

Section A (30 marks)

Shade your answers on the separate Answer Sheet provided.

1 Part of the scientific method involves these four processes.

- 1 collecting evidence by observing and recording
- 2 communication of results
- 3 conducting an investigation
- 4 making inferences and form conclusions

What is the correct sequence in which the four processes are applied in the scientific method?

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

2 The symbol below is observed on a bottle.



What hazard does this symbol represent?

- A** corrosive
- B** flammable
- C** irritant
- D** toxic

3 What are the SI units of length and mass?

	length	mass
A	centimetre	gram
B	centimetre	kilogram
C	metre	gram
D	metre	kilogram

4 Which is an example of a benefit from technology?

- A** developing computer viruses to spread on the internet
- B** developing dangerous micro-organisms for biological warfare
- C** developing nerve gas for use in a terrorist attack
- D** developing tsunami early-warning systems to reduce casualties

5 The diagram below shows a pot used for cooking.



What is the best material for making the body of the pot and what physical property is taken into consideration?

	material	physical property considered
A	metal	electrical conductivity
B	metal	thermal conductivity
C	plastic	density
D	plastic	strength

- 6 A hardness test is conducted for four materials, **W**, **X**, **Y** and **Z**.

W is left with a mark when rubbed by **X**.

Y is scratched by the other three materials and is left with a mark.

When rubbed by **Z**, all three materials are left with a mark.

Which is the correct order of hardness for the four materials?

	hardest	softest
A	X > Y > Z > W	
B	Y > W > X > Z	
C	Z > X > W > Y	
D	Z > Y > X > W	

- 7 Which instruments should be used to measure the inner diameter of a plastic tube and mass of a marble?

	inner diameter of a plastic tube	mass of a marble
A	digital calipers	electronic balance
B	digital calipers	spring balance
C	measuring tape	electronic balance
D	ruler	spring balance

- 8 Which option correctly describes air?

- A** a compound
- B** a mixture of elements
- C** a mixture of elements and compounds
- D** an element

9 Which element is a non-metal?

- A** aluminium
- B** iodine
- C** potassium
- D** silver

10 Which statement is true about compounds?

- A** Compounds can be separated by physical methods.
- B** Compounds have fixed melting and boiling points.
- C** Compounds have no fixed composition by mass.
- D** Compounds have the same properties as their constituent elements.

11 Which row will produce the most concentrated solution?

	mass of sugar used	volume of water used
A	5 g	200 cm ³
B	10 g	200 cm ³
C	20 g	300 cm ³
D	40 g	1000 cm ³

12 Which factor affects the solubility of a substance?

- A** rate of stirring
- B** size of solute particles
- C** size of container
- D** type of solvent

13 The amino acid glycine has the chemical formula, C₂H₅NO₂.

How many different types of elements are present in glycine?

- A** 3
- B** 4
- C** 7
- D** 10

14 Which statement about suspensions are **incorrect**?

- 1 A suspension is a compound, not a mixture.
- 2 Filtration can separate the constituents of a suspension.
- 3 Light can fully pass through a suspension.
- 4 When left to stand, a suspension will have solid deposits at the bottom.

- A** 1, 2 and 4 only
- B** 1 and 3 only
- C** 3 and 4 only
- D** all of the above

15 Which row about separation techniques and the physical properties used to separate substances is correct?

	separation technique	physical property
A	chromatography	solubility
B	distillation	melting point
C	evaporation to dryness	solute size
D	filtration	density

16 Which mixture can be separated with a magnet?

- A** copper and sand
- B** iron and steel
- C** salt and plastic
- D** steel and sand

- 17** Gold panning is a traditional method of separating insoluble gold from other particles by washing the mixture in a pan with water, as shown below.



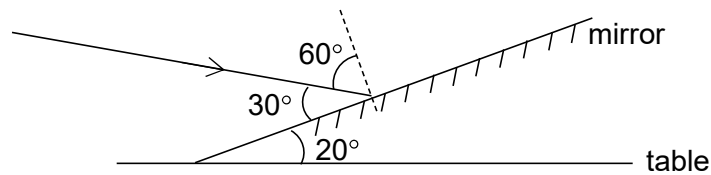
Which row best describes the method shown and the term used to describe the gold left in the pan?

	method	term describing gold in pan
A	distillation	distillate
B	distillation	residue
C	filtration	filtrate
D	filtration	residue

- 18** Which two separation techniques are used to obtain NEWater?

