Class	Full Name	Index Number

bowen SECONDARY

I believe, therefore I am

END-OF-YEAR EXAMINATION 2022

Exp

SCIENCE
Paper 1 Multiple Choice
Secondary 1 Express

13 Oct 2022 **45 minutes**

Additional Materials: OTAS Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, class and index number on all the work you hand in.

There are **thirty** 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 OTAS Sheet provided.

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 14.
The use of an approved scientific calculator is expected, where appropriate.

DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

This document consists of **14** printed pages.

Setters: Secondary 1 Science Teachers

1 A substance was sealed in a container and delivered to a laboratory.
The following symbols are printed on the container.

Which option best describes how the container should be stored and how the substance should be handled?

	Storage of container	Handling of substance
A	Store in high and dry place	Put on gloves and safety goggles
B	Place near a window	Do not inhale
C	Store in well-ventilated area	Do not inhale
D	Keep away from heat sources	Put on gloves and safety goggles

2 Ranen noticed that some of his T-shirts shrank in size after several rounds of washing. He wants to know why.
Thus, he undertook the following steps:

I. Ranen chose two T-shirts made from different materials, cotton and polyester.
II. He measured the size of the shirts before washing them the same way.
III. He predicted that shirts made of cotton will shrink more.
IV. Finally, he measured them after the wash and concluded that cotton results in greater shrinkage.

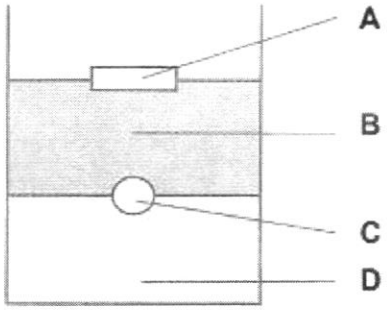
Re-arrange his steps following the Scientific Method.

A I, II, III, IV
B II, I, III, IV
C III, I, II, IV
D I, III, II, IV

3 Which statement is **not** true regarding the use of a Bunsen burner?

A Open the airhole when lighting the Bunsen burner.
B Hold the test tube at an angle of 45° when heating.
C Do not touch the barrel when adjusting the airhole during heating.
D Hold the lighter above the barrel before turning on the gas tap to light the burner.

4 Four unknown substances are placed in a tall container.



Which statement is true?

A The density of C is greater than that of D.
B B is as dense as C, but both are denser than A.
C If A and C have the same volume, C will have a greater mass than A.
D If all substances have the same mass, then D has the largest volume.

5 The physical properties of some substances are given below.

I. They are brittle.
II. They are good thermal insulators.
III. They have relatively high boiling points.

Which properties are typically used to describe non-metals?

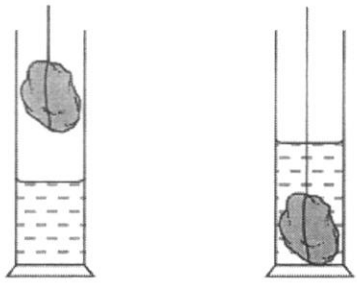
A I and II only
B I and III only
C II and III only
D I, II and III

6 Aluminium has a wide variety of applications.

Which of the following properties does **not** match its use?

	Property	Application
A	Rust-resistant	Window frames
B	Thermal conductor	Kettles
C	Electrical conductor	Frying pans
D	Low density	Aircraft bodies

7 A measuring cylinder contains 20 cm^3 of water. A stone is immersed in the water and the water level rises to 38 cm^3. The density of stone is 1.50 g/cm^3.



What is the expected reading if the same stone were to be placed on a beam balance?

A 0.8 g
B 8 g
C 18 g
D 27 g

8 Which element is matched to the wrong chemical symbol?

	element	chemical symbol
A	manganese	Mn
B	beryllium	Be
C	astatine	As
D	copper	Cu

9 Which method can be used to separate a compound into its constituent elements?

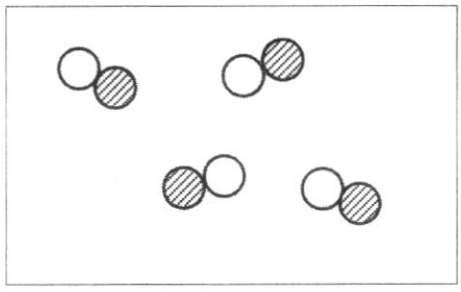
A Filtration
B Electrolysis
C Evaporation
D Chromatography

10 Which variable does **not** affect the solubility of a solute?

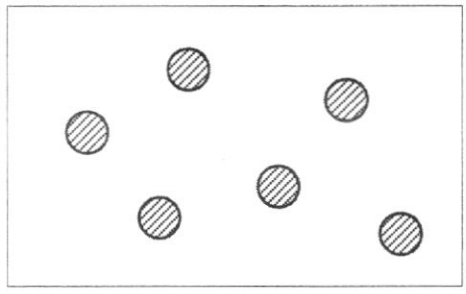
A Temperature
B Nature of solvent
C Nature of solute
D Particle size of solute

11 Which diagram shows particles in a mixture of elements and compounds?

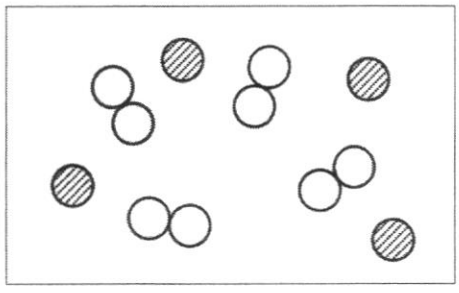
A



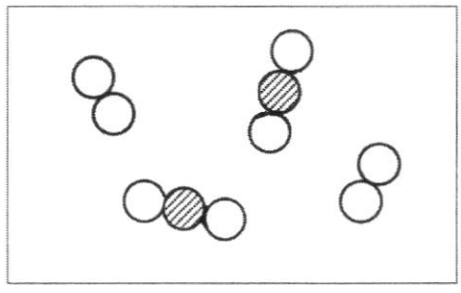
B



C



D



12 Octane, a component in petrol, and water are immiscible liquids. They do not mix.

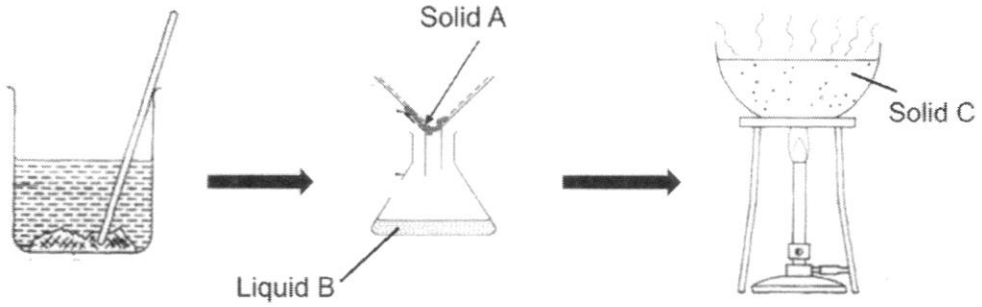
Which method could be used to separate a mixture of octane and water and how is the purity of separated octane checked?

	method of separation	purity check
A	filtration	find the boiling point
B	filtration	obtain a chromatogram
C	distillation	find the boiling point
D	distillation	obtain a chromatogram

13 Which mixture can be separated by magnetic attraction?

A chalk and sand
B steel and salt
C aluminium & sugar
D iron & cobalt

14 The processes used to separate a mixture of salt and sand is shown below.



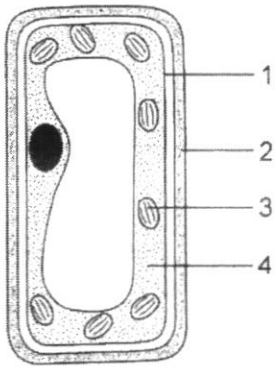
Which of the following correctly identifies solid A, liquid B and solid C?

