Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **October/November 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 A plant is placed on a windowsill. The next day, it is found to have all of its leaves facing the light.

Which of the characteristics is this plant displaying?

1 a permanent increase in size and dry mass by an increase in cell number or cell size or both

2 an action by an organism or part of an organism causing a change of position or place

3 the ability to detect or sense stimuli in the internal or external environment and to make appropriate responses

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

2 The length of an insect in a photograph is measured as 17 mm. The actual length of the insect is 12 mm.

What is the magnification of the insect in the photograph?

A ×1.2 **B** ×1.3 **C** ×1.4 **D** ×1.5

3 Which type of biological molecule contains carbon, hydrogen, oxygen and nitrogen?

A fat

B protein

C reducing sugar

D starch

4 A mixture of starch and saliva was set up at four different temperatures. Each mixture was tested with iodine solution after 15 minutes and again after 30 minutes.

The results are shown in the table.

temperature / °C	colour with iodine solution	
	15 minutes	30 minutes
0	blue-black	blue-black
15	blue-black	brown
35	brown	brown
95	blue-black	blue-black

What do the results suggest?

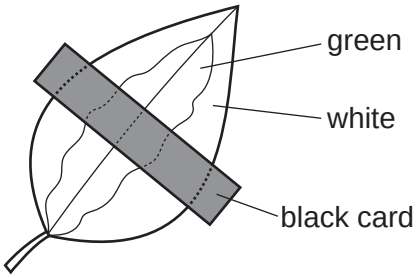
A The enzyme in saliva is inactive at 95 °C.

B The enzyme in saliva is slow to work at 35 °C.

C The enzyme in saliva works equally well at 15 °C and 35 °C.

D The enzyme in saliva works faster at higher temperatures.

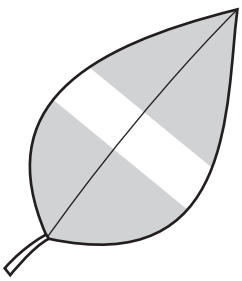
5 The diagram shows a destarched, variegated leaf that had a piece of black card attached. The leaf was left in a warm sunny location for a few days.



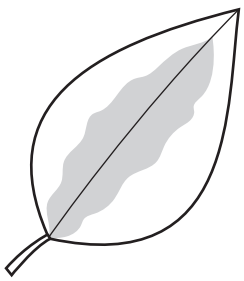
The card was then removed and the leaf tested for starch.

Which diagram shows the result of the starch test?

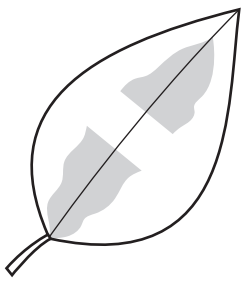
A



B



C



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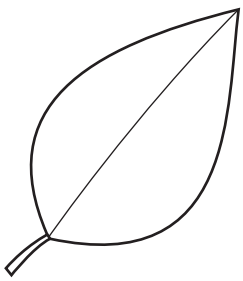


6 Much of the internal surface of the human small intestine is covered with villi.

What is the function of villi?

A excretion of waste into the intestine

B secretion of enzymes into the intestine

C to improve blood circulation in the intestine walls

D to increase the internal surface area of the intestine

7 Under which conditions will transpiration from a plant be fastest?

	temperature	humidity
A	high	high
B	high	low
C	low	high
D	low	low

8 Which row is correct for inspired air and expired air?

	inspired air / %		expired air / %	
	oxygen	carbon dioxide	oxygen	carbon dioxide
A	17	4	17	4
B	17	4	21	0.04
C	21	0.04	17	4
D	21	0.04	21	0.04

9 Which row correctly compares the hormonal and nervous systems in humans?

	hormonal		nervous	
	speed of action	length of response	speed of action	length of response
A	fast	long	fast	short
B	slow	long	fast	long
C	slow	long	fast	short
D	slow	short	slow	short

10 In human reproduction, which cells are haploid?

	gametes	zygotes
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

11 Which row about meiosis or mitosis is correct?

	process	involved in	description of cell produced
A	meiosis	gamete formation	haploid
B	meiosis	growth	diploid
C	mitosis	gamete formation	diploid
D	mitosis	growth	haploid

12 Which type of organism gets its energy from dead or waste organic matter?

A carnivore

B consumer

C decomposer

D producer

13 What is eutrophication caused by?

A combustion of fossil fuels

B cutting down of forests

C discarded plastic rubbish

D overuse of nitrogen containing fertiliser

14 An aqueous salt solution contains an insoluble impurity.

Which processes are used to obtain pure salt crystals?

