Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **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.

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[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 row is correct for a human sperm cell?

	flagellum	nucleus	presence of enzymes
A	no	diploid	yes
B	no	haploid	no
C	yes	diploid	no
D	yes	haploid	yes

3 What is the test for the presence of protein in a food sample?

A Benedict's solution

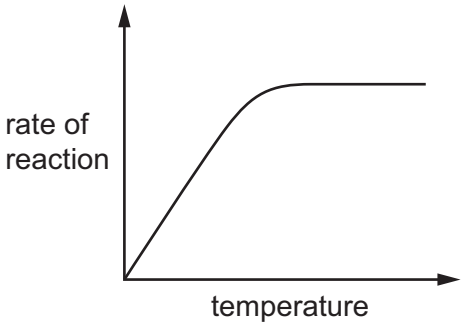
B biuret reagent

C ethanol emulsion

D iodine solution

4 Which graph shows the effect of temperature on the rate of an enzyme-controlled reaction?

A



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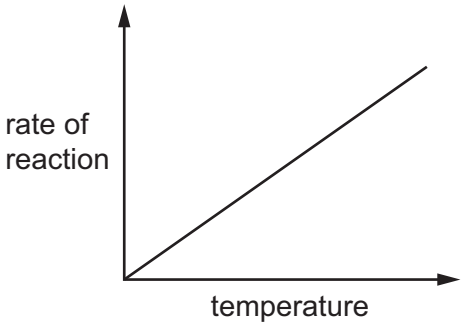

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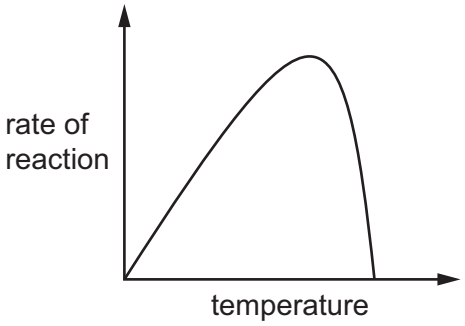
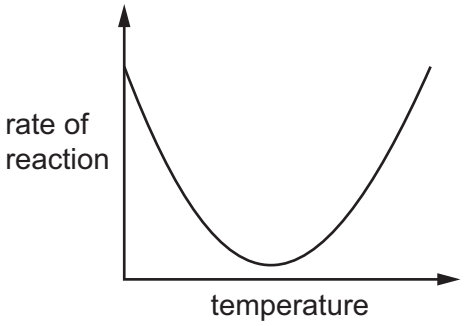


D



5 The balanced equation for photosynthesis is shown.

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

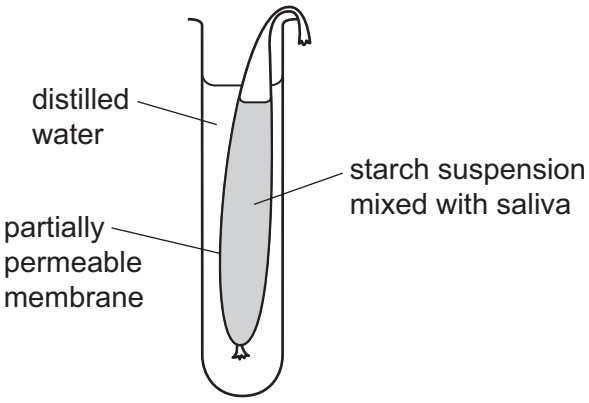
What is **X**?

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

6 A mixture of starch suspension and saliva is placed inside a bag with a partially permeable membrane.

The bag is placed into a test-tube filled with distilled water, as shown.

After one hour, the water is found to contain glucose.



Which row explains this result?

	type of digestion	movement of glucose through partially permeable membrane
A	chemical	diffusion
B	chemical	osmosis
C	mechanical	diffusion
D	mechanical	osmosis

7 What happens to the valves in the heart when the ventricles contract?

	valves between atria and ventricles	valves between ventricles and arteries
A	close	close
B	close	open
C	open	close
D	open	open

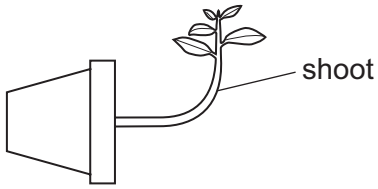
8 A child blows into a rubber balloon.

What is the percentage of oxygen inside the balloon?