	Solid A	Liquid B	Solid C
A	sand	water	salt
B	sand	salt solution	salt
C	salt	water	sand
D	salt	salt solution	sand

15 Why is reverse osmosis a preferred method of desalination as compared to simple distillation?

A Reverse osmosis has the ability to extract water that is less pure.
B Reverse osmosis has the ability to extract water that is purer.
C Reverse osmosis requires a higher amount of energy to extract water.
D Reverse osmosis requires a lower amount of energy to extract water.

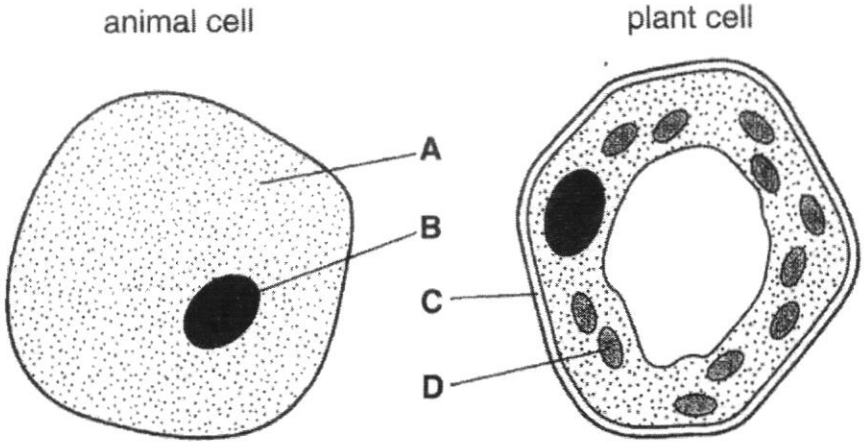
16 The diagram shows a plant cell.



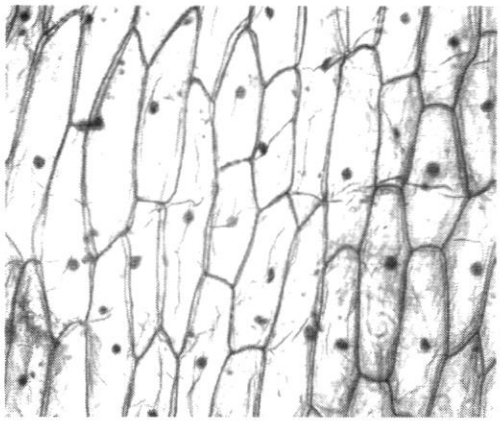
Which numbers show the parts named?

	cell membrane	cell wall	cytoplasm
A	1	2	3
B	1	2	4
C	2	1	3
D	2	1	4

17 Two cells are shown below. Which structure contains a large amount of inheritable material?



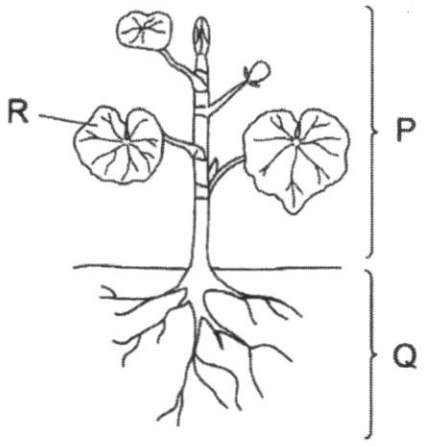
18 The diagram shows part of an onion epidermis as seen under the microscope.



Which of the following describes the onion epidermis?

A Cell
B Organ
C Organ system
D Tissue

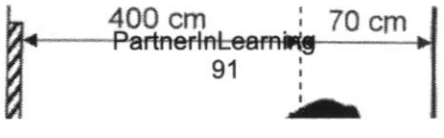
19 The diagram shows a flowering plant.



Which of the following correctly identifies **P, Q** and **R**?

	P	Q	R
A	organ	organ	tissue
B	organ	organ system	organ
C	organ system	organ	tissue
D	organ system	organ system	organ

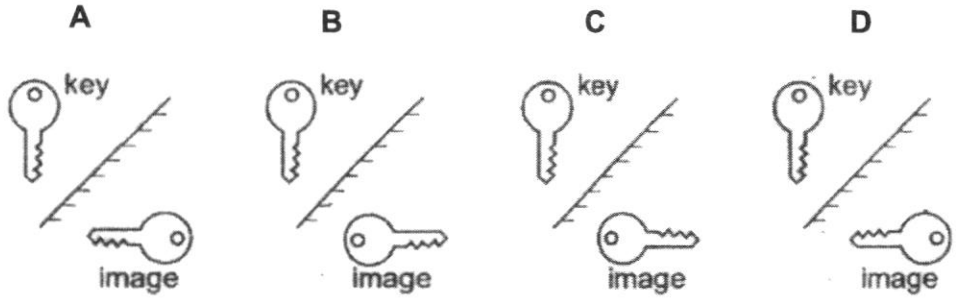
20 The diagram below shows a plane mirror placed at a distance of 400 cm in front of a man.



If the test card is fixed at 70 cm behind the man's eyes, what is the distance of the image of the man to the test card?

A 470 cm
B 800 cm
C 870 cm
D 940 cm

21 Which diagram shows the correct image of the key in a plane mirror?



22 A traffic blind spot mirror is often found on a road.

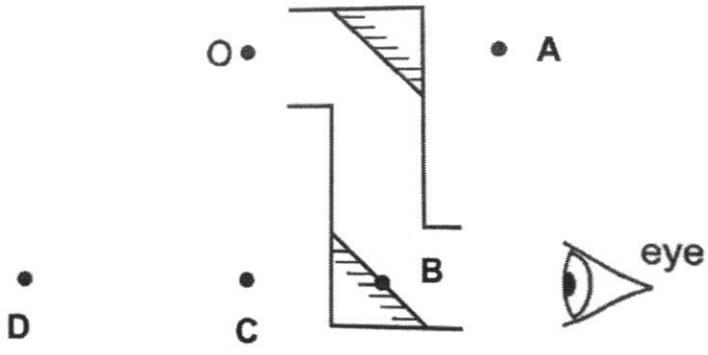
Which of the following does **not** describe a property of an image formed by this mirror?