A distil then crystallise

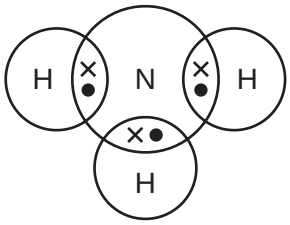
B distil then chromatography

C filter then crystallise

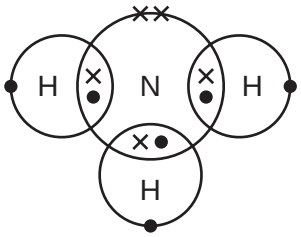
D filter then chromatography

15 Which dot-and-cross diagram represents a molecule of ammonia?

A



B



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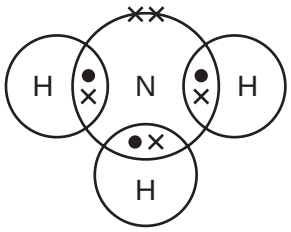
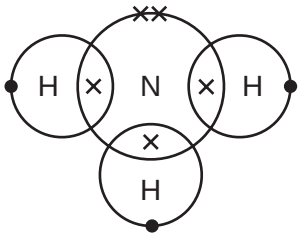


D



16 Which sample contains the smallest number of moles of the substance?

A 12 dm^3 of hydrogen at room temperature and pressure

B 500 cm^3 of 0.5 mol / dm^3 hydrochloric acid

C 12 g of carbon

D 20 g of calcium

17 Which statement describes an exothermic reaction?

A The products have less energy than the reactants and there is a decrease in temperature.

B The products have less energy than the reactants and there is an increase in temperature.

C The products have more energy than the reactants and there is a decrease in temperature.

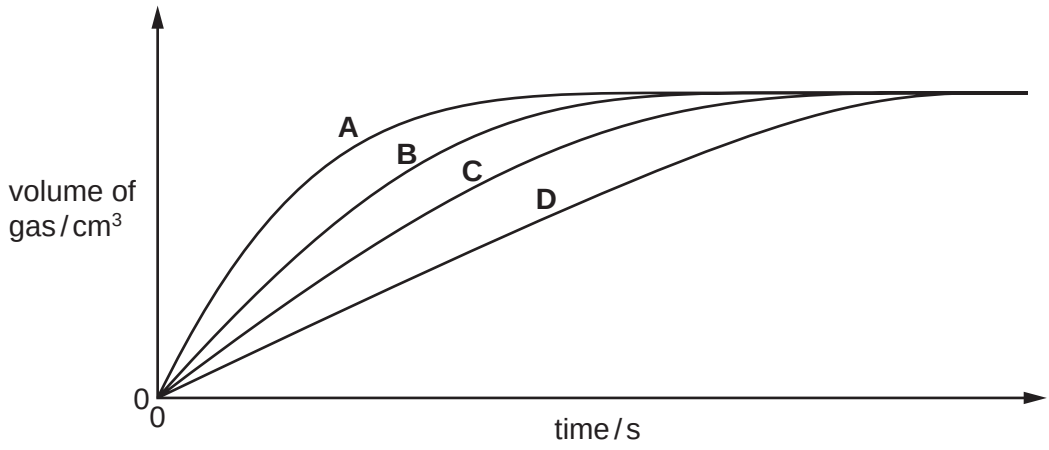
D The products have more energy than the reactants and there is an increase in temperature.

18 Four identical pieces of magnesium ribbon are added to separate 25 cm^3 samples of dilute hydrochloric acid.

The concentrations of the four acid samples are 0.5 mol / dm^3, 1.0 mol / dm^3, 1.5 mol / dm^3 and 2.0 mol / dm^3.

The volume of hydrogen gas produced is measured at different times. The results are shown in the graph.

Which line on the graph is obtained using 1.0 mol / dm^3 hydrochloric acid?



19 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

20 Which compound is prepared by reacting an acid with a base?

A calcium oxide

B copper hydroxide

C hydrogen chloride

D magnesium sulfate

21 Which statement about metallic bonding is correct?

A There is a strong electrostatic force of attraction between a lattice of oppositely charged ions.

B There is a strong electrostatic force of attraction between a lattice of positive ions and a sea of electrons.

C There is a weak electrostatic force of attraction between a lattice of metal atoms and a sea of electrons.

D There is a weak electrostatic force of attraction between a lattice of positive ions and a sea of electrons.

