Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/23**

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 structural feature is found in a plant cell but **not** in an animal cell?

A cell membrane

B cell wall

C cytoplasm

D nucleus

2 The balanced equation for photosynthesis is shown.

$$6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{light}} \mathbf{X} + 6O_2$$

What is **X**?

A $C_6H_{12}O_6$ **B** $C_6H_{12}O_{12}$ **C** $C_{12}H_6O_6$ **D** $C_{12}H_{12}O_2$

3 An enzyme from the alimentary canal has an optimum activity at an acidic pH.

Which statement is correct?

A The enzyme is an amylase and is found in the mouth.

B The enzyme is a protease and is found in the mouth.

C The enzyme is an amylase and is found in the stomach.

D The enzyme is a protease and is found in the stomach.

4 In a plant, what leads to offspring that are identical to the parent?

A asexual reproduction

B insect pollination

C seed germination

D sexual reproduction

5 Why do food chains usually have fewer than five trophic levels?

A Decomposers are not usually included in the chain.

B Energy is lost between each trophic level.

C There is only one level of carnivores.

D There is only one level of herbivores.

6 What is the function of microorganisms in yoghurt making?

A They make the sugar in milk become solid.

B They produce lactic acid.

C They raise the pH of the mixture.

D They reduce the fat content of the milk.

7 Which statement about how the eye views near objects (accommodation) is correct?

	ciliary muscles	suspensory ligaments	lens shape
A	contract	slacken	thick (fat)
B	contract	stretch	thin (narrow)
C	relax	slacken	thin (narrow)
D	relax	stretch	thick (fat)

8 In a plant, the allele for red flowers is dominant to the allele for yellow flowers. A heterozygous red-flowered plant is crossed with a homozygous yellow-flowered plant.

Which statement about the offspring is correct?

A 25% will have red flowers, 75% will have yellow flowers.

B 50% will have red flowers, 50% will have yellow flowers.

C 75% will have red flowers, 25% will have yellow flowers.

D 100% will have red flowers, 0% will have yellow flowers.

9 Why is breast-feeding of babies often recommended in preference to bottle-feeding?

A Breast milk contains antibodies.

B Breast milk contains protein.

C Breast milk has no bacteria.

D Breast milk is at body temperature.

10 Why is yeast added to dough in the production of bread?

A to lower the pH

B to produce alcohol

C to produce carbon dioxide

D to produce lactic acid

11 A blood cell is travelling through the hepatic vein.

Which blood vessel will it travel through next?

A hepatic artery

B pulmonary artery

C pulmonary vein

D vena cava

12 A scientist took a single living cheek cell from each of 30 different people. 15 of these people were male and 15 were female. He stained each cell so that the sex chromosomes could be observed.

How many X chromosomes would the scientist observe?

A 15 **B** 30 **C** 45 **D** 60

13 What may be defined as 'an action by an organism or part of an organism causing a change of position or place'?

A growth

B movement

C reproduction

D sensitivity

14 Which row shows the electronic structure of a calcium atom and of a fluoride ion?

	calcium atom	fluoride ion
A	2,8,8	2,7
B	2,8,8	2,8
C	2,8,8,2	2,7
D	2,8,8,2	2,8

15 How many atoms of metals and of non-metals are shown in the formula Na_2SO_4?

	atoms of metals	atoms of non-metals
A	1	1
B	1	2
C	2	4
D	2	5

16 The electrolysis of concentrated aqueous sodium chloride is an important industrial process.

During this process ……1…… is produced at the cathode and ……2…… is produced at the anode. The solution formed turns litmus ……3…… .

Which words complete gaps 1, 2 and 3?

	1	2	3
A	hydrogen	chlorine	blue
B	hydrogen	oxygen	blue
C	sodium	chlorine	red
D	sodium	oxygen	red

17 Aqueous sodium thiosulfate reacts with dilute hydrochloric acid.

Increasing the concentration of sodium thiosulfate increases the rate of reaction.

Which statement explains this observation?

A The particles are closer together and collide more frequently.

B The particles are closer together and collide with more energy.

C The particles have a greater surface area and collide more frequently.

D The particles have more energy and collide more frequently.