A The image is similar to that formed in a dentist's mirror.
B The image in the mirror are laterally inverted.
C The image in the mirror are upright.
D The image in the mirror is virtual.

23 The diagram shows an object O viewed using two mirrors.

A person looks into the mirror as shown.

At which position is the image of O seen?



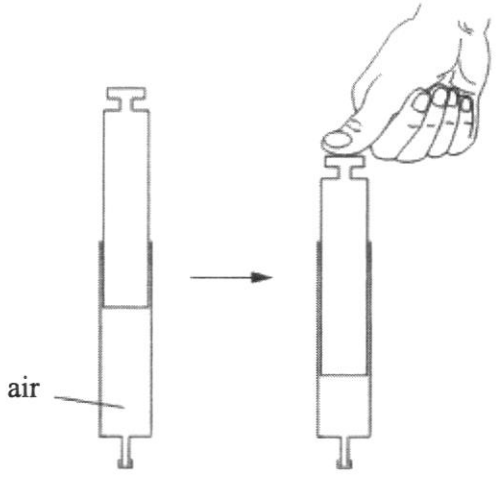
24 In an experiment to demonstrate Brownian motion, smoke particles in a container are illuminated by a strong light source and observed through a microscope.

The particles are seen as small specks of light that are in motion.

What causes the Brownian motion?

A Collisions between the smoke particles and air partices.
B Collisions between the smoke particles and the walls of the container.
C Difference in density between smoke and air particles.
D Particles gain energy from the the light source.

25 A student filled a syringe with air. He then pushed the syringe plunger.



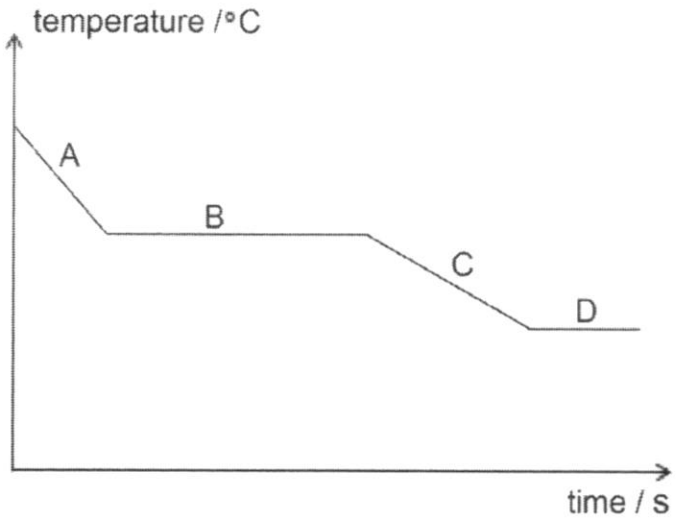
Which of the following best explains why this can occur?

A The mass of the gas decreases.
B The forces of attraction between particles are strong.
C There are large spaces between gas particles.
D The particles can move freely.

26 Which row shows the relative order of thermal expansion of iron, carbon dioxide and water?

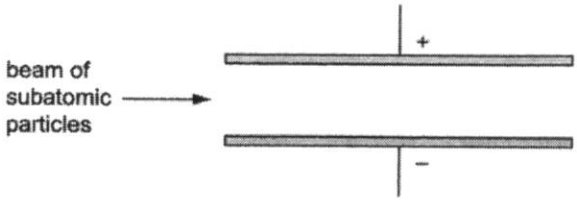
	least expansion	⟶	**most expansion**
A	carbon dioxide	water	iron
B	carbon dioxide	iron	water
C	iron	carbon dioxide	water
D	iron	water	carbon dioxide

27 The following graph shows the temperature changes when a gas X is cooled.



Which part of the graph, A, B, C or D corresponds to freezing?

28 Electrons and protons were fired with equal kinetic energy into an electric field.



Positively-charged particles will be attracted to the negative plate, and vice-versa.
Which row describes the behaviour of the electrons and protons?

	electrons	protons	relative amount of deflection
A	deflected towards negative (-) plate	deflected towards positive (+) plate	electrons deflected more than protons
B	deflected towards negative (-) plate	deflected towards positive (+) plate	protons deflected more than electrons
C	deflected towards positive (+) plate	deflected towards negative (-) plate	electrons deflected more than protons
D	deflected towards positive (+) plate	deflected towards negative (-) plate	protons deflected more than electrons

29 Which of the following atoms has the same number of neutrons as $^{28}_{14}Si$?

A $^{18}_{9}F$ **B** $^{28}_{13}Al$

C $^{30}_{16}S$ **D** $^{41}_{20}Ca$

30 Which of the following chemical formulae shows the smallest number of elements?

A CH_3Cl

B HCOOH

C NaOH

D Al_2O_3

-End of Paper-

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
						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

proton (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.).

Class	Full Name	Index Number

bowen SECONDARY

I believe, therefore I am

END-OF-YEAR EXAMINATION 2022

Exp

SCIENCE
Paper 2
Secondary 1 Express

11 Oct 2022 **1 h 30 min**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

A copy of the Periodic Table is printed on page 19.

The number of marks is given in brackets [ ] at the end of each question or part question.

	For Examiner's Use
Paper 1	**30**
Section A	**50**
Section B	**20**
Total	**100**

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This document consists of **19** printed pages.

Setters: Secondary 1 Science Teachers

Section A

Answer **all** questions in the spaces provided below.
The total mark for this section is 50.

A1 An "Iodine Test" is used to test for the presence of starch in food samples.
Fig. 1.1 below shows the procedure for such a test.

For Examiner's Use

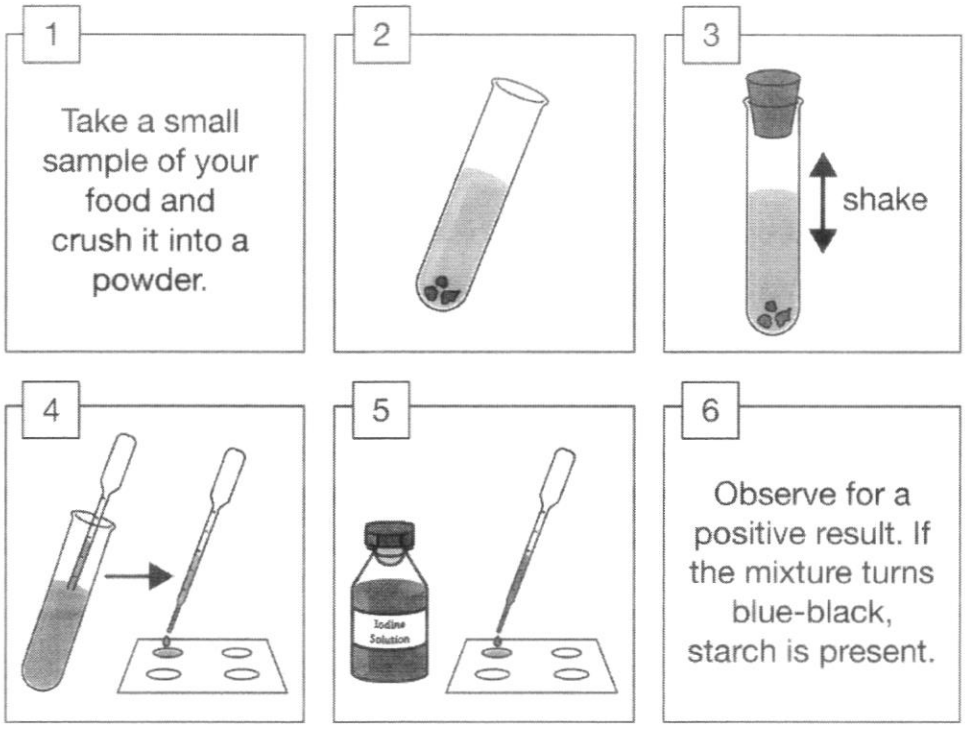


Fig. 1.1

An experiment was carried out on some food samples.
Table 1.2 below shows the test results.

