

## **Cambridge International Examinations**

Cambridge International General Certificate of Secondary Education

### **CO-ORDINATED SCIENCES**

0654/13

Paper 1 Multiple Choice October/November 2016

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.

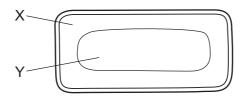
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.



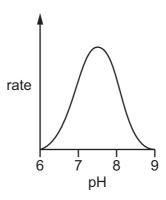
1 The diagram shows a plant cell.



In which regions of the cell are the chloroplasts and nucleus found?

	chloroplasts	nucleus
Α	Х	Х
В	X	Y
С	Y	Х
D	Υ	Y

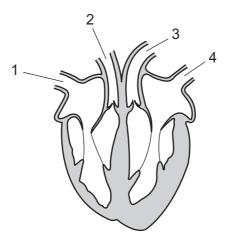
2 The diagram shows how the rate of an enzyme-controlled reaction is affected by pH.



What is the optimum pH for this enzyme-controlled reaction?

- **A** 6
- **B** 6.5
- **C** 7.5
- **D** 9
- 3 Which result with the biuret test would show protein is present?
  - A blue
  - **B** green
  - C orange
  - **D** purple

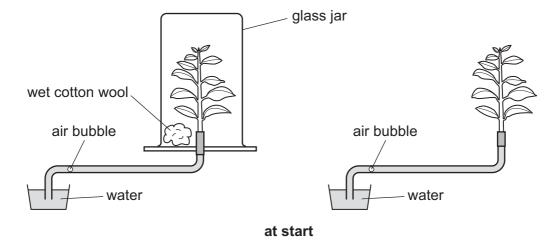
4 The diagram shows a section through the human heart.



Which two blood vessels are arteries?

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

**5** The diagram shows two stages in an experiment on water uptake in two shoots from the same plant. Both shoots are kept in the light for one hour.



wet cotton wool
air bubble
water

after one hour

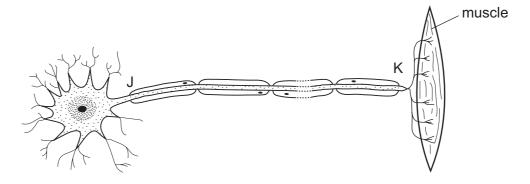
What does the experiment show?

- A Humidity affects the rate of water uptake.
- **B** Light affects the rate of water uptake.
- **C** Plants lose more water at higher temperatures.
- **D** Plants take up water by their roots.
- 6 Limewater can be used to investigate a difference in the composition of inspired and expired air.

Which statement is correct?

- **A** Expired air turns limewater milky because it contains less carbon dioxide.
- **B** Expired air turns limewater milky because it contains more carbon dioxide.
- C Inspired air turns limewater milky because it contains less oxygen.
- **D** Inspired air turns limewater milky because it contains more oxygen.

- 7 What could be measured to determine the rate of aerobic respiration of a plant?
  - A the rate of production of alcohol in the dark
  - **B** the rate of production of carbon dioxide in the dark
  - **C** the rate of production of glucose in the light
  - **D** the rate of production of oxygen in the light
- 8 The diagram shows a neurone and associated structures.



What type of neurone is shown and in which direction do impulses travel?

	type of neurone	direction of impulse
Α	motor	J to K
В	motor	K to J
С	sensory	J to K
D	sensory	K to J

## 9 What are the effects of adrenaline?

	blood glucose concentration	pulse rate
Α	decreases	decreases
В	decreases	increases
С	increases	decreases
D	increases	increases

10 In a human female, where is the ego
--

- **A** ovary
- **B** oviduct
- C uterus
- D vagina

## 11 Which aspect of human reproduction defines it as sexual reproduction?

- A A man and woman must have sexual intercourse to produce a baby naturally.
- **B** Genetic material from each parent combines to produce a zygote.
- **C** Human babies are naturally fed on breast milk.
- **D** Young women have menstrual periods when they are not pregnant.

