm^3 **D** 100 cm^3

27 Petroleum is separated into useful fractions by fractional distillation.

Which statement about the fractions is correct?

A All the fractions are used as fuels.

B Bitumen has the strongest attractive forces between molecules.

C Gasoline contains the largest molecules.

D Refinery gas is the least volatile.

28 A car travels at various speeds during a short journey.

The table shows the distances travelled and the times taken during each of four stages P, Q, R and S.

stage	P	Q	R	S
distance travelled / km	1.8	3.6	2.7	2.7
time taken / minutes	2.0	2.0	4.0	3.0

During which two stages is the car travelling at the same average speed?

A P and Q **B** P and S **C** Q and R **D** R and S

29 A solid, rectangular block of wood has length 4.0 cm, width 5.0 cm and height 6.0 cm.

The mass of the block is 90 g.

What is the density of the wood?

A $0.75\,g/cm^3$ **B** $1.3\,g/cm^3$ **C** $4.5\,g/cm^3$ **D** $6.0\,g/cm^3$

30 An object is travelling in a straight line at constant speed.

Which statement describes the resultant force on the object?

A It acts in the opposite direction to the motion of the object.

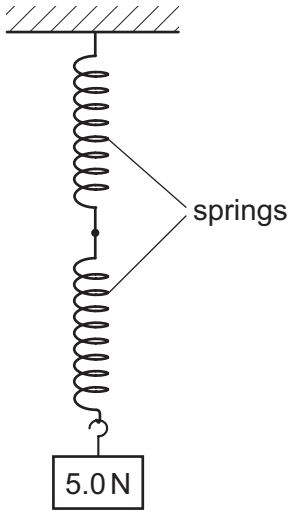
B It acts in the same direction as the motion of the object.

C It is constant, but not zero.

D It is zero.

31 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

32 A force of 4.0 N acts on a body for 6.0 s. The body moves a distance of 15 m in the direction of the force.

How much energy is transferred?

A 10 J **B** 24 J **C** 60 J **D** 360 J

33 Oxygen in a steel cylinder is easily compressed, but steel cannot be compressed.

How is this difference explained?

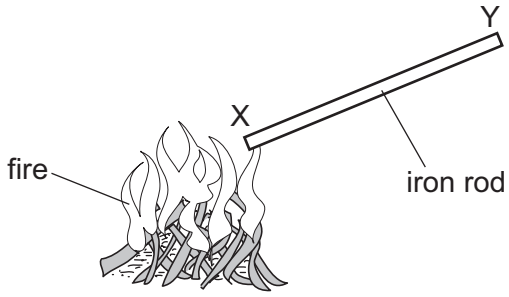
A The forces between the atoms in steel are greater than those between the molecules in oxygen.

B The kinetic energy of the atoms in steel is greater than that of oxygen molecules.

C The mass of an oxygen molecule is different from the mass of an atom in steel.

D The atoms in steel are further apart than the molecules in oxygen.

34 End X of an iron rod is held in a fire.



The other end Y of the rod becomes warm by thermal conduction through the rod.

One process of conduction involves atoms at end X vibrating faster.

This vibration is passed on to atoms at end Y.

How does this happen?

A The atoms collide with their neighbouring atoms and transfer energy.

B The atoms move along the rod, taking energy with them.

C The atoms emit infrared radiation which travels through the rod.

D The atoms produce an electric current in the rod.

35 The sound from a drum is loud and has a low pitch.

Which row describes the amplitude and the frequency of the sound wave?

	amplitude	frequency
A	large	high
B	large	low
C	small	high
D	small	low

36 A thin converging lens has a focal length of 5.0 cm.

An object is placed different distances from the lens.

For which distance does the lens act as a magnifying glass?

A 15 cm **B** 10 cm **C** 6.0 cm **D** 3.0 cm

37 How are sound waves transmitted in air?

A by compressions and crests

B by compressions and rarefactions

C by crests and rarefactions

D by crests and troughs

38 What is the definition of electrical current?

A the rate of flow of charge

B the rate of flow of energy

C the rate of flow of power

D the rate of flow of voltage

39 A 12 V power supply is connected to a 6.0 Ω resistor. This causes a current in the resistor.

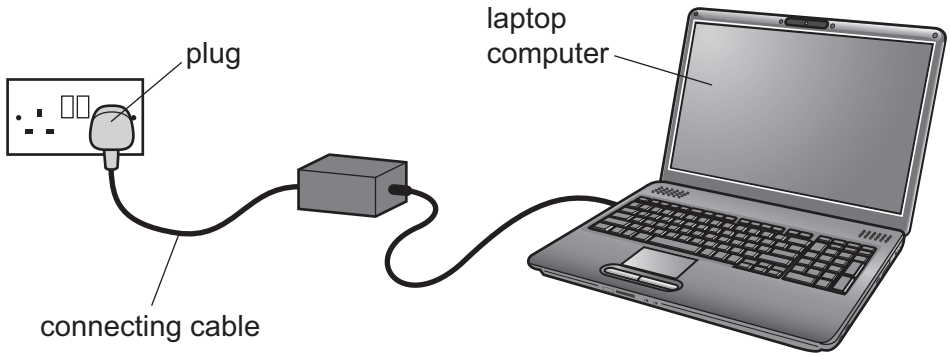
How much thermal energy is produced in the resistor in 5.0 minutes?

A 120 J **B** 600 J **C** 7200 J **D** 21 600 J

40 The charger for a laptop computer is connected by a cable to the mains supply through a plug.

The plug contains a 13 A fuse. The cable is designed to carry a current of 2 A.

A fault develops and the current in the cable increases to 5 A.



What is a possible danger caused by this larger current?

A A large amount of electrical energy is wasted.

B Somebody receives an electric shock.

C The fuse blows and starts a fire.

D The cable overheats and starts a fire.

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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.).