- A** filtration and evaporation to dryness
- B** filtration and reverse osmosis
- C** simple distillation and evaporation to dryness
- D** simple distillation and reverse osmosis

- 19** A ray of light is directed onto a mirror that is tilted at an angle of 20° from the table as shown in the diagram.



What is the angle of reflection?

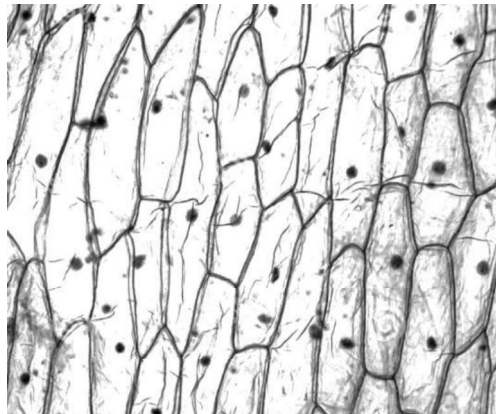
- A** 20°
B 30°
C 60°
D 90°
- 20** Which statement explains why we can see a non-luminous object?
- A** The object absorbs all the light that falls on it.
B The object emits light that enters our eyes.
C The object reflects the light that falls onto it into our eyes.
D The object refracts the light that falls onto it into our eyes.
- 21** Which item is an example of the application of convex mirrors?
- A** car rear-view mirror
B cosmetics mirror
C dentist mirror
D satellite dish
- 22** Which row correctly describes a harmful effect and beneficial application of infrared radiation?

	harmful effect	beneficial application
A	discoloration of photos	photosynthesis
B	global warming	thermal imaging
C	light pollution	vitamin D production
D	skin cancer	sterilisation of utensils

23 Which phrase demonstrates the division of labour in a multicellular organism?

- A** many cells having the same shape and size for a specific function
- B** many organs performing different functions
- C** one cell changing shape for its function
- D** one tissue performing a few different functions

24 The diagram shows part of an onion as seen under a light microscope.



Which level of organisation best describes this part of an onion?

- A** cell
- B** organ
- C** organ system
- D** tissue

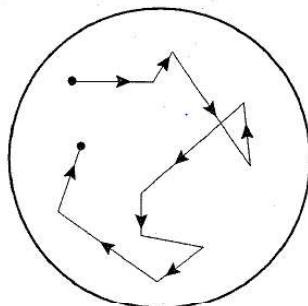
25 Which statements are true about a cell wall?

- 1 The cell wall gives a cell its fixed shape.
- 2 The cell wall is found in a typical animal cell.
- 3 The cell wall controls the movement of substances in and out of the cell.
- 4 The cell wall protects the cell from damage.

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

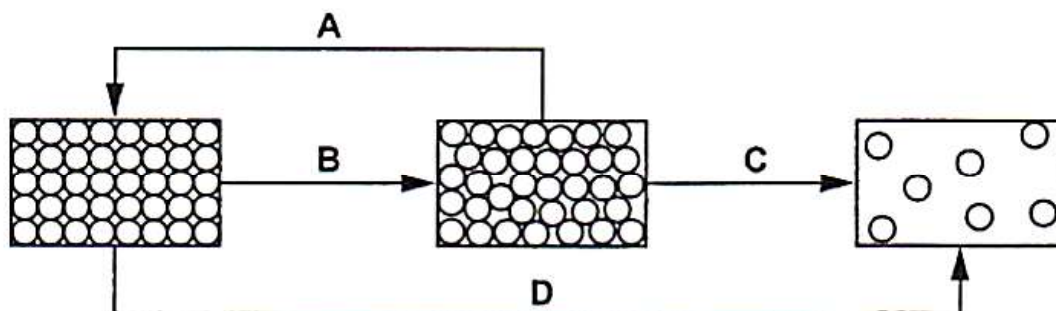
- 26** Pollen grains in a transparent container of water are observed using a light microscope.

One pollen grain is observed to move around as shown in the diagram below.



What does this experiment demonstrate about water molecules?

- A** They are in continuous random motion.
 - B** They can be seen through a microscope.
 - C** They move more quickly when heated.
 - D** They move due to collisions with the pollen grains.
- 27** Which substance has the strongest forces of attraction between its particles?
- A** carbon dioxide gas
 - B** iron bar
 - C** oil
 - D** water vapour
- 28** The diagram shows particles in a solid, liquid and gas.
Which arrow represents freezing?



29 Atoms **X** and **Y** belong to the same element.

Three statements about atoms **X** and **Y** are shown.