18 In which word equation is the <u>underlined</u> substance being oxidised?

A <u>carbon dioxide</u> + carbon → carbon monoxide

B <u>carbon monoxide</u> + iron oxide → carbon dioxide + iron

C <u>copper oxide</u> + magnesium → magnesium oxide + copper

D <u>magnesium oxide</u> + hydrochloric acid → magnesium chloride + water

19 The pH of water changes when ammonia is bubbled into it.

What happens to the pH and why?

	pH	ammonia is
A	decreases	acidic
B	decreases	alkaline
C	increases	acidic
D	increases	alkaline

20 The equation for the reaction between aqueous calcium chloride and aqueous potassium sulfate is shown.

$$CaCl_2(aq) + K_2SO_4(aq) \rightarrow CaSO_4(s) + 2KCl(aq)$$

Which process is **not** used to produce the pure salt calcium sulfate?

A crystallisation of the salt from solution

B filtration to collect the salt

C mixing two soluble salts together

D washing the salt with cold water

21 Which statement describes the structure of sodium chloride?

A contains alternating positive and negative ions

B contains an irregular arrangement of ions

C contains positive ions only

D is a giant covalent structure

22 Nickel is a metal.

Three statements about nickel are listed.

1 It is a good conductor of electricity.

2 It has a low melting point.

3 It is shiny.

Which statements about the properties of nickel are correct?

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

23 Which row shows a chemical test for the presence of water?

	substance	colour change
A	anhydrous cobalt(II) chloride	pink to blue
B	anhydrous cobalt(II) chloride	white to blue
C	anhydrous copper(II) sulfate	pink to blue
D	anhydrous copper(II) sulfate	white to blue

24 Modern cars are fitted with catalytic converters to reduce the pollution of the atmosphere.

Carbon monoxide is produced by the ……1…… combustion of petrol.

Nitrogen monoxide is produced in the car engine.

The nitrogen monoxide is ……2…… by the carbon monoxide in the catalytic converter to produce ……3…… .

Which words complete gaps 1, 2 and 3?

	1	2	3
A	complete	oxidised	nitrogen dioxide
B	complete	reduced	nitrogen
C	incomplete	oxidised	nitrogen dioxide
D	incomplete	reduced	nitrogen

25 Why do farmers add lime to soil?

A It acts as a fertiliser.

B It adds nitrogen to the soil.

C It decreases the pH of the soil.

D It increases the pH of the soil.

26 Which statement about the products of the fractional distillation of petroleum is **not** correct?

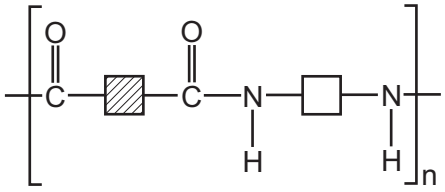
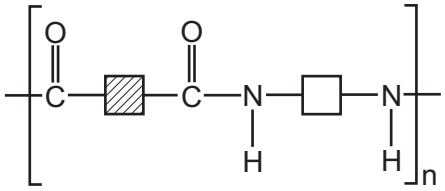
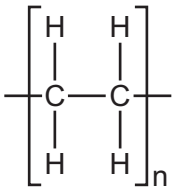
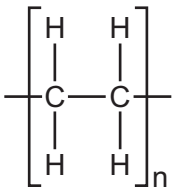
A Fractions obtained from high up the fractional distillation column contain small molecules.

B Fractions obtained from low down the fractional distillation column have low boiling points.

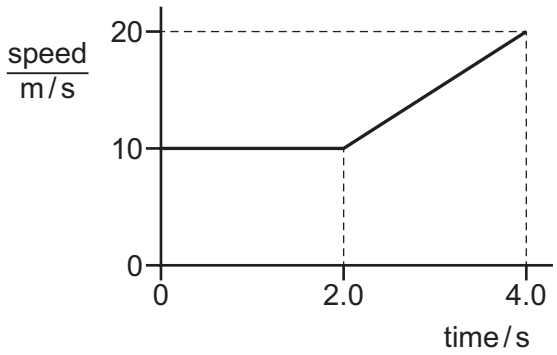
C Large molecules have large intermolecular attractive forces.

D Refinery gas is used for cooking and heating.

27 What is the structure of poly(ethene) and what type of polymerisation is used to make it?

	structure of polymer	type of polymerisation
A		addition
B		condensation
C		addition
D		condensation

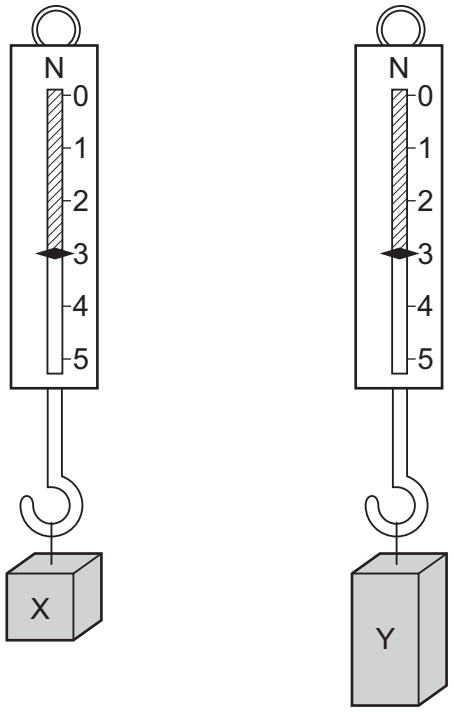
28 The diagram is a speed-time graph for a moving object.



