

# Cambridge IGCSE<sup>™</sup>

## **CO-ORDINATED SCIENCES**

Paper 1 Multiple Choice (Core)

0654/12 May/June 2021 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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

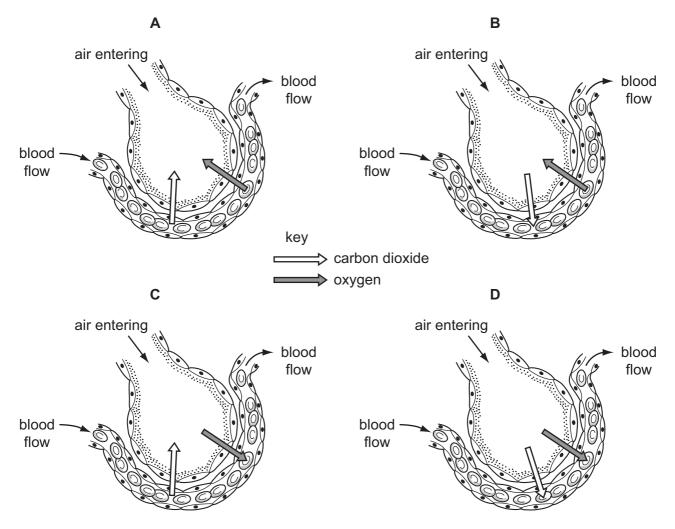
This document has 16 pages.

https://xtremepape.rs/

IB21 06\_0654\_12/3RP © UCLES 2021

[Turn over

- **1** What is respiration?
  - A breakdown of food by enzymes in the alimentary canal
  - **B** breathing to supply oxygen to cells
  - **C** release of carbon dioxide from the lungs
  - D release of energy for body activities
- **2** Which diagram correctly shows the diffusion of carbon dioxide and oxygen between an alveolus and a capillary?



3 Which row matches the nutrient to the chemical elements that it contains?

	nutrient	carbon	hydrogen	oxygen	nitrogen	
Α	fat	$\checkmark$	$\checkmark$	X	x	
в	protein	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
С	starch	$\checkmark$	X	$\checkmark$	$\checkmark$	
D	sugar	X	$\checkmark$	$\checkmark$	$\checkmark$	

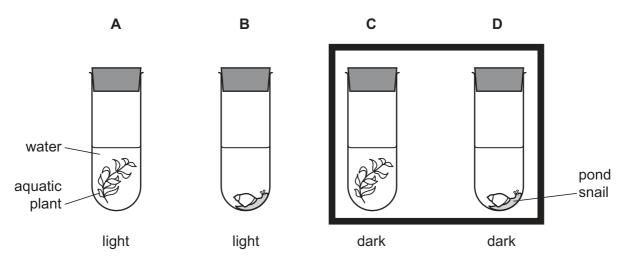
key

 $\checkmark$  = contains element

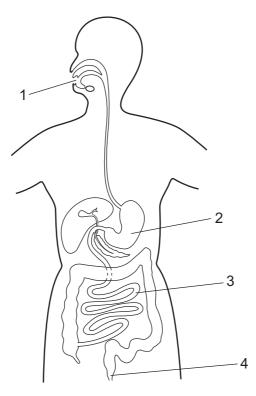
X = does not contain element

- 4 Which type of molecule are enzymes?
  - A fat
  - B carbohydrate
  - **C** protein
  - D DNA
- **5** Four test-tubes were set up as shown.

Which test-tube will contain the most dissolved oxygen after 24 hours?



6 The diagram shows the human digestive system.



Where do digestion, egestion, ingestion and absorption take place?

	digestion	egestion	ingestion	absorption
Α	1	4	2	3
в	2	4	1	3
С	3	1	4	2
D	4	3	2	1

7 Transpiration is the process by which water moves through a plant.

From which cells in the leaf does most of the water evaporate and through which structure is it lost as water vapour to the atmosphere?

	evaporates from	lost as water vapour through
Α	epidermis	cuticle
в	epidermis	stomata
С	mesophyll	cuticle
D	mesophyll	stomata

8 A child blows into a rubber balloon.

What is the percentage of oxygen inside the balloon?

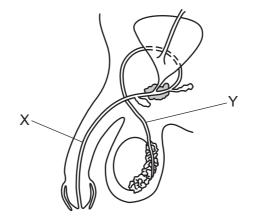
**A** 0% **B** 4% **C** 16% **D** 21%

**9** A student is in a dangerous situation and adrenaline is released into the blood. The table shows changes to pulse rate, breathing rate and pupil diameter.

Which row correctly describes the effect of adrenaline?

	pulse rate	breathing rate	pupil diameter
Α	decrease	increase	decrease
в	decrease	decrease	increase
С	increase	increase	increase
D	increase	decrease	decrease

**10** The diagram shows the human male reproductive system.



What are the functions of X and Y?

