

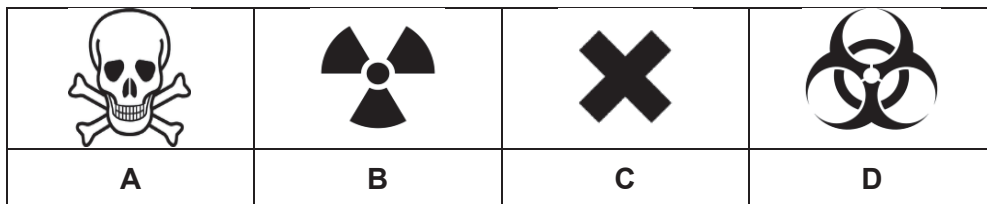
Section A

Answer **all** the questions in this section.

- 1 Which of the steps could be carried out first before formulating a hypothesis?

- A** decide on the variables **B** gather relevant information
C share of results with others **D** design an experiment

- 2 Laboratory tests showed that a patient is suffering from radioactive poisoning. Which hazard symbol did the patient most likely ignore before the incident?

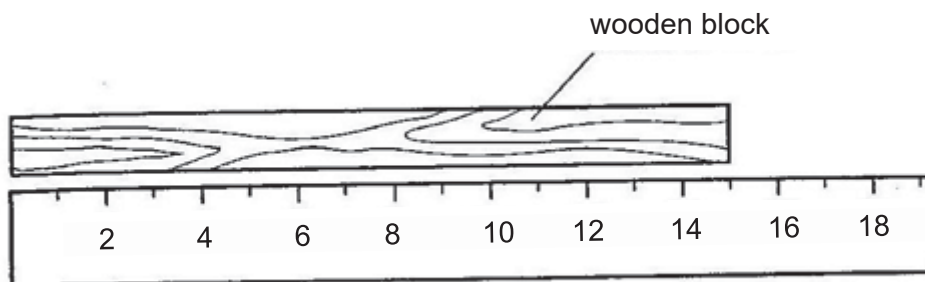


- 3 In mining fields, drills are used to remove rocks to search for the valuable metal ores below. The intense drilling generates high amount of frictional heat.

Which physical properties should be considered when we choose a material to make the drills?

- A** strength, melting point, transparency
B strength, electrical conductivity, thermal conductivity
C hardness, strength, melting point
D hardness, electrical conductivity, boiling point

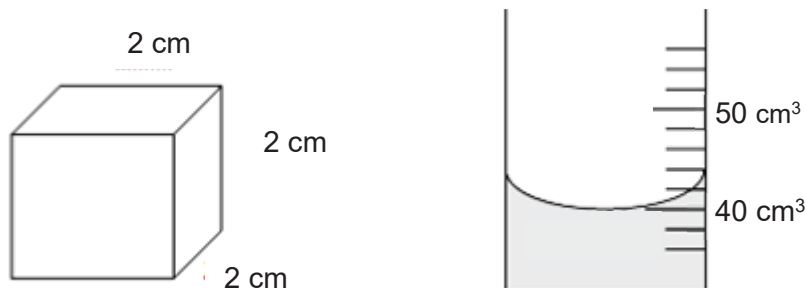
- 4 Tommy used a metre scale to measure the length of a wooden block in the diagram below.



What is the length of the block of wood?

- A** 13.5 m
B 14.0 m
C 14.5 m
D 15.0 m

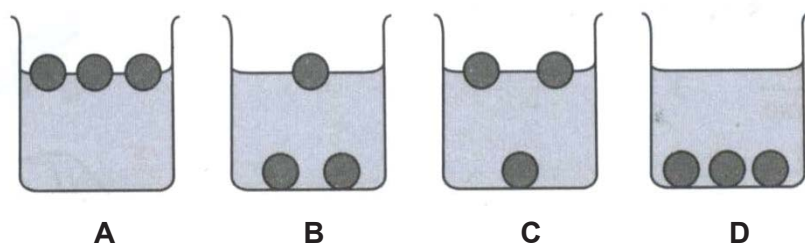
- 5 During an experiment, Janany placed a cube of nata de coco into the measuring cylinder below.