Table 1.2

Food sample	Test Result
Fish	Negative
Rice	Positive
Cucumber	Negative
White Bread	Positive

(a) State the independent variable in this experiment.

..... [1]

(b) Name two variables that should be kept constant in order to ensure fairness in the experiment.

For Examiner's Use

1. .....

2. .....
[2]

(c) In some experiments, a "control set-up" is used for comparison in order to verify the conclusion of an experiment.

Describe a control set-up which would be suitable for this experiment.

.....

.....

..... [1]

(d) With reference to Table 1.2, what can be concluded from the test result in white bread and cucumber?

.....

..... [1]

(e) A radish was placed on a scale as shown in Fig. 1.3 before it was cut and crushed into a powder. The scale reads 0.8 g after the radish was placed on it.

For Examiner's Use

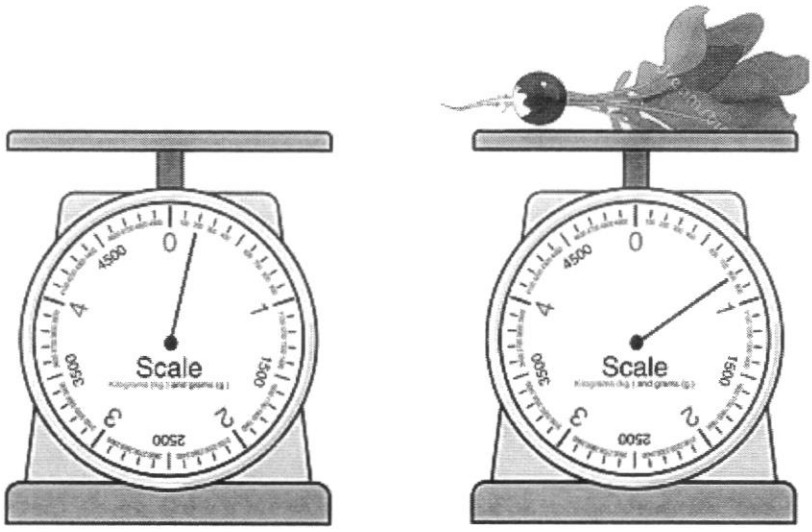


Fig. 1.3

(i) State if the reading is an underestimation or overestimation.
Justify your answer with reference to your observations from Fig. 1.3.

.....

.....

.....

..... [2]

(ii) Suggest how we can obtain an accurate reading from the scale.

.....

.....

..... [1]

[Total: 8]

A2 Authentic jade may consist of either Jadeite (density 3.33 g/cm^3) or Nephrite (density 3.00 g/cm^3).

For Examiner's Use

In order to determine the authenticity of a jade stone, a density test is commonly used.

A piece of jade stone, shown in Fig. 2.1, has a mass of 50 g.

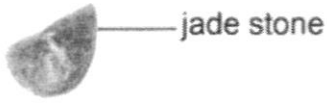


Fig. 2.1

The stone was subsequently immersed in a measuring cylinder filled with water as shown in Fig. 2.2.

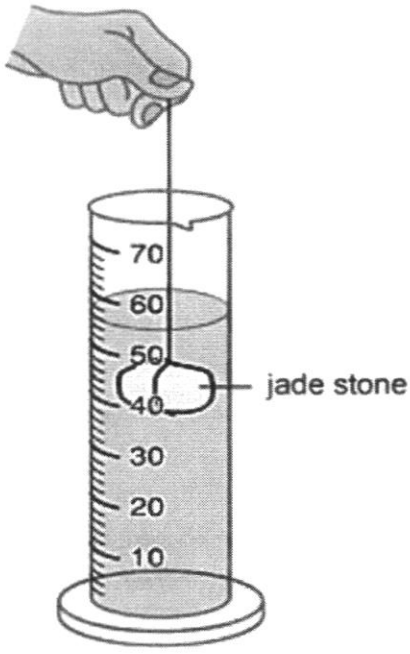


Fig. 2.2

(a) (i) Given that the measuring cylinder was originally filled with 41.0 cm^3 of water, state the volume of this jade stone.

Volume = ... cm^3 [1]

(ii) Calculate the density of the jade stone, expressing your answer to 3 significant figures and using the appropriate units.

Density = ... [1]

(b) State if the jade stone is authentic.
Justify your answer using your results in **(a)(ii)**.

.....

.....

..... [2]

For Examiner's Use

(c) Suggest a measuring instrument that you can use to make an accurate measurement of the following quantities.
For each of the quantities, state its corresponding SI unit.

Quantity	Measuring instrument	SI unit
Depth of the measuring cylinder used in **(a)**		
Mass of the jade stone		
Weight of the jade stone		

[3]

(d) The Mohs scale is commonly used to compare the hardness of different materials. Table 2.3 shows the hardness of some materials on the Mohs scale.

Table 2.3

Material	Hardness on Mohs scale
Glass	6.5
Jadeite	7.0
Nephrite	6.0

Using the information in Table 2.3, state and explain whether we can distinguish Jadeite from Nephrite using a "scratch test".

.....

.....

.....

..... [2]

[Total: 9]

For Examiner's Use

A3 Bromine is one of two elements in the Periodic Table that is a liquid at room temperature. Bromine can be chemically combined with potassium to form solid potassium bromide. When water is added to the solid and stirred, a solution of potassium bromide is formed.

(a) Based on its position in the Periodic Table, state and explain one property of bromine other than its physical state.

.....

.....

.....

..... [2]

(b) State and explain if the solution of potassium bromide is an element, compound or mixture.

.....

.....

.....

..... [2]

(c) When dilute silver nitrate is added to the solution of potassium bromide, a reaction occurs between the two substances and an off-white solid is formed as a suspension in the original solution. The suspension is then filtered.

(i) Suggest two differences between a solution and a suspension.

Difference 1: .....

.....

.....

Difference 2: .....

.....

..... [2]

(ii) Suggest how you might make the dilute solution of silver nitrate more concentrated.

.....

..... [1]

(iii) Suggest a possible identity for a solute present in the filtrate.

For Examiner's Use

..... [1]

[Total: 8]

A4 (a) James wanted to obtain salt by heating seawater. The experimental set-up is shown in Fig. 4.1.