## 12 The diagram shows a food chain.

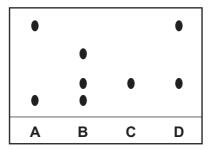
Which organisms pass the greatest amount of energy along the food chain?



- 13 Which natural resource is renewable?
  - A coal
  - B natural gas
  - C oil
  - **D** wood

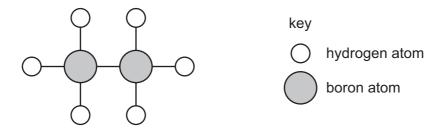
## **14** The diagram shows the chromatogram obtained from four different substances.

Which substance is pure?



- **15** Which statements about atomic structure are correct?
  - 1 A neutron is a particle with negligible mass.
  - 2 The nucleus is at the centre of the atom and contains only protons and neutrons.
  - 3 The nucleon number is the total number of protons and neutrons in an atom.
  - A 1 and 2 only
- **B** 1 and 3 only
- C 2 and 3 only
- **D** 1, 2 and 3

16 A model of a molecule is shown.



Which row shows the formula of this molecule and describes the type of bonding between the atoms?

	formula	bonding
Α	2BH₃	covalent
В	2BH₃	ionic
С	$B_2H_6$	covalent
D	$B_2H_6$	ionic

- 17 Which word equation represents a redox reaction?
  - A carbon + copper oxide → copper + carbon dioxide
  - **B** hydrochloric acid + potassium hydroxide → potassium chloride + water
  - **C** magnesium carbonate → magnesium oxide + carbon dioxide
  - **D** sodium sulfate + barium nitrate → barium sulfate + sodium nitrate
- **18** Which type of reaction and which temperature change take place when an acid reacts with an alkali?

	type of reaction	temperature change
Α	endothermic	decrease
В	endothermic	increase
С	exothermic	decrease
D	exothermic	increase

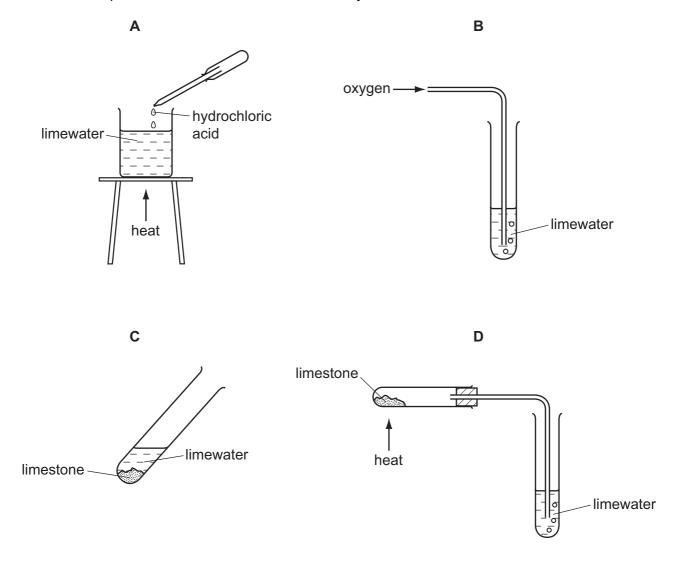
- 19 Which products are formed when dilute sulfuric acid is electrolysed using inert electrodes?
  - A hydrogen and oxygen
  - **B** hydrogen and sulfur
  - **C** hydrogen and sulfur dioxide
  - D oxygen and sulfur dioxide
- 20 A piece of magnesium ribbon is placed in dilute hydrochloric acid.

The magnesium reacts and bubbles of a colourless gas are formed.

What is the word equation for this reaction?