What is the distance travelled by the object in 4.0 s?

A 30 m **B** 40 m **C** 50 m **D** 80 m

29 Two blocks of metal, X and Y, hang from spring balances as shown.



What does the diagram show about X and Y?

A They have the same mass and the same volume but different weights.

B They have the same mass and the same weight but different volumes.

C They have the same mass, the same volume and the same weight.

D They have the same weight and the same volume but different masses.

30 A spring of unstretched length 5.0 cm has a spring constant k of 20 N / cm. A load is suspended from the spring and its new length is 8.5 cm.

What is the weight of the load?

A 0.70 N **B** 1.7 N **C** 70 N **D** 170 N

31 The Sun is an important energy resource.

Which energy source powers the Sun?

A chemical

B geothermal

C nuclear fission

D nuclear fusion

32 A sample of a substance has a mass of 2.0 kg. The sample gains 40 000 J of energy and this causes its temperature to change from 10 °C to 50 °C.

What is the specific heat capacity of the substance?

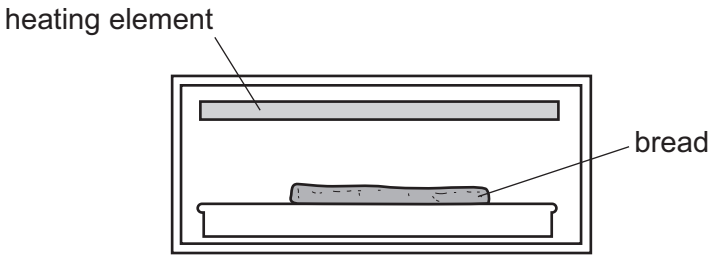
A 400 J / (kg °C)

B 500 J / (kg °C)

C 800 J / (kg °C)

D 1000 J / (kg °C)

33 Bread can be cooked by placing it below a heating element.



Which process transfers thermal energy from the heating element to the bread?

A conduction

B convection

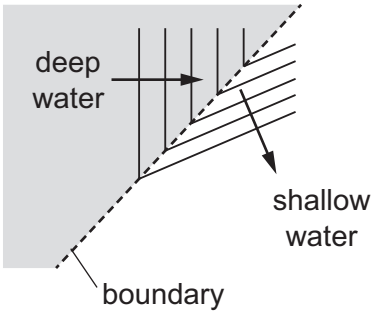
C evaporation

D radiation

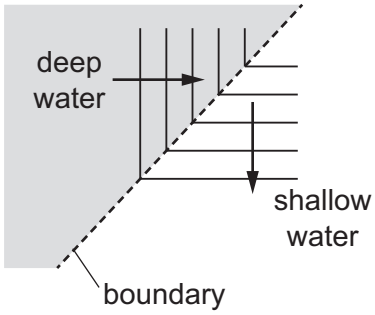
34 The diagrams show a water wave travelling towards a boundary. At the boundary, the wave passes from deep water into shallow water and its speed decreases. Arrows indicate the direction of the wave.

Which diagram shows the wave in the shallow water?

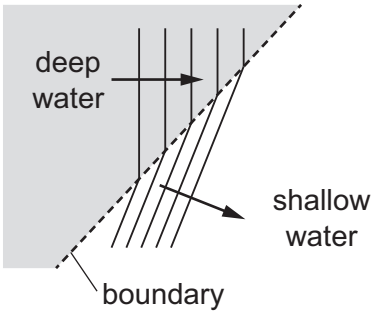
A



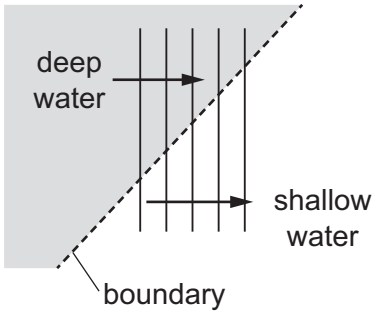
B



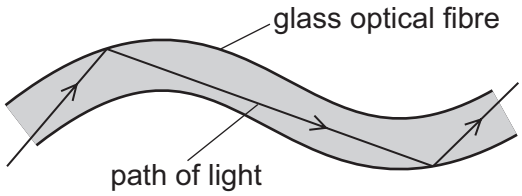
C



D



35 The diagram shows light passing along a glass optical fibre.



Which description applies to the optical fibre?