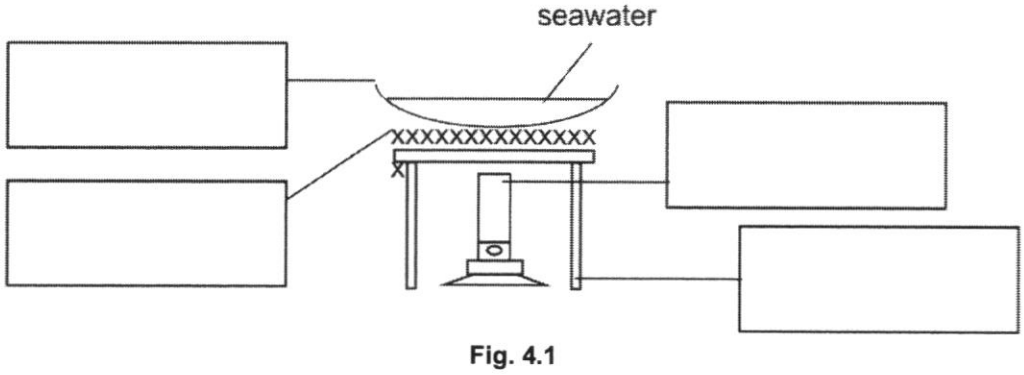


Fig. 4.1

(i) Label the apparatus used by filling in the blanks in Fig. 4.1. [2]

(ii) Name the experimental technique used.

..... [1]

(iii) Explain, with reference to the particles in seawater, why filtration **cannot** be used to obtain salt from seawater.

.....

.....

.....

..... [2]

(b) Forensic scientists use paper chromatography to compare inks from five different bank notes with the ink used to make genuine bank notes.

For Examiner's Use

Their results are shown in a chromatogram in Fig. 4.2 below.

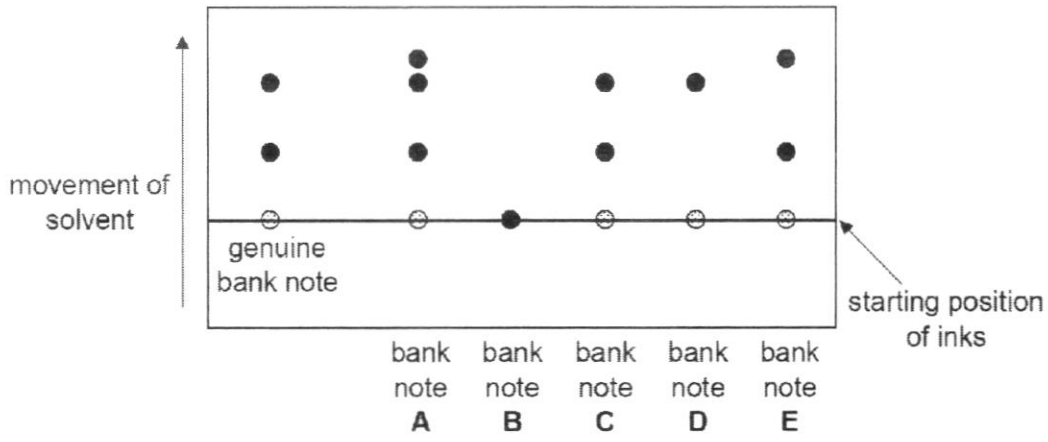


Fig. 4.2

(i) In typical paper chromatography, the start line is usually drawn in pencil. Explain why this is so.

.....

.....

.....

..... [2]

(ii) From Fig. 4.2, state which one of the bank notes is genuine.

..... [1]

(iii) Suggest a reason why water would **not** be a suitable solvent to be used for this chromatography.

.....

..... [1]

[Total: 9]

A5 Fig. 5.1 shows a single-celled organism as seen through the high power of a light microscope.

For Examiner's Use

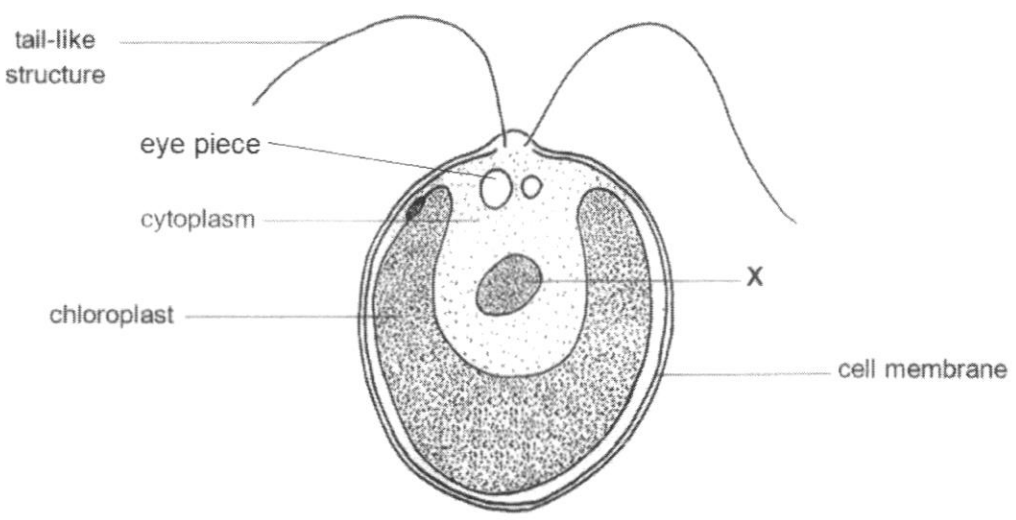


Fig. 5.1

Despite possessing similar organelles to a plant cell, scientists do not classify the organism as a plant.

(a) Name the structure labelled **X**.

X: ..... [1]

(b) With reference to Fig. 5.1, explain the characteristics that suggest this organism is a plant cell.

.....

..... [1]

(c) With reference to Fig. 5.1, state the characteristics that suggest this organism is an animal cell.

.....

..... [1]

(d) Suggest how the organism in Fig. 5.1 is able to survive in an environment with limited sunlight.

.....

..... [1]

[Total: 4]

A6 **(a)** Table 6.1 contains the names of organelles found in a typical plant cell.

For Examiner's Use

Table 6.1

organelle	function
nucleus	controls cell activities
cell membrane	
mitochondrion	

Complete Table 6.1 by stating the function of each organelle. [2]

(b) Explain the importance of having different systems in a multicellular organism.

.....

.....

.....

..... [2]

[Total:4]

A7 The symbol for an atom **D** is shown below.

$$1326D$$

(a) State the number of protons present in atom **D**. ..... [1]

(b) Draw the electronic structure for atom **D** in the space below.

[1]

(c) Using the Periodic Table provided, state the name of atom **D**.

For Examiner's Use

..... [1]

(d) Explain why atom **D** is electrically neutral.

..... [1]

[Total: 4]

A8 Caffeine is a stimulant commonly found in coffee and tea. A model representing a molecule of caffeine is shown in Fig. 8.1.