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

9 A plant was placed horizontally in complete darkness.

The diagram shows how the plant had grown after one week.



Which response has the shoot made?

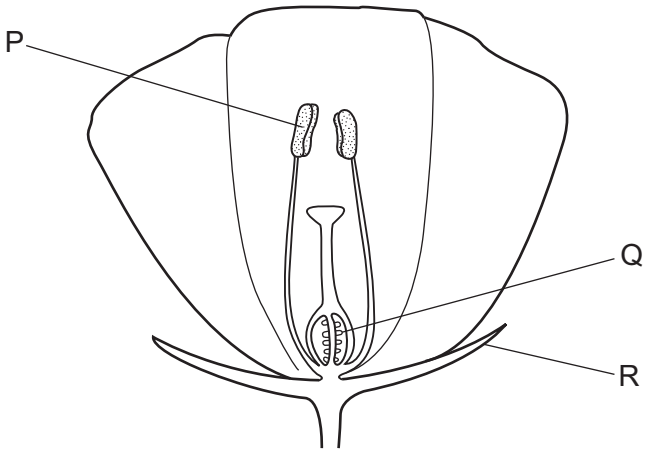
A gravitropism away from gravity

B gravitropism towards gravity

C phototropism away from light

D phototropism towards light

10 The diagram shows a flower.



Which row shows the correct names for the structures labelled P, Q and R?

	P	Q	R
A	anther	ovary	sepal
B	anther	style	carpel
C	filament	ovary	carpel
D	filament	style	sepal

11 Which row about cell division is correct?

	type of cell division	cell chromosome number at start	number of cells produced	cell chromosome number at end
A	meiosis	diploid	2	haploid
B	meiosis	haploid	4	diploid
C	mitosis	diploid	2	diploid
D	mitosis	haploid	4	haploid

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

A All the carnivores consume herbivores.

B The energy passed on reduces from one trophic level to the next.

C There is less protein in each individual higher up the chain.

D There is only one producer in each chain.

13 Putting too much fertiliser on soil can lead to eutrophication in water.

Which substance, dissolved in water, is reduced in concentration as a result of eutrophication?

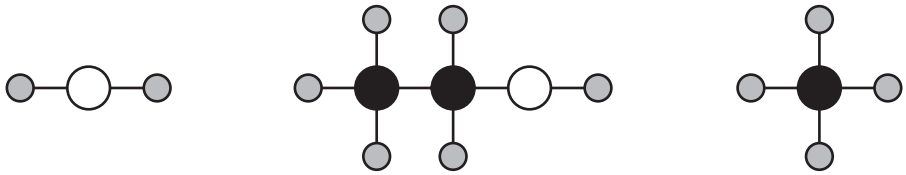
A carbon dioxide

B ions

C nitrogen

D oxygen

14 The structures of some substances are shown.

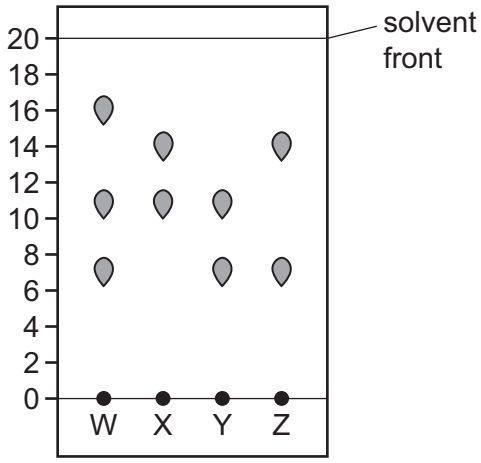


water ethanol methane

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
A	3	9
B	3	17
C	7	9
D	7	17

15 A chromatogram of four different inks, W, X, Y and Z, is shown.

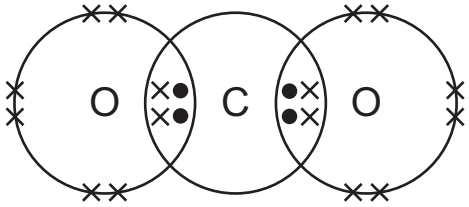


How many inks contain a dye with an R_f value of 0.7?