- A magnesium + hydrochloric acid → magnesium chloride + carbon dioxide
- **B** magnesium + hydrochloric acid → magnesium chloride + carbon dioxide + water
- **C** magnesium + hydrochloric acid → magnesium chloride + hydrogen
- **D** magnesium + hydrochloric acid → magnesium chloride + hydrogen + water

21 In which experiment does limewater become milky?

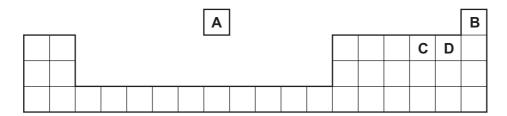


- 22 Which statement about lithium, sodium and potassium is not correct?
  - **A** They are in the same group of the Periodic Table.
  - **B** They are in the same period of the Periodic Table.
  - **C** They float on water.
  - **D** They react with water to give a flammable gas.

23 Part of the Periodic Table is shown.

The letters are not the symbols of the elements.

Which element is used to fill balloons?



**24** A student reacts five metals with cold water and with dilute hydrochloric acid. The student measures the volumes of gas produced in one minute.

The results are shown.

metal	volume of gas in cold water/cm <sup>3</sup>	volume of gas in dilute hydrochloric acid/cm³
magnesium	2	15
zinc	0	8
calcium	18	25
iron	0	4
copper	0	0

What is the order of reactivity from most reactive to least reactive?

**A** calcium  $\rightarrow$  magnesium  $\rightarrow$  zinc  $\rightarrow$  copper  $\rightarrow$  iron

**B** calcium  $\rightarrow$  magnesium  $\rightarrow$  zinc  $\rightarrow$  iron  $\rightarrow$  copper

**C** magnesium  $\rightarrow$  calcium  $\rightarrow$  zinc  $\rightarrow$  iron  $\rightarrow$  copper

 $\textbf{D} \quad \mathsf{zinc} \to \mathsf{calcium} \to \mathsf{magnesium} \to \mathsf{iron} \to \mathsf{copper}$ 

25 Which conditions are required for rusting?

**A** air only

B air and water

C salt and water

**D** water only

26 Lime is manufactured from limestone.

The limestone undergoes .....1..... during the reaction.

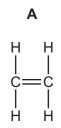
The chemical name for lime is .....2......

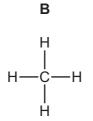
Lime is used to treat .....3..... industrial waste.

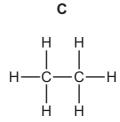
Which words complete gaps 1, 2 and 3?

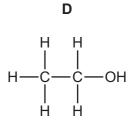
	1	2	3
Α	reduction	calcium oxide	acidic
В	thermal decomposition	calcium carbonate	acidic
С	thermal decomposition	calcium oxide	acidic
D	thermal decomposition	calcium oxide	basic

27 Which structure represents an unsaturated hydrocarbon?

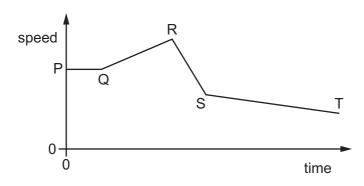








28 The diagram shows the speed/time graph for a train as it travels along a track.



For which part of the graph is the train's speed changing at the greatest rate?

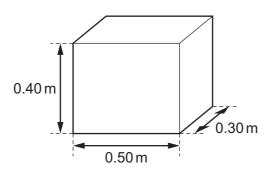
A PQ

**B** QR

C RS

**D** ST

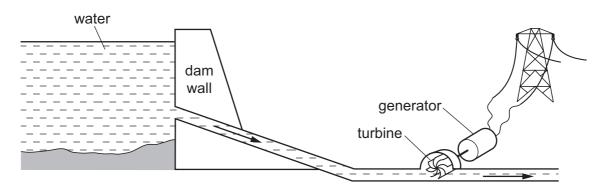
29 The diagram shows the dimensions of a block of wood of density 500 kg/m<sup>3</sup>.



What is the mass of the block?