22 Four different metals are separately heated with their metal oxides.

The results are shown.

	oxide of W	oxide of X	oxide of Y	oxide of Z
metal W	✗	✗	✗	✗
metal X	✓	✗	✓	✓
metal Y	✓	✗	✗	✓
metal Z	✓	✗	✗	✗

key

✓ = reacts

✗ = no reaction

What is the order of reactivity?

	most reactive →			least reactive
A	X	Y	Z	W
B	X	Z	Y	W
C	W	Y	Z	X
D	W	Z	Y	X

23 Which process does **not** produce carbon dioxide?

A acid reacting with a metal

B acid reacting with sodium carbonate

C complete combustion of methane

D respiration

24 In the Haber process, ammonia is manufactured using hydrogen and nitrogen.

What is the source of hydrogen for this process?

A the electrolysis of dilute sulfuric acid

B the reaction of hydrochloric acid with zinc

C the reaction of steam with magnesium

D the reaction of steam with methane

25 The Contact process is used to manufacture sulfuric acid.

Which statement about the Contact process is **not** correct?

A A nickel catalyst is used.

B Sulfur dioxide reacts with oxygen to form sulfur trioxide.

C Sulfur burns to form sulfur dioxide.

D Sulfur trioxide dissolves in concentrated sulfuric acid to form oleum.

26 Ethanol is formed by fermentation and by the addition of steam to ethene.

What is used to catalyse these reactions?

	fermentation	addition of steam
A	glucose	nickel
B	yeast	nickel
C	glucose	phosphoric acid
D	yeast	phosphoric acid

27 Poly(ethene) is made from ethene by the process of addition polymerisation.

Which word describes ethene in this process?

A fuel

B catalyst

C monomer

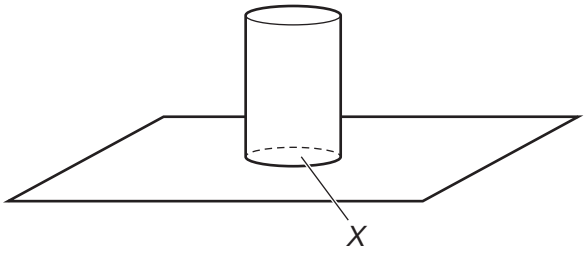
D solvent

28 An object travelling in a straight line accelerates from a speed of 6.0 m/s to a speed of 15 m/s in 6.0 s.

What is the acceleration of the object?

A $1.0\,m/s^2$ **B** $1.5\,m/s^2$ **C** $2.5\,m/s^2$ **D** $3.5\,m/s^2$

29 A cylinder of weight *W* and cross-sectional area *X* exerts a pressure *P* on the ground.



Some changes are made to *W* and to *X*.

Which row shows a situation that produces the same pressure *P* on the ground?

	W	*X*
A	doubled	doubled
B	doubled	halved
C	unchanged	doubled
D	unchanged	halved

30 A box of mass 8.0 kg is lifted vertically from the ground on to a shelf that is 2.0 m above the ground.

The gravitational field strength *g* is 10 N / kg.

How much work is done as the box is lifted on to the shelf?

A 4.0 J **B** 16 J **C** 40 J **D** 160 J

31 Electricity is generated in power stations. Many power stations use steam to drive turbines.

Which type of power station does **not** use steam?

A chemical energy (fuel) power stations

B geothermal energy power stations

C hydroelectric energy power stations

D nuclear energy power stations

32 An electric kettle is switched on and the temperature of the water in it increases to 60 °C.

What is the main method of heat transfer within the water?

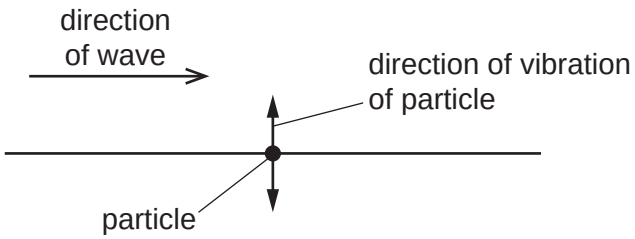
A boiling

B conduction

C convection

D radiation

33 The diagram shows the direction of a wave that passes a particle. The particle is made to vibrate by the wave. The direction of vibration of the particle is shown.

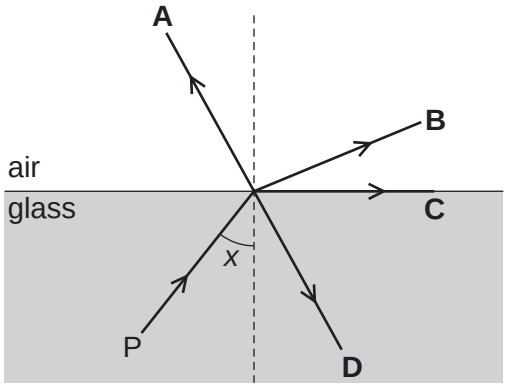


Which row states the type of wave that passes the particle, and gives an example of this type of wave?

	type of wave	example
A	longitudinal	light
B	longitudinal	sound
C	transverse	light
D	transverse	sound

34 The diagram shows a ray of light travelling in glass from point P. Angle *x* is greater than the critical angle.

In which labelled direction does the ray continue?