A 0 **B** 1 **C** 2 **D** 3

16 Which dot-and-cross diagram represents a molecule of carbon dioxide?

A



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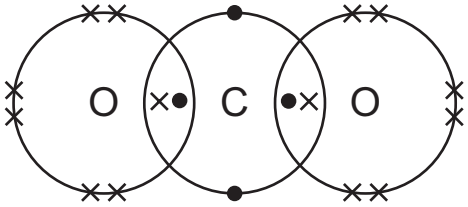

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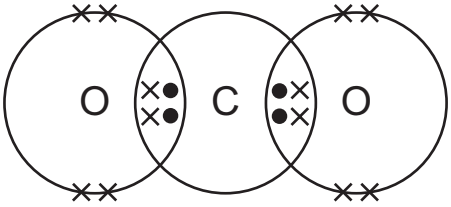
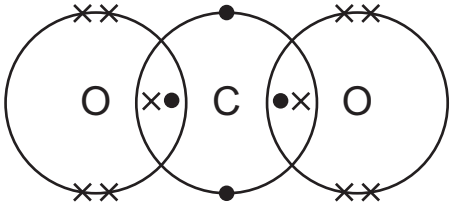


D



17 Which quantity contains one mole of the substance?

A 6 g of carbon atoms, C

B 12 dm^3 of hydrogen gas, H_2, at room temperature and pressure

C 32 g of oxygen atoms, O

D 44 g of carbon dioxide gas, CO_2

18 What are the electrode products when aqueous copper(II) sulfate is electrolysed using inert electrodes?

	anode	cathode
A	copper	hydrogen
B	copper	oxygen
C	oxygen	copper
D	oxygen	hydrogen

19 Chlorine displaces iodine from a solution of sodium iodide in a redox reaction.

The equation for this reaction is shown.

$$Cl_2 + 2NaI \rightarrow 2NaCl + I_2$$

Which statement about this reaction is correct?

A Chlorine is the oxidising agent and it oxidises iodide ions.

B Chlorine is the oxidising agent and it reduces iodide ions.

C Chlorine is the reducing agent and it oxidises iodide ions.

D Chlorine is the reducing agent and it reduces iodide ions.

20 What reacts with ammonia gas?

	hydrochloric acid	sodium hydroxide
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = reacts

✗ = does not react

21 Which element has similar chemical properties to chlorine?

A argon

B bromine

C oxygen

D sulfur

22 An experiment is carried out to investigate the reactions of four metals M, N, O and P with solutions of their sulfates.

The results of the experiment are listed.

- metal N + metal O sulfate = reacts
- metal N + metal P sulfate = reacts
- metal O + metal M sulfate = no reaction
- metal M + metal P sulfate = reacts

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

A $N \rightarrow M \rightarrow P \rightarrow O$

B $N \rightarrow P \rightarrow M \rightarrow O$

C $O \rightarrow M \rightarrow P \rightarrow N$

D $O \rightarrow P \rightarrow M \rightarrow N$

23 Which statement explains how oxides of nitrogen are formed in a car engine?

A Nitrogen from the air reacts with the fuel.

B Oxygen and nitrogen from the air react together.

C Oxygen from the air reacts with sulfur impurities in the fuel.

D Oxygen from the air reacts with the fuel.

24 Other than hydrogen and oxygen, which substance provides only **one** of the essential elements for plant growth?

A K_3PO_4 **B** KNO_3 **C** $(NH_4)_3PO_4$ **D** NH_4NO_3

25 Which row about the Contact process is correct?

	catalyst	pressure / atm
A	iron	2
B	iron	200
C	vanadium(V) oxide	2
D	vanadium(V) oxide	200

26 Which equation represents a thermal decomposition reaction?

A $CaCO_3 \rightarrow CaO + CO_2$

B $HCl + NaOH \rightarrow NaCl + H_2O$

C $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

D $S + O_2 \rightarrow SO_2$

27 Which substances can be produced by cracking?

A alkanes only

B alkenes only

C alkenes and hydrogen only

D alkanes, alkenes and hydrogen

28 Which expression defines the acceleration of a moving object?

A change of velocity × time taken

B distance travelled × time taken

C $\frac{\text{change of velocity}}{\text{time taken}}$

D $\frac{\text{distance travelled}}{\text{time taken}}$

29 Two springs P and Q both obey Hooke's law.

A force of 10 N is applied to spring P and it extends by 2.0 cm.