- 1 They can have a different number of protons.
- 2 They can have a different number of electrons.
- 3 They can have a different number of neutrons.

Which statement(s) is/are correct?

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

30 The diagram shows an outline of the Periodic Table with five elements.

[illegible]

Which statement is correct?

- A** T has more electrons than R.
- B** R and U are classified as metals.
- C** S has a greater mass number than T.
- D** R has the highest number of protons among the five elements.

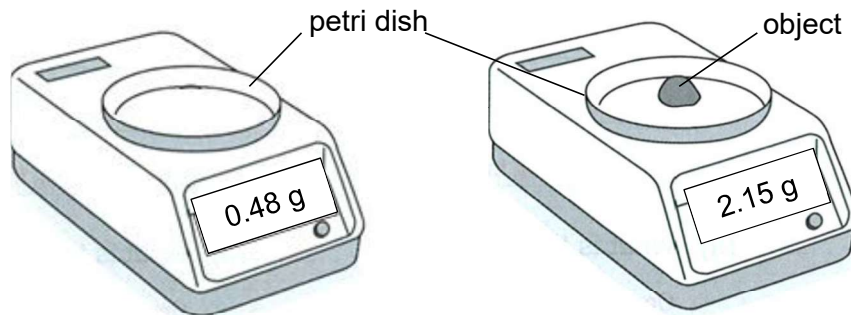
End of Section A

Section B (40 marks)

Answer **all** questions in this section.
Write your answers in the spaces provided.

- 1 Caitlyn is tasked to investigate the density of an irregularly-shaped object for a project.

She first measured the mass of the petri dish and then the mass of the petri dish with the object using an electronic mass balance as shown below.



- (a) Calculate the mass of the object.

mass of the object = _____ [1]

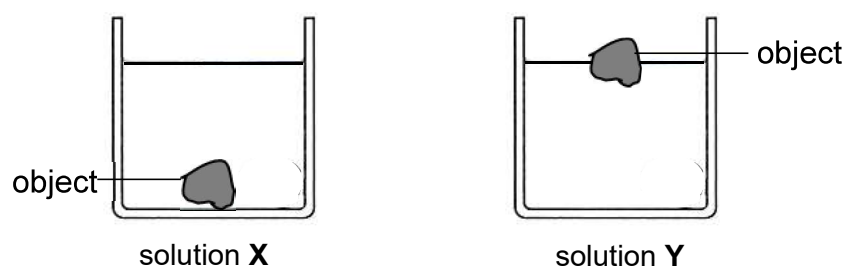
- (b) Given that the object has a volume of 1.4 cm^3 , calculate its density.
Give your answer to 2 decimal places.

density of the object = _____ [2]

- (c) Caitlyn then placed the same object into a beaker of solution **X**.

The object is removed from the beaker, dried with a piece of cloth and then transferred into another beaker of solution **Y**.

Caitlyn's observations are shown in the diagram below.



With reference to the diagram above, deduce which solution is less dense. Explain your answer.

[2]

- 2 The table below shows the properties of three unknown substances, **J**, **K** and **L**.

substance	ability to break down when electricity is passed through it	ability to be separated by physical methods
J	breaks down when electricity passes through it	can be separated by physical methods
K	breaks down when electricity passes through it	cannot be separated by physical methods
L	does not break down when electricity passes through it	cannot be separated by physical methods

- (a) Define the term *mixture*.

[1]

- (b) Use the information in the table above to identify substances **J**, **K** and **L** as an element, compound or mixture.

J: _____

K: _____

L: _____

[2]

- (c) A scientist ground a solid sample of substance **J** into a fine powder and dissolved it in a beaker of water.