35 Which statement about an NTC thermistor is correct?

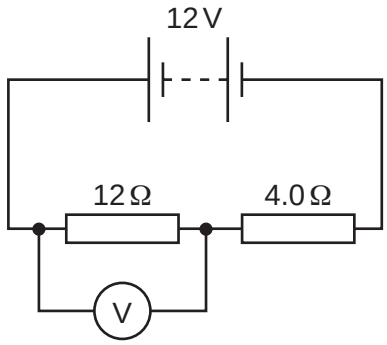
A As its temperature increases its resistance decreases.

B As its temperature increases its resistance increases.

C As the brightness of light falling on it increases its resistance decreases.

D As the brightness of light falling on it increases its resistance increases.

36 A 12 Ω resistor and a 4.0 Ω resistor are connected across the terminals of a 12 V battery.



There is a voltmeter connected across the 12 Ω resistor.

What is the reading on the voltmeter?

A 3.0 V **B** 8.0 V **C** 9.0 V **D** 12 V

37 An electric oven has a power rating of 2.0 kW when connected to a 250 V power supply.

What is the current in the oven?

A 0.13 A **B** 8.0 A **C** 130 A **D** 500 A

38 An electric kettle is designed so that the usual current in its heater is 9.0 A. The owner of the kettle fits the plug with a fuse rated at 3 A.

What happens when the kettle is filled with water and switched on?

A The current in the circuit increases to greater than 9.0 A.

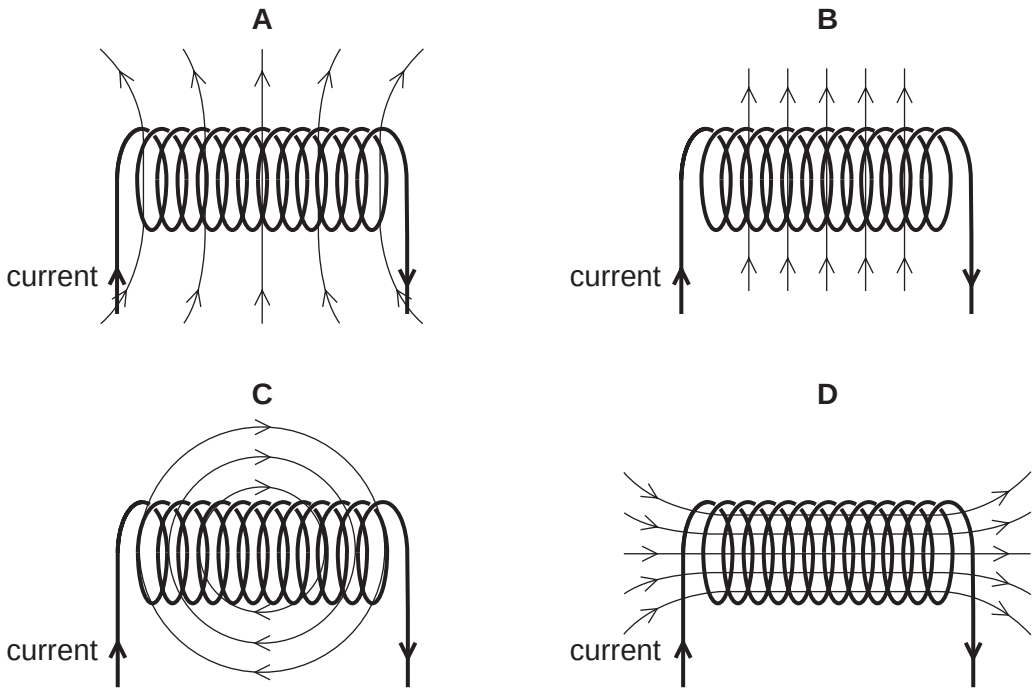
B The fuse blows immediately and the kettle fails to operate.

C The water reaches boiling point more quickly due to an increase in the voltage.

D The water reaches boiling point more slowly due to a decrease in the current.

39 A solenoid carrying a current produces a magnetic field.

Which diagram shows the magnetic field pattern?



40 Which type of radiation has the greatest ionising effect?

A infrared rays

B α-particles

C β-particles

D γ-rays

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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.).