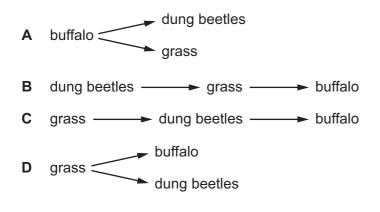
	Х	Y		
Α	carries urine and semen out of the body	transfers sperm to the urethra		
В	production of male gametes	transfers semen to the vagina during sexual intercourse		
С	transfers semen to the vagina during sexual intercourse	production of male gametes		
D	transfers sperm to the urethra	carries urine and semen out of the body		

11 Which row is correct for the inheritance of sex in humans?

	female	male	
A XX		XY	
B XY		XX	
С	ΥY	XX	
D	XX	ΥY	

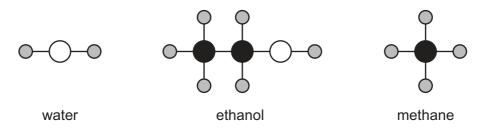
**12** Dung beetles lay their eggs in the faeces of plant-eating mammals like buffalo. Both the adult beetles and their young stages eat the **undigested** food in the faeces.

Which diagram shows this food relationship?



- 13 Which process removes carbon dioxide from the atmosphere?
  - A combustion
  - B photosynthesis
  - **C** respiration
  - D transpiration

**14** The structures of some substances are shown.



Which row shows the total number of different elements and the total number of atoms in the three structures?

	total number of different elements	total number of atoms
Α	3	9
В	3	17
С	7	9
D	7	17

- **15** Which method can be used to separate graphite from dilute nitric acid?
  - A chromatography
  - **B** crystallisation
  - C distillation
  - **D** filtration
- 16 Which statement about a carbon dioxide molecule is correct?
  - **A** It is composed of metallic elements, which are covalently bonded.
  - **B** It is composed of metallic elements, which are ionically bonded.
  - **C** It is composed of non-metallic elements, which are covalently bonded.
  - **D** It is composed of non-metallic elements, which are ionically bonded.

**17** Hydrogen reacts with iodine to form hydrogen iodide.

The equation for this reaction is shown.

$$H_2 \ + \ I_2 \ \rightarrow \ 2HI$$

During this reaction the temperature increases.

Which statement explains why the temperature increases?

- A One molecule of hydrogen is forming two molecules of hydrogen iodide.
- **B** The reaction is exothermic.
- **C** The reaction is very fast.
- **D** The reaction takes in energy.
- **18** The catalytic converter in the exhaust of a car brings about the reaction shown.

2NO + 2CO  $\rightarrow$  2CO<sub>2</sub> + N<sub>2</sub>

Which row about this reaction is correct?

	oxidation	reduction	
Α	$\checkmark$	$\checkmark$	key
в	$\checkmark$	X	✓ = occurs
С	X	$\checkmark$	<b>X</b> = does not occur
D	X	X	

- **19** The results of two tests on substance X are listed.
  - 1 A lilac flame is produced in a flame test.
  - 2 A gas which turns damp red litmus blue is produced when X is heated with aluminium powder and aqueous sodium hydroxide.

What is X?

- A potassium nitrate
- B potassium sulfate
- C sodium nitrate
- D sodium sulfate

**20** What reacts with ammonia gas?

	hydrochloric acid	sodium hydroxide	
Α	$\checkmark$	$\checkmark$	key
В	$\checkmark$	X	✓ = reacts
С	X	$\checkmark$	<b>X</b> = does not react
D	x	X	

21 Which row describes trends in the properties of Group I elements as the group is descended?

	melting point	reactivity with water		
Α	decreasing	decreasing		
В	decreasing	increasing		
С	increasing	decreasing		
D	increasing	increasing		

**22** Bauxite is the main ore of aluminium.

Which method is used to extract pure aluminium from bauxite?

- A fractional distillation
- B electrolysis
- C neutralisation
- **D** thermal decomposition
- **23** In order to make water from reservoirs fit to drink .....1..... is used to kill bacteria.

Water in a condenser is used during distillation as a .....2......

When water is used to make ethanol from ethene it is acting as a ......3......

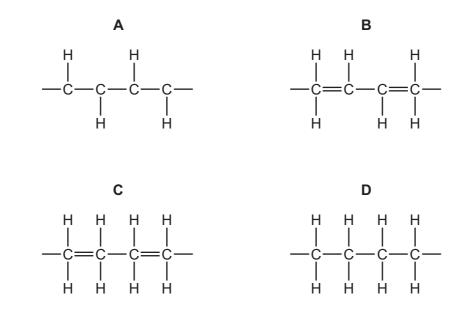
Which words correctly complete gaps 1, 2 and 3?