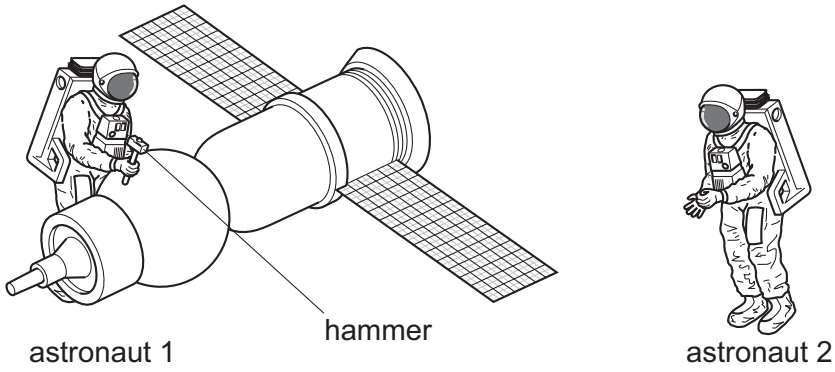
A A maximum amount of light is absorbed by the glass.

B Light waves reflect inside the fibre.

C Microwaves can be transmitted in the fibre.

D The signal strengthens as the length of the fibre increases.

36 Astronaut 1 uses a hammer to mend a satellite in space. Astronaut 2 is nearby. There is no air in space.



What does astronaut 2 hear compared with the sound heard if they were working on Earth?

A a louder sound

B a quieter sound

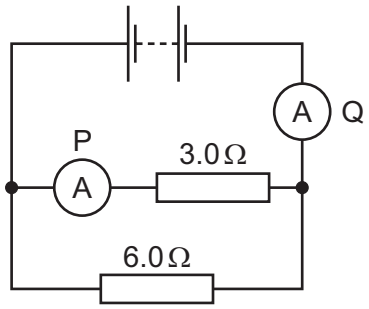
C a sound of the same loudness

D no sound at all

37 Which quantity is related to the flow of charge and which quantity is defined in terms of the energy supplied by a source in driving charge round a complete circuit?

	flow of charge	energy supplied by a source
A	current	e.m.f.
B	current	p.d.
C	resistance	e.m.f.
D	resistance	p.d.

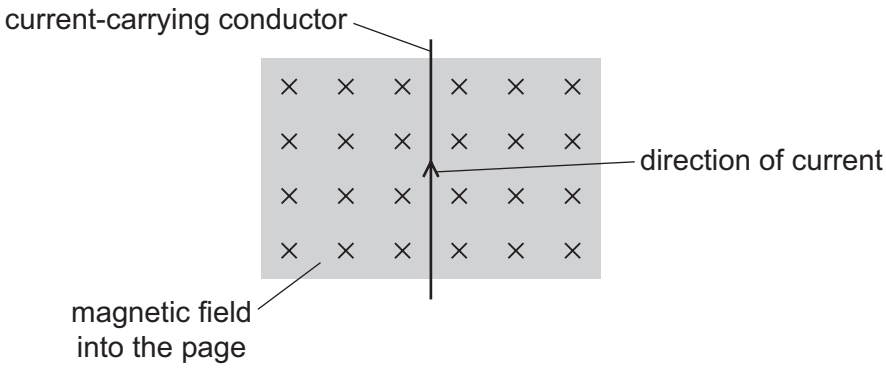
38 A battery is connected to a 3.0 Ω resistor, a 6.0 Ω resistor and two ammeters P and Q.



What is the combined resistance of the two resistors and which ammeter has the greater reading?

	combined resistance / Ω	ammeter with greater reading
A	less than 3.0	P
B	less than 3.0	Q
C	9.0	P
D	9.0	Q

39 A current-carrying conductor is placed in a magnetic field that is directed into the page.



The conductor experiences a force due to the magnetic field.

In which direction does the force act?

A into the page

B out of the page

C to the left

D to the right

40 Which row compares the number of protons and the number of neutrons in atoms of different isotopes of an element?

	number of protons	number of neutrons
A	different	different
B	different	the same
C	the same	different
D	the same	the same

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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.).