What is the final water level in the measuring cylinder if the nata de coco sinks in water?

- A 42 cm³ B 46 cm³
 C 48 cm³ D 52 cm³
- 6 Three balls of the same size but different densities are immersed in four beakers carrying different liquids.
- The densities of the balls are 0.8 g/cm³, 1.1 g/cm³, 1.4 g/cm³.

Which beaker holds a liquid of density 1.2 g/cm³?



- 7 Which of the following gives the correct SI units for length and time respectively?

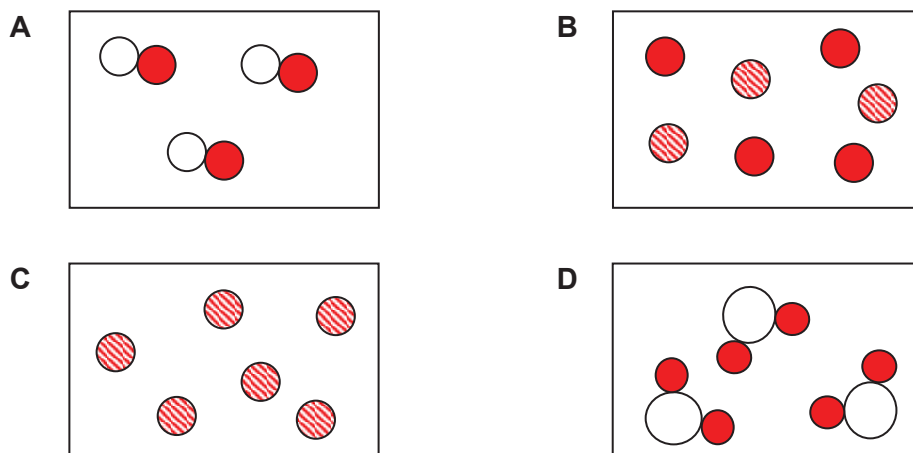
	length	time
A	m	h
B	m ²	min
C	m ³	h
D	m	s

- 8 Which of the following is correct?

	name of element	chemical symbol
A	nitrogen	Ni
B	cobalt	Co
C	carbon	Ca
D	beryllium	B

[Turn over

9 Which of the following diagrams represents a mixture?



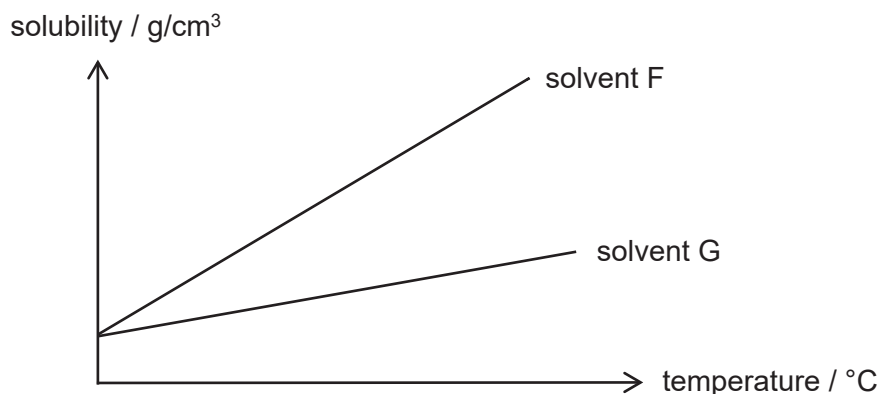
10 Which of the following shows the correct classification of substances?

	element	compound	mixture
A	mineral water	carbon dioxide	diamond
B	diamond	mineral water	carbon dioxide
C	carbon dioxide	diamond	mineral water
D	diamond	carbon dioxide	mineral water

11 Which of the following gives the correct description of a compound?

- A** A compound has the same properties as its constituent elements.
- B** A compound can only be decomposed by heat into its constituent elements.
- C** A compound consists of two or more elements chemically combined together.
- D** A compound has the same physical state as its constituent elements.