	1	2	3	
Α	chlorination	coolant	reactant	
в	chlorination	solvent	solvent	
С	filtration coolant		reactant	
D	filtration	solvent	solvent	

- 24 Other than hydrogen and oxygen, which substance provides only one of the essential elements for plant growth?
  - K₃PO₄ В KNO<sub>3</sub>  $(NH_4)_3PO_4$ D NH₄NO<sub>3</sub> Α С
- 25 What are the products of the thermal decomposition of calcium carbonate, CaCO<sub>3</sub>?
  - Α calcium and carbon dioxide
  - В calcium, carbon and oxygen
  - calcium oxide and carbon dioxide С
  - D calcium oxide and carbon monoxide
- 26 Which property allows petroleum to be separated by fractional distillation?
  - Α boiling point
  - В colour
  - С density
  - D melting point
- 27 Poly(ethene) is a saturated hydrocarbon.

It is formed by the addition polymerisation of ethene, H<sub>2</sub>C=CH<sub>2</sub>.

Which diagram shows part of a molecule of poly(ethene)?



**28** A girl runs 5000 m in 1200 seconds and then walks a further 3000 m in 1800 seconds.

What is her average speed for this journey?

1.7 m/s **B** 2.7 m/s **D** 5.8 m/s Α С 2.9m/s

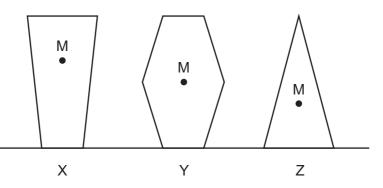
0654/12/M/J/21

**29** An object is falling freely near the Earth without air resistance.

Which statement about the acceleration of the object is correct?

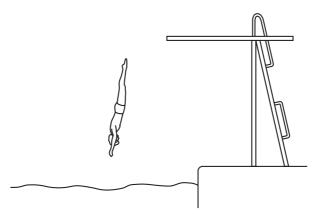
- A It is constant, but not zero.
- B It is decreasing.
- **C** It is increasing.
- D It is zero.

30 Three objects X, Y and Z are at rest on a table. The centre of mass of each object is labelled M.



What is the order of stability of these three objects, from most stable to least stable?

31 The diagram shows a man diving into water.



Which form of energy is increasing as he accelerates downwards through the air?

- A chemical
- B elastic potential (strain)
- **C** gravitational potential
- D kinetic

https://xtremepape.rs/

**32** There is a vacuum between the double walls of a vacuum flask.

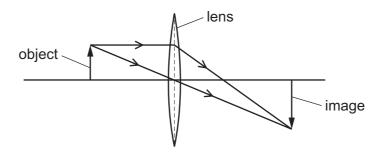
Which of the methods of thermal energy transfer are prevented by the vacuum?

- A conduction only
- B conduction and convection
- **C** convection only
- D radiation only
- **33** A boy looks into a plane mirror that is 50 cm in front of his face.

How far from the boy's face is the image of his face?

Α	25 cm	в	50 cm	С	100 cm	D	150 cm
~	20011		000011	•	100 011		100 0111

**34** The diagram shows the image of an object produced by a thin converging lens.

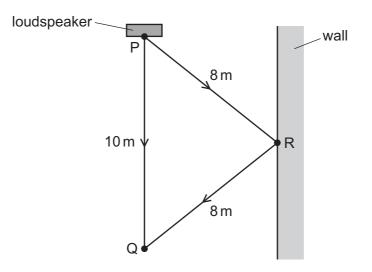


How is the image described?

- A diminished and inverted
- **B** diminished and upright
- C enlarged and inverted
- D enlarged and upright

**35** Sound from a loudspeaker at P travels directly to Q. Sound also reaches Q after being reflected from a wall at R.

13

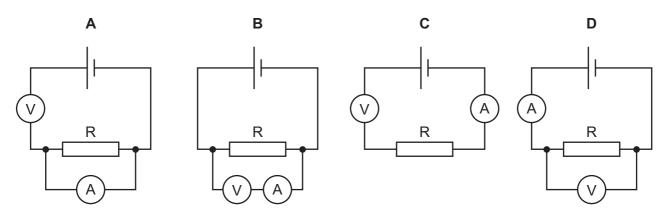


The speed of sound is 330 m/s.

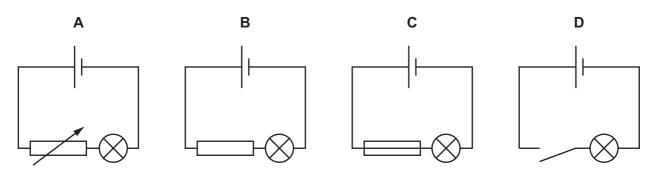
What is the difference in time for sound to travel from P to Q by the two routes?