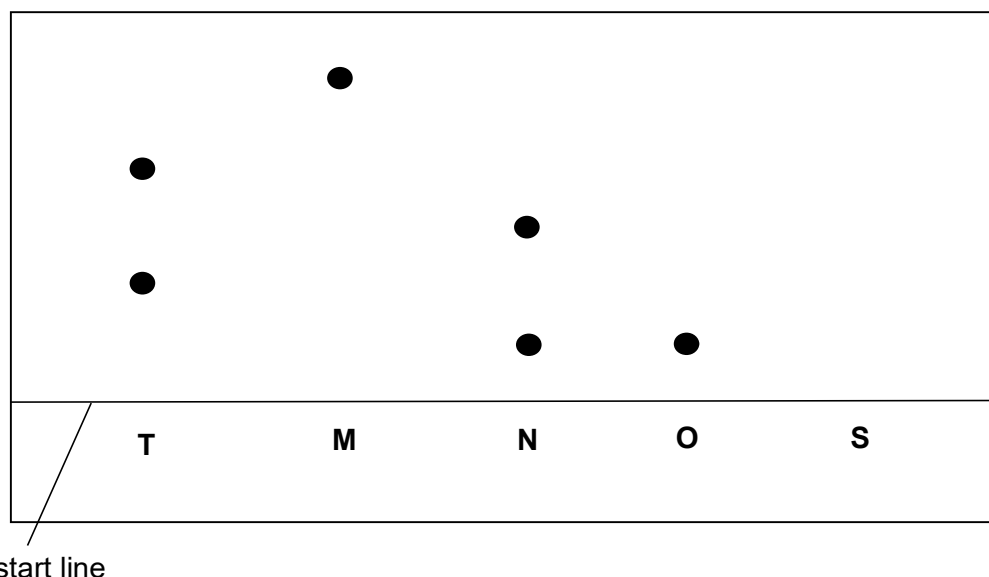
Explain how grinding substance **J** into fine powder would affect its rate of dissolving in water.

[2]

- 3 A ceramic cup is coated with paint **T**. A sample of paint **T** is sent to the laboratory to check whether it contains harmful chemicals.

A paper chromatography test is done using **T** and three chemicals, **M**, **N** and **O** that are known to be harmful to the human body.

The chromatogram obtained is shown below.

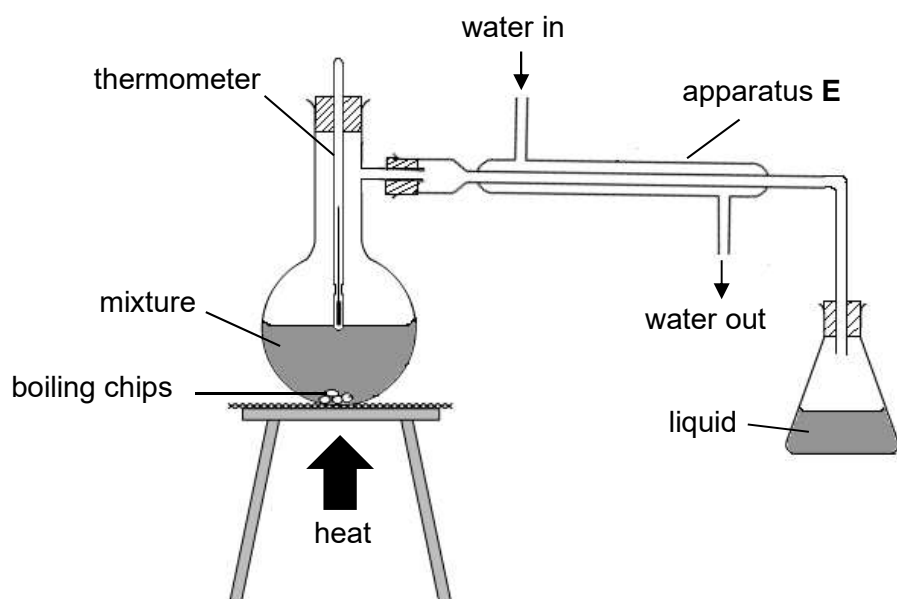


- (a) Explain why the start line is drawn in pencil.
- _____
- _____ [1]
- (b) State whether paint **T** is a pure substance or a mixture. Explain your answer.
- _____
- _____ [2]
- (c) State if paint **T** is harmful to the human body. Explain your answer.
- _____
- _____ [2]
- (d) A paper chromatography test was also conducted on paint **S** which contains chemicals **M** and **O**.

Sketch the results for paint **S** on the chromatogram above.

[1]

- 4 The diagram below shows an experimental set-up for a separation technique.



- (a) Name the separation technique shown in the diagram above.

_____ [1]

- (b) State the name of apparatus **E** and describe its function.

name: _____

function: _____

_____ [2]

- (c) State the function of the boiling chips.

_____ [1]

- (d) There are mistakes in the set-up above.

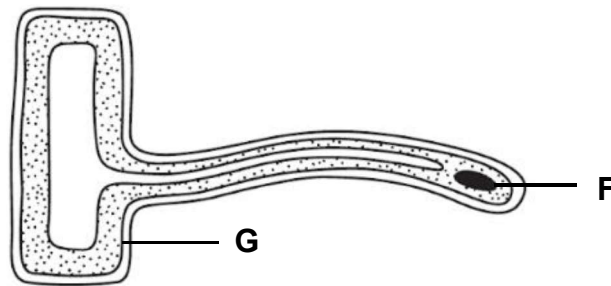
Describe how you would change the set-up to correct **two** of these mistakes.