- 12** The graph below shows how the solubility of solute S in solvent F and solvent G changes with temperature.



Which of the following statements regarding the solubility of solid S is correct?

- A** Solid S has the same solubility in both solvents.
- B** Solid S has higher solubility in Solvent F than in solvent G in general.
- C** Solid S has lower solubility in Solvent F than in solvent G in general.
- D** Solid S is insoluble in both solvents.

- 13** Some sugar and steel powder are mixed together.

Which is the most appropriate method to separate the mixture?

- | | |
|-----------------------|------------------------------|
| A distillation | B filtration |
| C evaporation | D magnetic attraction |

- 14** Water that is safe for consumption can be obtained by

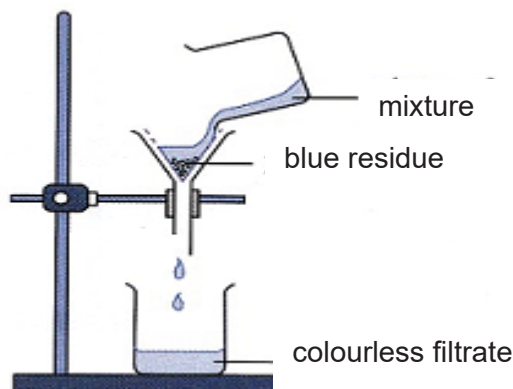
- 1 chromatography
- 2 distillation
- 3 evaporation

- | | |
|-----------------|-----------------------|
| A 1 only | B 1 and 2 only |
| C 2 only | D 2 and 3 only |

- 15** The table below shows the colour and solubilities of four types of solids in water.

solid	colour	solubility in water
1	white	soluble
2	white	insoluble
3	blue	insoluble
4	blue	soluble

A mixture containing two of the four types of solids undergoes filtration as shown below.



Which are the two solids in the mixture?

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

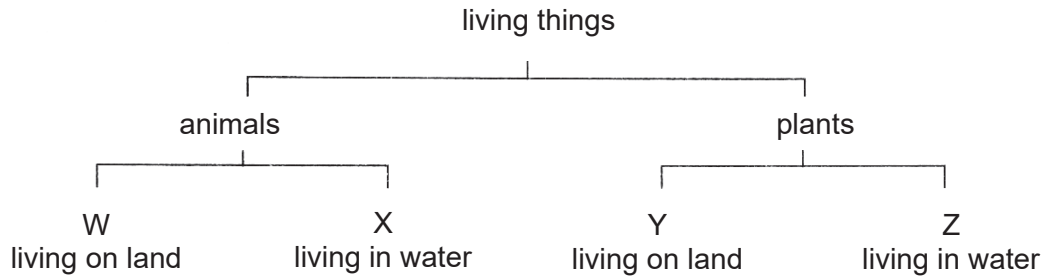
- 16** Which of the following is the correct sequence to obtain dry salt and sand from a salt-and-sand mixture?

- A** crystallisation → dissolving → filtration → heating
B dissolving → crystallisation → evaporation → filtration
C dissolving → filtration → evaporation → crystallisation
D heating → dissolving → crystallisation → filtration

- 17** Chromatography is a suitable separation technique for substances which

- A** have different solubilities. **B** decompose upon heating.
C have the same colour. **D** do not dissolve in a solvent.

- 18 Study the classification below.



Which of the following matches the classification shown above?

	W	X	Y	Z
A	chicken	frog	aloe vera	orchid
B	mackerel	elephant	grass	crab
C	rabbit	clownfish	pine tree	water lettuce
D	lion	starfish	pine tree	stingray

- 19 Which of the following groups are all vertebrates?