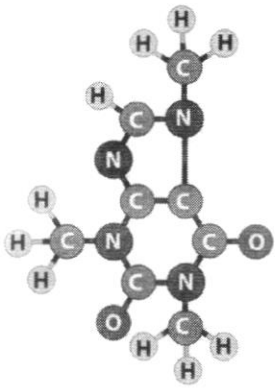


Fig. 8.1

(a) Explain why caffeine is a compound.

..... [1]

(b) Complete Table 8.2 to show the number of different atoms present in one molecule of caffeine.

Table 8.2

type of atom	number of atoms in one molecule
oxygen	
	4
carbon	
	10

[2]

(c) Oxygen and carbon are elements found in caffeine.
Oxygen and carbon can exist as carbon dioxide gas, CO_2.
In the space provided, draw a model to represent a molecule of carbon dioxide.

For Examiner's Use

[1]

[Total: 4]

End of Section A

Section B

There are 2 questions in this section. Answer the questions in the spaces provided below.
The total mark for this section is 20.

B1 Francis is on a holiday and decides to visit the beach for a game of beach volley ball and a swim in the sea.

For Examiner's Use

(a) State the law of reflection.

.....

..... [1]

(b) Fig. 9.1 below shows the beach ball in front of a plane mirror.
Draw a ray diagram to locate the image of the ball, showing clearly two light rays.

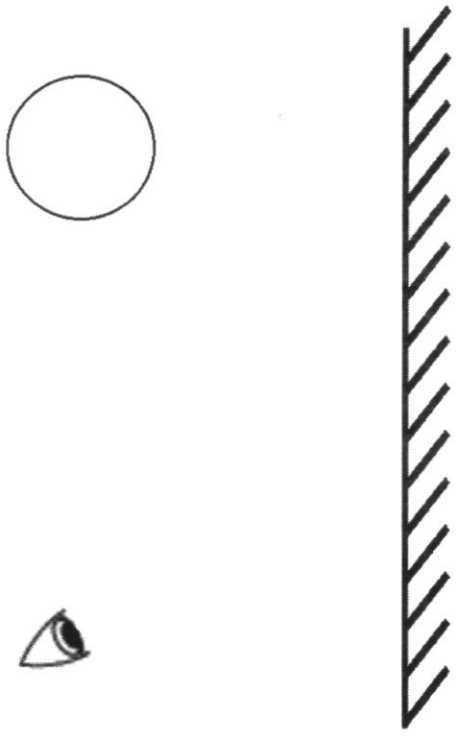
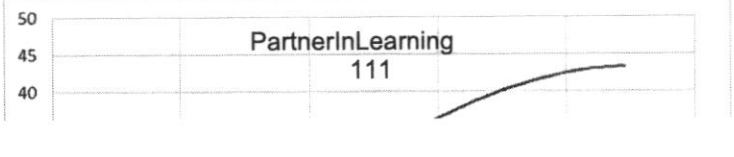


Fig. 9.1

[3]

(c) Francis purchased a new torchlight and decided to give it a try. He shone a light beam **from** medium 1 to medium 2. The angle of incidence, *i*, in medium 1 and the corresponding angle of refraction, *r*, in medium 2 is recorded in Fig. 9.2.

For Examiner's Use



Angle of refraction (*r*)

Angle of incidence (*i*)

Fig. 9.2

(i) It was suggested that medium 1 is water and medium 2 is air. State if you agree.

..... [1]

(ii) With reference to the concept of refraction, explain your answer in **(c)(i)**.

.....

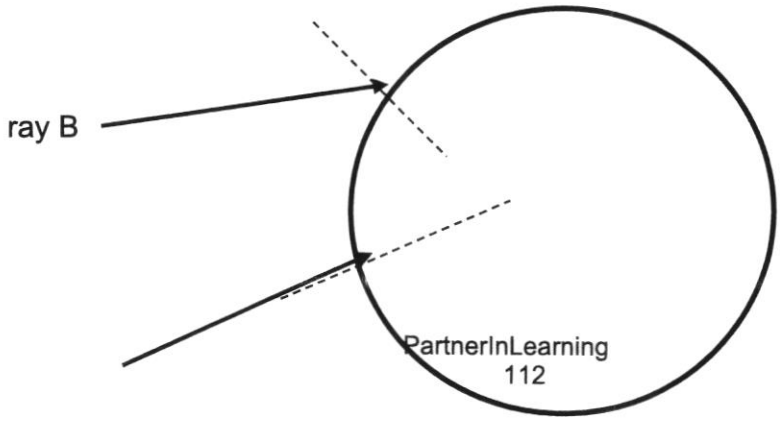
.....

.....

..... [2]

(d) While Francis was diving in the sea, he observed the formation of an air bubble. Fig. 9.3 shows the air bubble. Two rays of light, A and B, are incident on the air bubble. The normals to the surfaces have been drawn for you.

For Examiner's Use



ray A

Fig. 9.3

(i) Suggest why ray A will not undergo any refraction.

.....

..... [1]

(ii) On **Fig. 9.3**, complete the path that ray B will take until it emerges out of the air bubble. Indicate clearly the angle of refraction with a letter *r*.

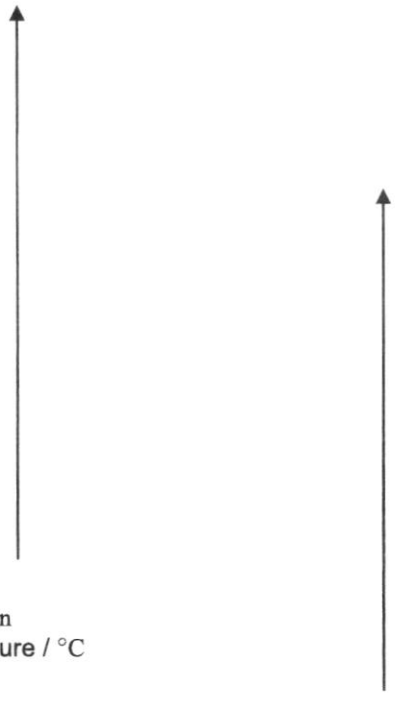
[2]

[Total: 10]

B2 **(a)** Substance X has a melting point of 44 °C and a boiling point of 280 °C.

For Examiner's Use

(i) In the space below, sketch a graph to show the changes in temperature of substance X as temperature increases from 0 °C to 80 °C over time. Label all relevant temperatures on the graph drawn.



[2]

(ii) Explain using the particulate nature of matter, the changes that happen to substance X when it is heated from 80 °C to 200 °C.

.....

.....

.....

..... [2]

(iii) Describe and explain what will happen to the behavior and arrangement of the particles in substance X when it reaches 280 °C.

.....

.....

.....

..... [2]

(iv) Draw the arrangement of the particles of substance X at 300 °C. [1]

For Examiner's Use

(b) Fig. 10.1 shows a student who placed a spoonful of sugar at the bottom of a glass of cold tea and left it undisturbed for several minutes.

After 2 minutes, she used a straw to taste some of the tea from the top of the glass. It did not taste sweet.

After 10 minutes, the sugar had disappeared and the solution at the top of the glass tasted sweet.