1. _____

2. _____

_____ [2]

5 The diagram below shows a root hair cell.



(a) Identify structure **F** and describe its function.

name: _____

function: _____

[2]

(b) Identify structure **G** and describe its function.

name: _____

function: _____

[2]

(c) With reference to the diagram above, give **two** reasons why the root hair cell is a plant cell.

[2]

(d) Name the structure that is found in a typical plant cell but missing in the root hair cell.

Explain why this structure is not present in the root hair cell.

name: _____

explanation: _____

[2]

6 (a) Light falls on a rough surface is reflected and a blurry image is produced.

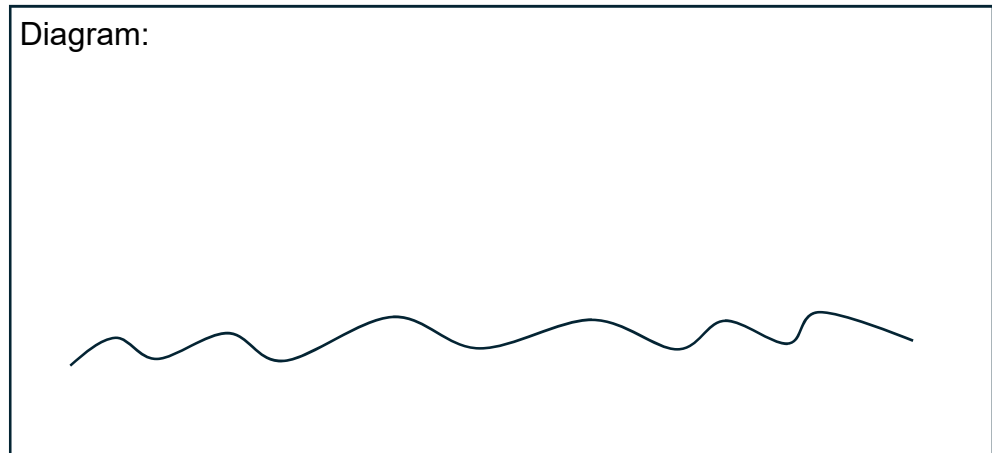
(i) Name the type of reflection that occurs.

[1]

(ii) Explain, with the help of a diagram, why a blurry image is produced when light is reflected off a rough surface.

[1]

Diagram:

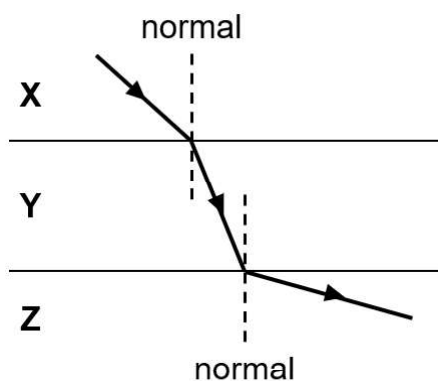


[1]

(b) State **two** characteristics of an image formed in a plane mirror.

[2]

- 7 The diagram below shows the bending of light as it passes through three optical mediums, **X**, **Y** and **Z**.



- (a) State the phenomenon shown in the diagram above.

[1]

- (b) Explain what causes the phenomenon in (a).

[2]

- (c) The optical densities of air, glass and water are shown in the table below.

optical medium	optical density
air	1.0
glass	1.5
water	1.3

Given that **X**, **Y** and **Z** are either air, glass or water, deduce the identities of the optical mediums using the information from the diagram and table above.

X: _____

Y: _____

Z: _____

[2]

Section C (30 marks)

Answer **all** questions in this section.
Write your answers in the spaces provided.

- 8** The table below shows the melting and boiling points of various substances.

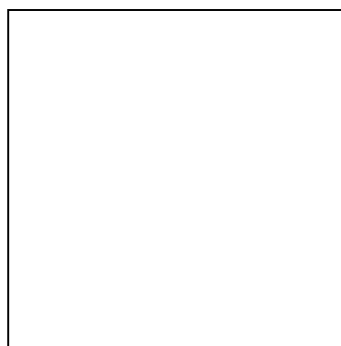
substance	melting point / °C	boiling point / °C
bromine	– 7.3	58.8
mercury	– 38.9	356.6
potassium	63.7	774.0
radon	– 71.0	– 61.8
zinc	419.6	907.0

- (a)** At room temperature (25 °C), state which substance(s) exist(s) as

- (i) solid; _____
- (ii) liquid; _____
- (iii) gas; _____

[3]

- (b)** In the space below, draw the arrangement of particles in a solid.