- A leopard, owl, rabbit B monkey, cat, earthworm
 C zebra, jellyfish, rat D beetle, octopus, starfish

- 20 Which of the following statements about a dichotomous key is **not** correct?

- A We can understand things easier with the use of a dichotomous key.
 B It can help us to differentiate between living things and non-living things.
 C A dichotomous key divides things based on their similarities and differences.
 D At each stage of the dichotomous key, three smaller groups of classifications always appear.

Section B

Answer **all** questions in the spaces provided.

- 21 Fig. 21.1 shows an experimental set-up to determine the boiling point of a liquid.

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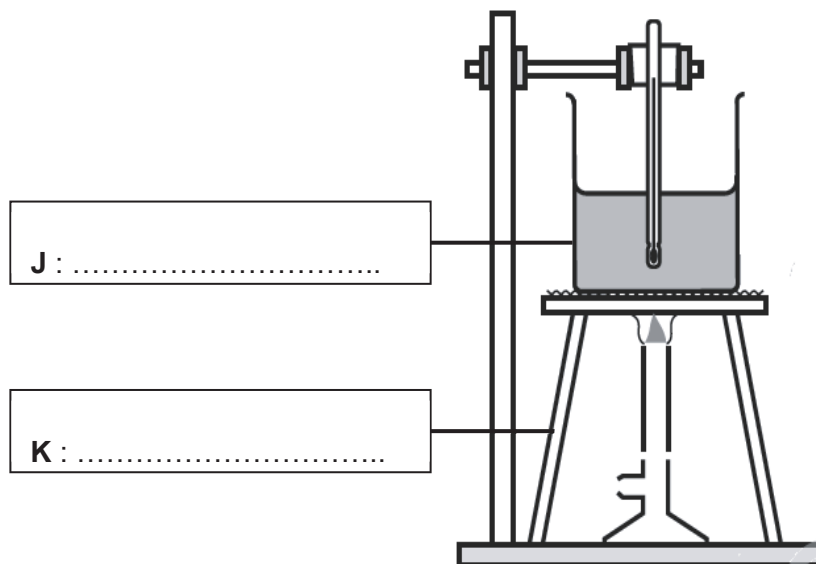


Fig. 21.1

- (a) Name the apparatus labelled J and K in Fig. 21.1 above. [2]

- (b) Write down a safety precaution you should take when you conduct the experiment above.

..... [1]

- (c) State the type of flame that should be used in the experiment above. Give a reason for your answer.

..... [2]

[Total:5]

- 22** Moh's scale of hardness is a scale used to classify the hardness of matter. The higher the number, the harder the substance is. Hence, the hardest substance will be given 10 and the least hard will be given 1 on the Moh's scale.

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Table 22.1 below shows a list of substances and their respective hardness on Moh's scale. With reference to the table, answer the following questions.

Table 22.1

substance	Moh's scale
talc	1
fingernail	2.5
calcite	3
fluorite	4
steel	6
quartz	8
diamond	10

- (a)** Write down the hardness (Moh's scale) required to scratch calcite.

..... [1]

- (b)** Jessica has a piece of glass that she thinks has a hardness of about 5. What can she do to check if she is correct?

.....

 [3]

[Total:4]

[Turn over

23 (a) Convert the following physical quantities

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(i) 1.25 kg = g

(ii) 1.44 km = cm [2]

(b) Fig. 23.1 shows the outline of mainland Singapore.



Fig. 23.1

Given that each grid square unit represents an area of 18 km^2 , calculate the approximated area of mainland Singapore. Show your working.

approximated area of mainland Singapore = km^2 [2]

[Total:4]

- 24 Read the following passage titled Landfills “The Good and Bad of Semakau Landfill”.