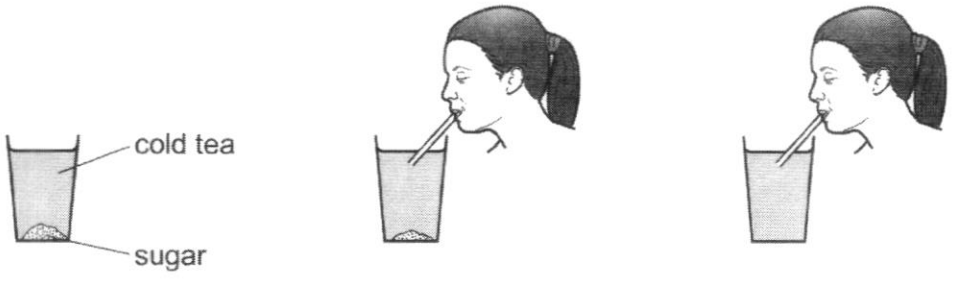


Fig. 10.1

Use your understanding of Brownian motion to explain these observations.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

- End of Paper -

Secondary 1 Express: SCIENCE
END-OF-YEAR EXAMINATION 2022 Mark Scheme

PAPER 2

General guidelines for Calculations:

- Answers with no units do not earn credit.
- Answers not expressed to 2-3 sf will lose up to [1], regardless of number of occurrences.

SECTION A

Question		Answer	Marks	Marker's Comments
A1	(a)	The food sample	1	
	(b)	Any 2 • the mass / volume of food sample used • the mass / volume of iodine used • the mass / volume of water used • the temperature of the food samples / iodine used • the intensity of shaking • any other reasonable and non-trivial variables	2	Other answers accept: - Number of time sample mixture were shaken - How much force was used to shake the food sample (since it's a extraction so how vigorously the mixture was shaken has some impact on how much starch is extracted) Reject: time before food is sampled (does not affect test in this case) Reject: size of food (irrelevant as food sample.crushed to powder form) For the use of "amount", max. 1 mark awarded to encourage students to be more specific in future.
	(c)	Any one • Addition of iodine to pure water (sample with no starch) • Drops of iodine with no food sample added to dish	1	Negative control Answers should reflect that all conditions remain the same except that the food sample (changed variable) is removed.
	(d)	Starch is present in white bread and absent in cucumber.	1	

Question		Answer	Marks	Marker's Comments
	(e)(i)	The reading is an overestimation. The scale showed positive zero error at the start of the experiment. OR zero error + idea of more mass measured than actual	1 1	
	(e)(ii)	Any one • Note the error at the start of the experiment and subtract this error from the final reading. • Adjust the scale to make sure that the pointer is at zero at the start of the experiment.	1	Reject: use another scale Accepted: worked solution 0.8kg - 0.2kg = 0.6kg

A2	(a)(i)	15.0 cm^3 (precision must remain at 1 dp)	1	
	(a)(ii)	Density = 50 ÷ 15 = 3.33 g/cm^3	1	ECF awarded if erroneous value of V was used
	(b)	The jade is authentic. (allow ECF) The density of the stone is an exact match with the known density of Jadeite.	1 1	Full ECF if conclusion is made based on mis calculated value of density
	(c)	[1] for 2 blanks correctly written.	3	

Quantity	Measuring instrument	SI unit
Depth of the measuring cylinder used in (a)	Vernier caliper	m
Mass of the jade stone	Electronic balance / Beam balance	kg
Weight of the jade stone	Spring balance / Compression balance	N

	(d)	Yes. **Jadeite will leave a mark on Glass but Nephrite will not.** Using glass to scratch the jade samples, **Nephrite will get scratched, but Jadeite** wouldn't.	1 1	Accepted: Scratch test not reliable because bo glass and jadeite can scratch nephrite. Density test works better Reject: Nephrite & Jadeite scratching eaother because that only proves Jadeite is harder, an there is no comparison with another sample to verify Jadeite's identity Reject: Answers which do not provide an explanation of how the test can be conducted

A3	**(a)**	Since bromine **is a** non-metal, it has a low melting/boiling point / is a poor electrical/**thermal** conductor	1 1	• Many stated "non-metal" as a property of bromine.
	(b)	It is a mixture. Water **and** potassium **bromide** are not combined **by** chemical methods / there was no chemical reaction / water and potassium **bromide** are combined by physical methods / water **and** potassium bromide **were** not combined in a fixed ratio.	1 1	• Many stated that potassium bromide solution is a compound as it is made up of two elements chemically combined.
	(c)(i)	[2] for any two of the following: • A **solution** is homogeneous **but** a suspension is non-homogeneous / heterogeneous. • A solution allows light to pass through / is clear / is transparent but a suspension does **not allow** light to pass through / is opaque / is translucent / **is** cloudy. • **When** left to **stand**, the solute in a solution does not separate from the solvent but **in a suspension** insoluble solids settle to the bottom. • A solution cannot be separated by filtration but a suspension can. • When filtered, a solution has no filtered particles remaining but a suspension leaves insoluble solids on the filter paper.	2	• Accepted spelling errors for homogeneous / heterogeneous. • Did not accept "uniform / consistent through the solution" in place of "homogeneous". • Did not accept the use of "solute" in reference to suspensions. • Did not accept the use of "residue" without mention of filtration. • Some students stated that suspensions can be filtered but

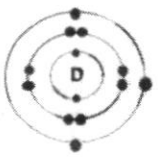
				solutions cannot. Both can be filtered, but with different outcomes. • Some students have the misconception that solutions can be separated by chemical methods but suspensions can be separated by physical methods.
	(c)(ii)	Add more silver nitrate / Heat to remove some water / Boil the solution / Evaporate the solution	1	• Did not accept "add more solute". Solute should be specified. • Did not accept "increase the temperature of the solution". Idea of removing water must be there.
	(c)(iii)	Silver nitrate / potassium bromide.	1	• Poorly attempted.

A4	**(a)(i)**	label correctly evaporating dish/ crucible; wire gauze; Bunsen burner; tripod stand; [1] for every 2 correct answers	2	Reject: spelling errors
	(a)(ii)	evaporation (to dryness)	1	
	(a)(iii)	salt particles are smaller than the pores of the filter paper; salt particles can pass through the pores of the filter paper;	1 1	
	(b)(i)	Pencil lead (which is made of graphite) is insoluble in the solvent; Hence, it would not separate and contaminate the substance in the sample; OR Ink (when used to draw start line) will dissolve in solvent; and move up with the ink from bank notes thus contaminating the samples or causing misinterpretation of results;	1 1	
	(b)(ii)	C	1	
	(b)(iii)	Ink used in bank notes is insoluble in water (so there would be no separation at all) OR	1	

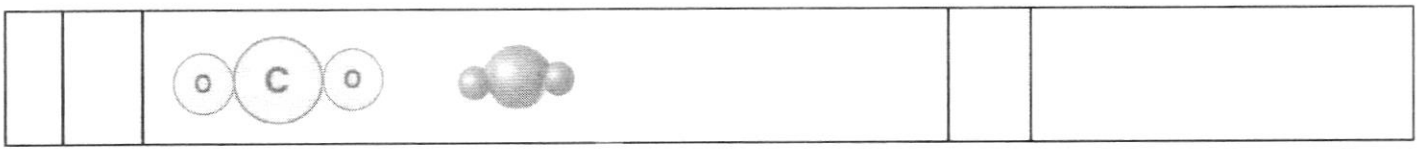
		Bank notes are waterproof so ink will not dissolve in water;		