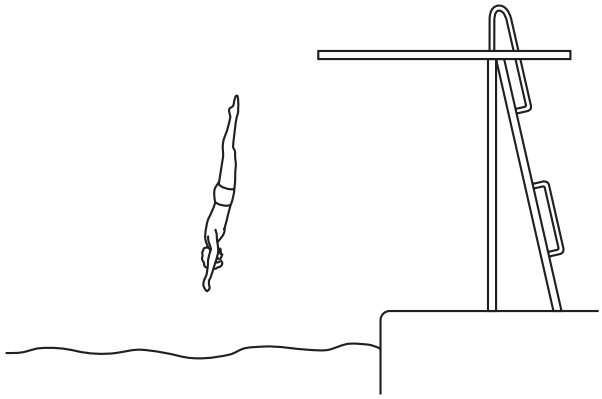
The spring constant of Q is double the spring constant of P.

A force of 20 N is applied to spring Q.

What is the extension of spring Q?

A 1.0 cm **B** 2.0 cm **C** 4.0 cm **D** 8.0 cm

30 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

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 solid metal transfers energy by thermal conduction.

What causes this transfer?

A molecular vibration and moving electrons

B molecular vibration only

C moving electrons only

D neither molecular vibration nor moving electrons

33 Which statement about waves is correct?

A They do not transfer energy or matter.

B They transfer energy and matter.

C They transfer energy but not matter.

D They transfer matter but not energy.

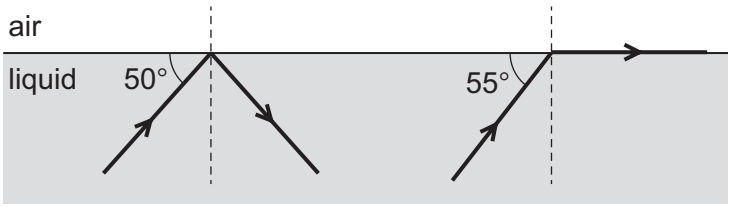
34 A boy stands 3.0 m in front of a plane mirror. He sees his image formed by the mirror.

The boy moves 1.0 m closer to the mirror.

How much closer is the boy to his image now?

A 0.50 m **B** 1.0 m **C** 2.0 m **D** 4.0 m

35 The diagram represents the surface of a transparent liquid. Two rays of light are travelling in the liquid. They both reach the surface. The path of each ray is shown.



What is the critical angle for this liquid?

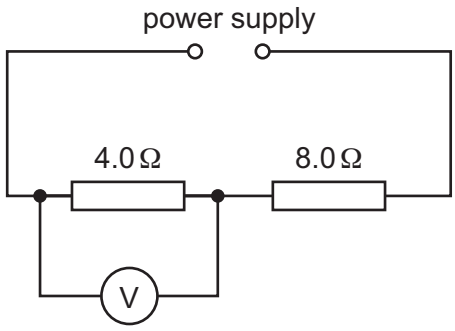
A 35° **B** 40° **C** 50° **D** 55°

36 Four wires are made of the same material. They have different lengths and different cross-sectional areas.

Which row shows the wire with the smallest resistance?

	length / m	cross-sectional area / mm^2
A	20	2.0
B	20	4.0
C	50	2.0
D	50	4.0

37 A 4.0 Ω resistor and an 8.0 Ω resistor are connected in series with a power supply. The circuit diagram shows the arrangement.

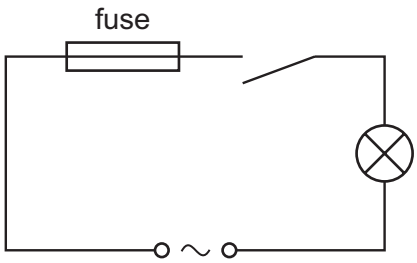


The reading on the voltmeter connected across the 4.0 Ω resistor is 2.0 V.

What is the potential difference (p.d.) across the power supply?

A 2.0 V **B** 4.0 V **C** 6.0 V **D** 12 V

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 primary coil of a 100% efficient transformer has N_p turns and the secondary coil has N_s turns.

The voltage supplied to the primary coil is V_p and the voltage induced across the secondary coil is V_s.

Which equation relates these terms?

A $\frac{N_p}{N_s} = \frac{V_p}{V_s}$

B $\frac{N_p}{N_s} = \frac{V_s}{V_p}$

C $N_p \times N_s = V_p \times V_s$

D $N_p \times N_s \times V_p = V_s$

40 A radioactive nucleus emits a β-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.

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.).