**A**  $\left(\frac{6}{330}\right)$ s **B**  $\left(\frac{16}{330}\right)$ s **C**  $(6 \times 330)$ s **D**  $(16 \times 330)$ s

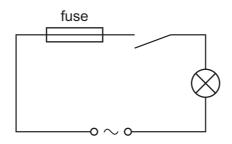
36 Which circuit can be used to take measurements to determine the resistance of resistor R?



37 In which circuit can the brightness of the lamp be varied continuously?



**38** A student connects the circuit shown.

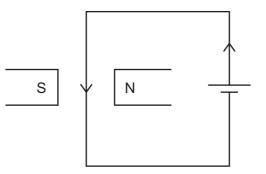


When the switch is closed the fuse blows and stops the current.

What is a possible reason for this?

- **A** The current rating of the fuse is too high.
- **B** The current is too large.
- C The lamp is too dim.
- **D** The voltage is too small.
- **39** The diagram shows a wire in a magnetic field.

There is a current in the wire.



The force produced on the wire causes the wire to move into the page.

The direction of the current is now reversed.

What happens to the wire?

- A It does not move at all.
- **B** It moves out of the page.
- C It moves sideways towards one of the poles of the magnet.
- **D** It still moves into the page.

#### **40** A radioactive nucleus emits a $\beta$ -particle.

What happens to the proton number (atomic number) of the nucleus?

- A It stays the same.
- B It increases by 1.
- **C** It decreases by 2.
- **D** It decreases by 4.

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2021

The Periodic Table of Elements

	VIII	2	He	helium 4	10	Ne	neon 20	18	Ar	argon 40	36	ŗ	krypton 84	54	Xe	xenon 131	86	Rn	radon -			
	NII N						fluorine 19						-									
																						Ę
	>				8	0	oxygen 16	16	S	sulfur 32	34	Se	seleniur 79	52	Te	telluriun 128	84	Ъ	poloniur –	116	2	livermoriu —
	>				7	z	nitrogen 14	15	٩	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	Bi	bismuth 209			
	N				9	ပ	carbon 12	14	Si	silicon 28	32	Ge	germanium 73	50	Sn	tin 119	82	Pb	lead 207	114	Fl	flerovium –
	Ξ				5	ш	boron 11	13	Al	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	11	thallium 204			
											30	Zn	zinc 65	48	Cd	cadmium 112	80	Hg	mercury 201	112	C	copernicium -
											29	Cu	copper 64	47	Ag	silver 108	79	Au	gold 197	111	Rg	roentgenium -
dr											28	ïZ	nickel 59	46	Pd	palladium 106	78	ħ	platinum 195	110	Ds	darmstadtium -
Group											27	ပိ	cobalt 59	45	Rh	rhodium 103	77	Ir	iridium 192	109	Mt	meitnerium -
		-	т	hydrogen 1							26	Fe	iron 56	44	Ru	ruthenium 101	76	SO	osmium 190	108	Hs	hassium –
					I						25	Mn	manganese 55	43	Ч	technetium -	75	Re	rhenium 186	107	Bh	bohrium –
						loc	SS				24	ŗ	chromium 52	42	Mo	molybdenum 96	74	8	tungsten 184	106	Sg	seaborgium -
				Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	qN	niobium 93	73	Та	tantalum 181	105	Db	dubnium –
					g	atoi	relat				22	F	titanium 48	40	Zr	zirconium 91	72	Ŧ	hafnium 178	104	Ŗ	rutherfordium -
								L			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	S	strontium 88	56	Ba	barium 137	88	Ra	radium -
	_				3	:	lithium 7	11	Na	sodium 23	19	¥	potassium 39	37	Rb	rubidium 85	55	Cs	caesium 133	87	ŗ	francium –
		1						1			1			1			1					

16

	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
lanthanoids	La	Ce	Pr	Nd	Pm	Sm	Еu	Ъд	Тb	D	Ч	ч	Tm	Υb	Lu
	lanthanum 139	cerium 140	praseodymium 141	neodymium 144	promethium -	samarium 150	europium 152	gadolinium 157	terbium 159	dysprosium 163	holmium 165	erbium 167	thulium 169	ytterbium 173	lutetium 175
	89	06	91	92	93	94	95	96	97	98	66	100	101	102	103
actinoids	Ac	Th	Ра		dN	Pu	Am	Cm	Ŗ	Ç	Еs	Е Н	Md	No	L
	actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	califomium	einsteinium	fermium	mendelevium	nobelium	lawrencium
	I	232	231	238	I	I	I	I	I	I	I	I	I	I	I

The volume of one mole of any gas is  $24\,dm^3$  at room temperature and pressure (r.t.p.).

## © UCLES 2021

0654/12/M/J/21