[1]

- (c) Using the particulate nature of matter, explain the change in state when liquid bromine boils.

[2]

- (d) Using the particulate nature of matter, explain the following observations.

- (i) An iron bar cannot be compressed.

[1]

- (ii) Water takes the shape of its container.

[1]

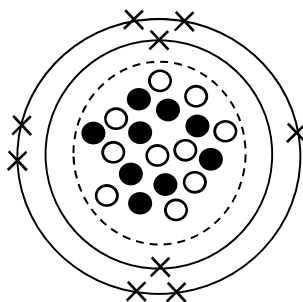
- (iii) Air in a hot air balloon expands when heated.

[2]

- 9 The diagram below shows a simplified representation of an atom of an element, **Q**, from the Periodic Table.

The region bounded by the dotted line is the nucleus of the atom.

The symbols ●, ○ and × represent different sub-atomic particles found in the atom.



atom of element **Q**

- (a) (i) Complete the table below to show the name, relative mass and relative charge of each of the sub-atomic particles.

symbol of sub-atomic particle	name of sub-atomic particle	relative mass	relative charge
○	neutron		
●		1	
×			

[3]

- (ii) Using the Periodic Table, identify element **Q**.

_____ [1]

- (iii) Explain why an atom of element **Q** is electrically neutral.

 _____ [1]

(b) The chemical formula of the natural form of element **Q** is **Q₂**.

(i) Define the term *element*.

[1]

(ii) State if element **Q** exists as an atom or a molecule in its natural form. Explain your answer.

[2]

(c) The diagram below shows information about an element, **R**, from the Periodic Table.

5
R
12

Using the information above, complete the table below.

element	number of protons	number of electrons	number of neutrons
R			

[2]

- 10** Alex wanted to investigate how lights of different colours affect photosynthesis in green plants. He hypothesised that only the plant exposed to green light will be able to undergo photosynthesis.

Alex carried out the following steps to test his hypothesis.

- Step 1: Place each plant in one dark cabinet in the same room and water the plants daily.
- Step 2: Expose the plants to light of only 1 colour (blue, green or red) for 8 hours per day.
- Step 3: Measure the height of each plant over 14 days.

Alex then recorded his results in the table below.

colour of light	height of plant / cm			remarks
	day 0	day 7	day 14	
blue	50.0	53.0	57.0	Light green buds appearing at the tip of the shoot.
green	54.0	54.0	54.0	Leaves appear wilted.
red	53.0	53.0	56.0	Stem of plant appears longer.

- (a)** State the variable that is changed and the variable that is measured.

variable that is changed: _____ [1]

variable that is measured: _____ [1]

- (b)** Suggest **two** variables which should be kept constant.

_____ [2]

- (c) Identify the qualitative and quantitative data that Alex collected.

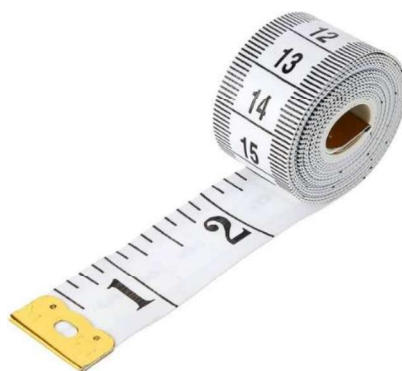
qualitative: _____

quantitative: _____ [2]

- (d) State **one** conclusion that Alex can make after conducting his experiment.

_____ [1]

- (e) Upon closer observation, Alex discovers that the measuring tape that he has been using to measure the height of plants has been damaged. The beginning of the measuring tape is shown below.



- (i) State the type of error present in Alex's results.

_____ [1]

- (ii) Using your knowledge of accuracy and precision, describe how Alex's results are affected by the error in (e)(i).

_____ [1]

- (iii) Describe how Alex can correct the error in the results he obtained without changing instruments.