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Semakau Landfill, the world's first man-made offshore landfill opened in 1999, is home to more than 700 types of plants, animals and several endangered species. Having been transformed into an eco-park, mangroves and coral reefs ring the island and many nature-related recreational activities are held here.

By locating it offshore, 8 miles south of Singapore, the risk for soil pollution is greatly decreased. Through innovative engineering solutions, the waste is effectively contained within the landfill area, which is lined with impermeable membrane, marine clay and rock layers.

Every year, about 200,000 tonnes of solid waste and ash are received at this landfill. At the rate in which waste is being sent there, it is projected to run out of space by 2035.

(adapted from <http://blog.nus.edu.sg/pollutionistheword/2015/04/02/landfills-the-good-and-bad-of-semakau-landfill/>)

- (a) State what are used to contain the waste in the landfill area.
..... [1]
- (b) Suggest what the rock layers are used for.
..... [1]
- (c) Suggest what the marine clay is used for.
..... [1]
- (d) Explain why there is a need for an impermeable membrane around the landfill.
.....
.....
..... [2]
- (e) Explain why using landfill to hold waste disposal is **not** sustainable in Singapore.
.....
..... [1]

[Total: 6]

[Turn over

25 Fig. 25.1 below shows the different species of sea snails found in an ocean.

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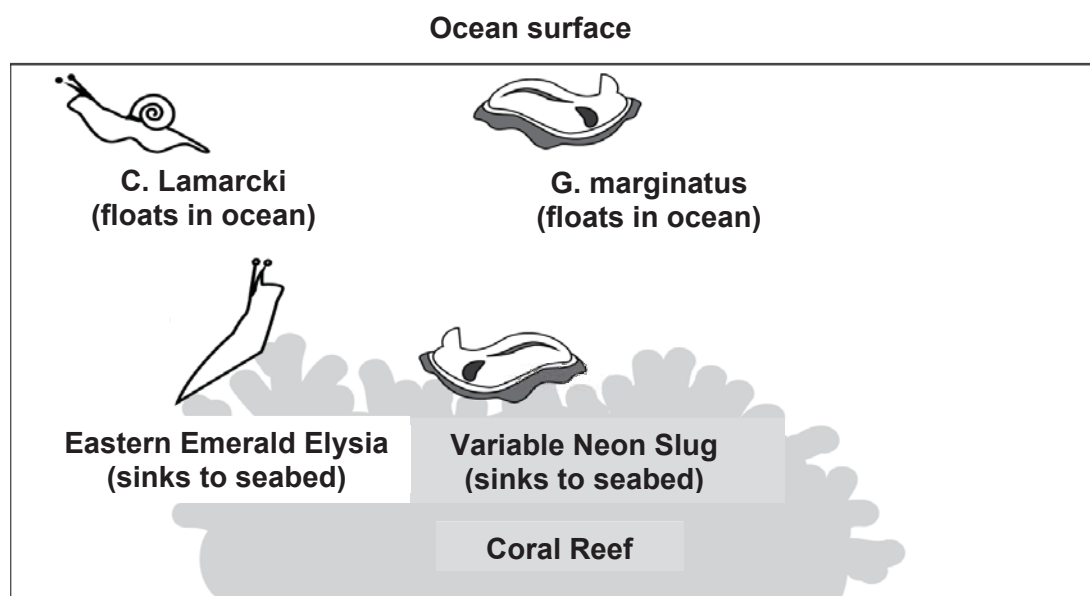


Fig. 25.1

(a) Name the apparatus required to measure the

- (i) mass of a shell.
- (ii) volume of a shell. [2]

(b) Table 25.2 shows some information about the two other species of snails, *H. physis* and *O. olivacea*.