A5	(a)	Nucleus	1	Reject: spelling error
	(b)	Presence of chloroplast	1	
	(c)	Presence of tail-like structure / No cell wall / Presence of eye-piece	1	
	(d)	Eyespot guides the cell towards brighter areas / Tail-like structure allows the cell to move towards sources of light.	1	Reject: to find food or catch prey since this organism probably makes its own food via photosynthesis as it has a big chloroplast. (Structure and function)

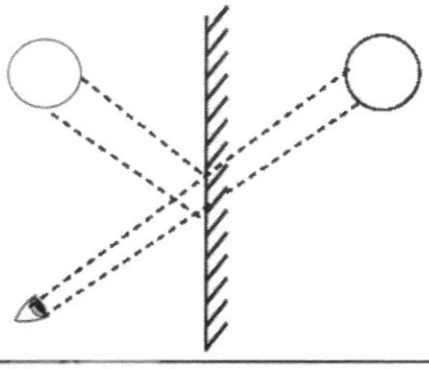
A6	(a)	cell membrane: controls movement of substances in and out of the cell / allows only small molecules to enter and leave the cell mitochondrion: perform respiration to release energy for the cell	1 1	
	(b)	Division of labour can occur This allow different functions to be performed efficiently at the same time to keep the organism alive.	1 1	

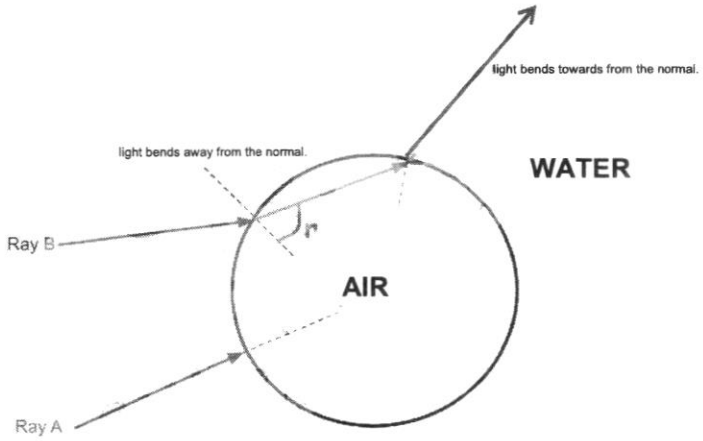
A7	(a)	13	1	
	(b)	Note - EC: 2.8.3  	1	
	(c)	aluminium	1	
	(d)	It has equal number (13) of protons and electrons.	1	

A8	(a)	It consists of different types of atoms chemically combined together.	1	
	(b)	2 nitrogen 8 hydrogen (any 2 correct – 1 m, max 2 m)	2	
	(c)	Any 1 of the 2 diagrams: Size of the circles for 'C' and 'O' should be different (or shading done) to show difference in size. Labelling of 'C' and 'O' is optional. Drawing of lines to represent stick is optional.	1	

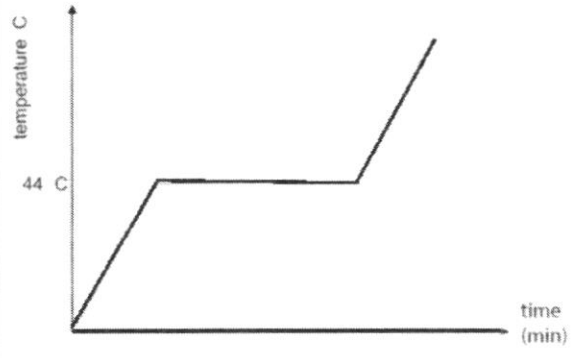

O
C
O

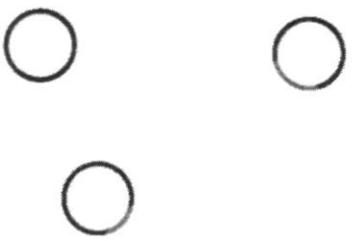
SECTION B

Question		Answer	Marks	Marker's Comments
B1	(a)	The law states that upon reflection the **angle of incidence is always equal** to the angle of reflection.	1	
	(b)	[1]: Accurate location of image. [1]: All construction lines properly shown (Real and virtual rays inclusive) [1]: Light rays are travelling in the correct direction. 	3	
	(c)(i)	Disagree / No	1	
	(c)(ii)	Allow ECF based on (c)(i): From Fg.1.1, **the angle of refraction is always lower than the angle of incidence**.	1	Award [1] for 1 set of correctly drawn ray

Question		Answer	Marks	Marker's Comments
		This means that the **refracted ray will bend towards the normal.** Hence, medium 1 is optically less dense than medium 2. Thus medium 1 must be air and medium 2 must be water.	1	Reject: Answers which state the correct bending but do not express it as a conclusion made from interpreting the results in the chart
	(e)(i)	The **angle of incidence is 0°**, as the incident ray travels along the normal. Hence, the angle of refraction is 0 ° and no refraction will be observed.	1	Light ray enters perpendicular to surface Accepted: Aligned with normal
	(e)(ii)	 **Fig 1.2**	2	[1] refracted ray bends away from the normal, with r labelled (r bigger) [1] emergent ray bends towards normal (r smaller)

Question		Answer	Marks	Marker's Comments

B2	**(a)(i)**	1m for drawing horizontal line at 44 °C and label temperature. 1m for showing increase in temperature from 0 to 44 °C & 44 °C to 80 °C  	2	• Did not accept if line did not start from origin. • Some students mistakenly drew a flat line after 80 deg C. • Did not penalise, but note that temperature labels on y-axis do not require units (graph skills) and a dotted line should be drawn from the flat line to meet the y-axis at 44 deg C.
	(a)(ii)	• The particles gained kinetic energy and moved more vigorously. • The particles moved further apart, causing the substance to increase in volume / expand.	1 1	• Many students mentioned that particles gained heat but did not relate this to a gain in kinetic energy. • Few students recognised that the volume of the liquid expands.
	(a)(iii)	• At 280 C, they gain enough energy to overcome the strong forces of attraction between the particles. • The particles became disorderly in arrangement / start to move randomly in all directions.	1 1	• Did not accept "forces of attraction became weaker" and "break the forces of attraction". • Few students recognised that at 280 deg C, a change in state was taking place and a discussion about forces of attraction between particles would be relevant.

	(c)	Particles are drawn far apart: 	1	• Well done. Students recognised that the substance would have become a gas and drew the right representation of a gas.
	(d)	Any 3: • sugar dissolves • sugar particles particles move from concentrated region to dilute region / from bottom to top of the solution • via diffusion • movement of sugar particles in random directions • (water and sugar) particles constantly collide • particles spread out / separate	3	• Some students were unable to recognise that diffusion had occurred and instead explained the phenomenon in terms of the particulate nature of matter as temperature of the solution increases.