- **A** 30 kg
- **B** 60 kg
- **C** 75 kg
- **D** 100 kg

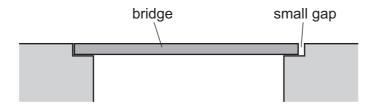
**30** The diagram shows the main parts of a hydroelectric power station. Electricity is generated from energy stored by the water.



Which form of energy decreases as the electricity is generated?

- **A** chemical
- **B** gravitational
- **C** nuclear
- **D** thermal

31 The diagram shows a bridge on a cold day. The bridge has been built with a small gap at one end.



On a warmer day, the bridge changes size and the gap changes size.

What happens to the size of the bridge, and what happens to the size of the gap?

	bridge	gap
Α	becomes bigger	becomes bigger
В	becomes bigger	becomes smaller
С	becomes smaller	becomes bigger
D	becomes smaller	becomes smaller

- **32** How is thermal energy transferred in a vacuum?
  - A by conduction and convection
  - **B** by convection and radiation
  - **C** by convection only
  - **D** by radiation only
- 33 A water wave passes point Y.

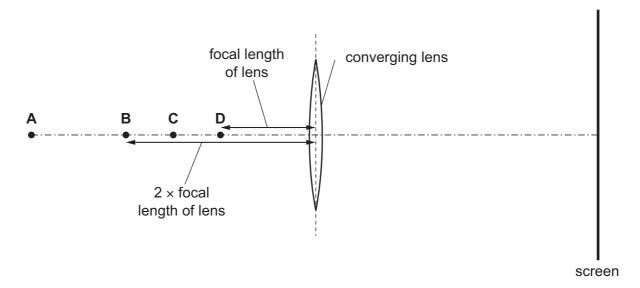
A student counts how many wave crests pass point Y in 30 seconds.

Using **only** this information, what can the student calculate?

- A the amplitude of the wave
- B the frequency of the wave
- C the speed of the wave
- **D** the wavelength of the wave

**34** A converging lens in a projector is used to make an **enlarged** (magnified) image of an object on a screen.

At which labelled point could the object be placed so that the lens produces this image?



**35** Electromagnetic waves are used to cook food under a grill. Electromagnetic waves are also used to send telephone messages over large distances.

Which type of electromagnetic wave is used for each of these two purposes?

	cooking food under a grill	sending telephone messages
Α	infra-red waves	infra-red waves
В	infra-red waves	microwaves
С	microwaves	infra-red waves
D	microwaves	microwaves

**36** What is the range of frequencies a typical person can hear?

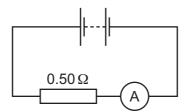
**A** 20 Hz – 2000 Hz

**B** 20 Hz – 20 000 Hz

**C** 200 Hz – 2000 Hz

**D** 200 Hz - 20 000 Hz

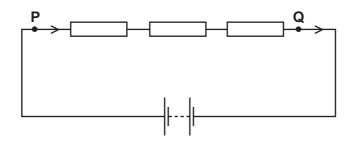
37 The diagram shows a battery connected to a  $0.50\Omega$  resistor and an ammeter. The reading on the ammeter is  $0.20\,\text{A}$ .



What is the p.d. across the resistor?

- **A** 0.10 V
- **B** 0.40 V
- **C** 0.70 V
- **D** 2.5 V

38 Three resistors are connected in series with a battery, as shown in the diagram.

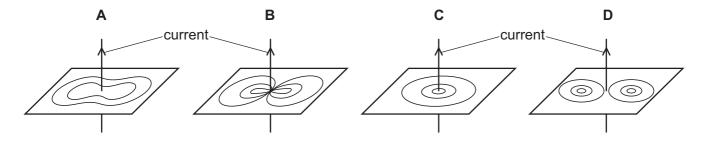


The current at point **P** is 6.0 A.

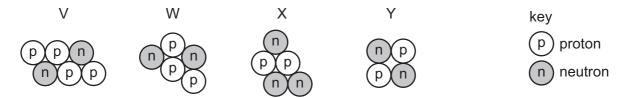
What is the current at point **Q**?