_____ [1]

End of Sections B and C

The Periodic Table of Elements

Group												
1	2											13
Key proton (atomic) number atomic symbol name relative atomic mass							1					
							H					
							hydrogen					
3	4											5
Li	Be											B
lithium	beryllium											boron
7	9											11
11	12											13
Na	Mg											Al
sodium	magnesium											aluminium
23	24	3	4	5	6	7	8	9	10	11	12	27
19	20	21	22	23	24	25	26	27	28	29	30	31
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga
potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium
39	40	45	48	51	52	55	56	59	59	64	65	70
37	38	39	40	41	42	43	44	45	46	47	48	49
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In
rubidium	strontium	yttrium	zirconium	niobium	molybdenum	technetium	ruthenium	rhodium	palladium	silver	cadmium	indium
85	88	89	91	93	96	—	101	103	106	108	112	115
55	56	57–71	72	73	74	75	76	77	78	79	80	81
Cs	Ba	lanthanoids	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl
caesium	barium		hafnium	tantalum	tungsten	rhenium	osmium	iridium	platinum	gold	mercury	thallium
133	137		178	181	184	186	190	192	195	197	201	204
87	88	89–103	104	105	106	107	108	109	110	111	112	
Fr	Ra	actinoids	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	
francium	radium		rutherfordium	dubnium	seaborgium	bohrium	hassium	meitnerium	darmstadtium	roentgenium	copernicium	
—	—		—	—	—	—	—	—	—	—	—	

lanthanoids

57	58	59	60	61	62	63	64	65	66	67
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho
lanthanum	cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium
139	140	141	144	—	150	152	157	159	163	165
89	90	91	92	93	94	95	96	97	98	99
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es
actinium	thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium
—	232	231	238	—	—	—	—	—	—	—

actinoids



Marsiling Secondary School
Marking Scheme

EOY 2024

Subject	Science		
Level	Secondary 1	Stream	G3

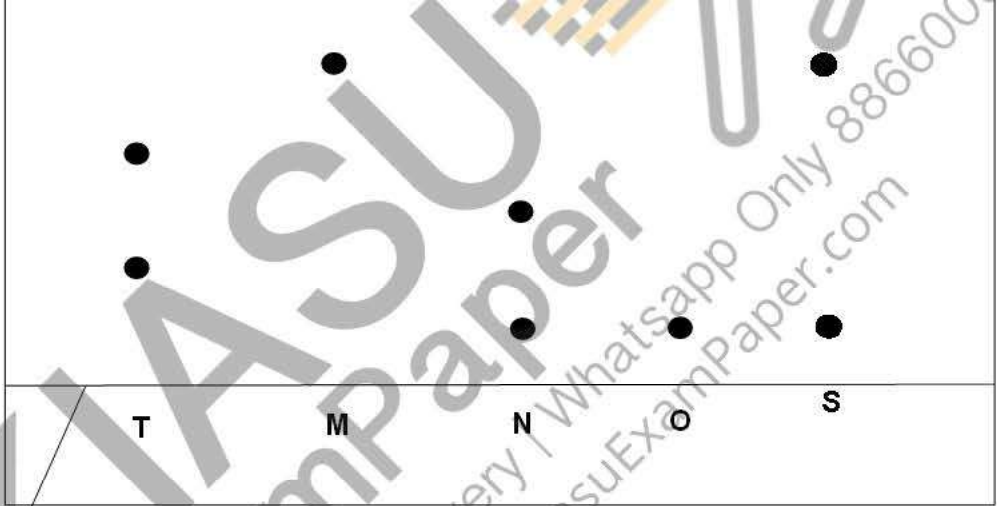
Section A [30 marks]

1	C	2	A	3	D	4	D	5	B
6	C	7	A	8	C	9	B	10	B
11	C	12	D	13	B	14	B	15	A
16	D	17	D	18	B	19	C	20	C
21	A	22	B	23	B	24	D	25	A
26	A	27	B	28	A	29	D	30	D

Section B [40 marks]

1	a	2.15 g – 0.48 g = 1.67 g [1] for answer in correct units	[1]
	b	1.67 g ÷ 1.4 cm ³ = 1.19 g/cm³ [1] for working [1] for answer in correct units maximum of [1] penalty for lack of correct units	[2]
	c	Solution X is less dense. The object sinks in solution X as it is more dense than solution X , but floats in solution Y as the object is less dense than Y . Thus, X is less dense than Y . *answer must refer to density relative to the solutions and object	[1] [1]
Total: [5]			

2	a	A mixture is a substance that is made of two or more substances that are not chemically combined .	[1]
	b	J: mixture K: compound L: element	[1] [1] [1]
	c	Substance J will dissolve faster when it is a fine powder; as there is a larger surface area to volume ratio. A: smaller solute/particle size	[1]
Total:			[5]