- **A** 0A
- **B** 2.0 A
- **C** 3.0 A
- **6.0** 6.0

39 Which diagram shows the magnetic field pattern around a straight wire carrying a current?



**40** The diagrams represent the nuclei of four different atoms V, W, X and Y.



Which two diagrams represent isotopes of the same element?

A V and W B W and X C X and Y D Y and V

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The Periodic Table of Elements

	$\equiv$	ه <sub>5</sub>	helium 4	10	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	54	Xe	xenon 131	98	R	radon			
	II/			6	Щ	fluorine 19	17	Cl	chlorine 35.5	35	Ā	bromine 80	53	П	iodine 127	85	Αt	astatine			
	>			80	0	oxygen 16	16	ഗ	sulfur 32	34	Se	selenium 79	52	<u>a</u>	tellurium 128	84	Ро	molouium -	116		livermorium —
	>			7	z	nitrogen 14	15	۵	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	Ξ	bismuth 209			
	≥			9	O	carbon 12	14	S	silicon 28	32	Ge	germanium 73	20	Sn	tin 119	82	Ър	lead 207	114	Εl	flerovium -
	≡			2	В	boron 11	13	Ρl	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	1L	thallium 204			
										30	Zn	zinc 65	48	ပ္ပ	cadmium 112	80	Нg	mercury 201	112	Ö	copernicium -
										29	Cn	copper 64	47	Ag	silver 108	62	Au	gold 197	111	Rg	roentgenium -
Group										28	Ë	nickel 59	46	Pd	palladium 106	78	£	platinum 195	110	Ds	darmstadtium -
Gro										27	ဝိ	cobalt 59	45	몺	rhodium 103	77	'n	iridium 192	109	Μ̈́	meitnerium -
		- ⊐	hydrogen 1							26	Ьe	iron 56	44	Ru	ruthenium 101	9/	Os	osmium 190	108	Hs	hassium -
										25	Mn	manganese 55	43	ပ	technetium -	75	Re	rhenium 186	107	Bh	bohrium —
					pol	ass				24	ပ်	chromium 52	42	Mo	molybdenum 96	74	≯	tungsten 184	106	Sg	seaborgium -
			Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	g	niobium 93	73	д	tantalum 181	105	Op	dubnium —
					atc	ne.				22	j	titanium 48	40	Zr	zirconium 91	72	Ξ	hafnium 178	104	꿆	rutherfordium -
										21	Sc	scandium 45	39	>	yttrium 89	57–71	lanthanoids		89–103	actinoids	
	=			4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	Š	strontium 88	56	Ba	barium 137	88	Ra	radium -
	_			က	:=	lithium 7	7	Na	sodium 23	19	¥	potassium 39	37	Rb	rubidium 85	55	S	caesium 133	87	Ŧ	francium -

Lu Lu	lutetium 175	103	۲	lawrencium	I
o <sub>y</sub> Y	ytterbium 173	102	9 N	nobelium	I
e <sub>e</sub> Tm	thulium 169	101	Md	mendelevium	I
88 <b>Ē</b>	erbium 167	100	Fm	fermium	ı
67 Ho	holmium 165	66	Es	einsteinium	ı
66 Dy	dysprosium 163	86	ŭ	californium	I
65 Tb	terbium 159	26	Ř	berkelium	I
<sup>20</sup> Gd	gadolinium 157	96	Cm	curium	I
e3 Eu	europium 152	92	Am	americium	I
62 Sm	samarium 150	94	Pu	plutonium	I
e1 Pm	promethium -	93	d	neptunium	I
09 <b>P</b> Z	neodymium 144	92	$\supset$	uranium	238
P	praseodymium 141	91	Ра	protactinium	231
Se O	cerium 140	06	T	thorium	737
57 <b>La</b>	lanthanum 139	89	Ac	actinium	I
lanthanoids			actinoids		

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)