3	a	So that the pencil lead will not dissolve in the solvent and affect the results .	[1]
	b	Mixture It has more than one dot / substance (above the start line) on the chromatogram	[1] [1]
	c	No , it is not harmful to the human body it does not contain M, N or O which are harmful to the human body	[1] [1]
	d		[1]
Total:			[6]

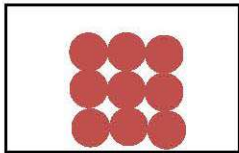
4	a	simple distillation	[1]
	b	condenser to cool and condense hot vapor into liquid	[1] [1]
	ci	ensure smooth boiling	[1]
	cii	'water in' should be from the bottom of the condenser and 'water out' should be at the top of the condenser bulb of the thermometer should be at the top of the distillation flask	[1] [1]
Total:			[6]

5	a	nucleus controls all activities in the cell (R : contains genetic information)	[1] [1]
	b	cell membrane controls the substances moving in and out of the cell	[1] [1]
	c	it has a cell wall (R : it has a fixed shape) it has a large, central vacuole	[1] [1]
	d	chloroplast root hair cell is underground, so it will not be able to trap light energy	[1] [1]
Total:			[8]

6	a	diffused reflection	[1]
	b	when light is reflected off a rough surface, it travels in different directions  R if light rays clearly do not follow the law of reflection	[1]
	c	any 2 of the following: • virtual • same size as the object • laterally inverted • upright • same distance from the mirror as the object	[2]
Total:			[5]

7	a	refraction	[1]
	b	light changes in speed as it enters a medium of a different optical density	[1] [1]
	c	X: water Y: glass Z: air [1] for each correct demonstration of optical density affecting speed (e.g. Y: glass, Z: water = 1m)	[2]
Total:			[5]

Section C [30 marks]

8	ai	Potassium, Zinc	[1]
	a ii	Bromine, Mercury	[1]
	a iii	Radon	[1]
	b	Particles should not overlap but touch one another; At least 9 particles, each particle must be equal size 	[1]
	c	Particles gain energy and move further away from one another Particles from one another until they are far apart in a disorderly manner	[1] [1]
	di	Particles in the iron bar are closely packed , there is little space between the particles.	[1]
	dii	Particles in water slide past one another . Therefore, they do not have a definite shape.	[1]
	diii	Particles in the air gain energy and move faster ; Particles move further away from one another/ volume increases ; density of air in the hot air balloon decreases . [any 2 for 2m max]	[2]
			Total: [10]

9	ai	<table border="1"> <thead> <tr> <th>symbol of sub-atomic particle</th><th>name of sub-atomic particle</th><th>relative mass</th><th>relative charge</th></tr> </thead> <tbody> <tr> <td>○</td><td>neutron</td><td>1</td><td>0</td></tr> <tr> <td>●</td><td>proton</td><td>1</td><td>+1</td></tr> <tr> <td>x</td><td>electron</td><td>1/1840</td><td>-1</td></tr> </tbody> </table>	symbol of sub-atomic particle	name of sub-atomic particle	relative mass	relative charge	○	neutron	1	0	●	proton	1	+1	x	electron	1/1840	-1	[1] for each row correct
symbol of sub-atomic particle	name of sub-atomic particle	relative mass	relative charge																
○	neutron	1	0																
●	proton	1	+1																
x	electron	1/1840	-1																
	a ii	flourine	[1]																
	a iii	it has the same number of protons and electrons	[1]																
	bi	an element is a substance that cannot be broken down into another substance	[1]																
	bii	molecule; it is made of 2 atoms that are chemically combined	[1] [1]																
	f	<table border="1"> <thead> <tr> <th>element</th><th>number of protons</th><th>number of electrons</th><th>number of neutrons</th></tr> </thead> <tbody> <tr> <td>R</td><td>5</td><td>5</td><td>7</td></tr> </tbody> </table>	element	number of protons	number of electrons	number of neutrons	R	5	5	7	[2]								
element	number of protons	number of electrons	number of neutrons																
R	5	5	7																
			Total: [10]																

10	a	changed: colour of light measured: height of plant	[1] [1]
	b	location, amount of light, amount of water, soil, type of plant, duration of light exposed [any 2 for 2m]	[2]
	c	height of plant is quantitative data; remarks recorded is qualitative data	[1] [1]
	d	the plant under blue light grew the most / AVP	[1]
	ei	zero error	[1]
	eii	results are not accurate	[1]
	eiii	subtract 7 from the results in the table Reject: use a different measuring tape/ruler	[1]
			Total: [10]