Table 25.2

	mass of shell	volume of shell	density
* <i>H. physis</i>	9 g	5.5 cm ³	
* <i>O. olivacea</i>	4 g	7.0 cm ³	0.57 g/cm ³

* These two species are not included in Fig. 25.1 above

- (i) Calculate the density of the shell of *H. physis* and fill up Table 25.2. Show your working. [2]
- (ii) Sea water has a density of 1.02 g/cm³. State where you are most likely to find *O. olivacea* in the ocean. Explain why.
-
- [2]

- (c) The main component of the shells on sea snails is calcium carbonate, CaCO_3 . Write down the number of atoms in one molecule of calcium carbonate, CaCO_3 .

..... [1]

- (d) Occupying less than 1% of the ocean floor, coral reefs are home to more than 25% of marine life. Write down one threat to the survival of corals.

..... [1]

[Total:8]

- 26 Joanne set up the experiment in Fig. 26.1 below to investigate whether the particle size of the sodium chloride affects the rate of dissolving.

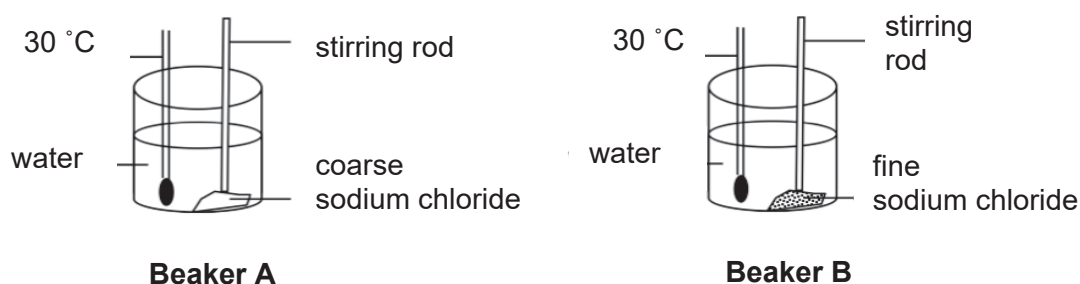


Fig. 26.1

- (a) Identify the independent and dependent variable for the above experiment.

Independent variable :

Dependent variable : [2]

- (b) State which beaker will allow sodium chloride to dissolve faster. Explain why.

.....

.....

..... [2]

[Total:4]

27 Fig. 27.1 below shows a simple distillation setup.

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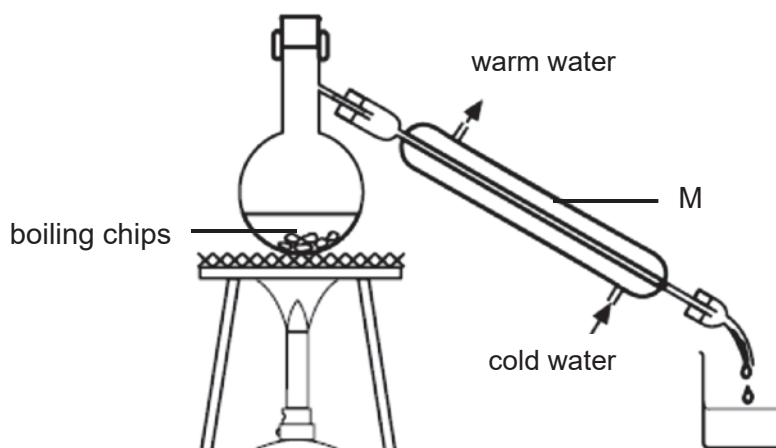


Fig. 27.1

(a) Indicate with an 'X' on Fig. 27.1, the position where the bulb of the thermometer should be placed. [1]

(b) (i) State the function of M.

..... [1]
.....

(ii) Suggest why cold water enters from the bottom of apparatus M.

..... [1]
.....

(c) Give a reason why smooth boiling is crucial during distillation.

..... [2]
.....
.....

[Total:5]

- 28** An investigation was carried out on two different fruit juices, P and Q and four known coloured dyes, 1, 2, 3 and 4. The results are shown in the chromatogram below. Dye 2 is found in a list of banned dyes.

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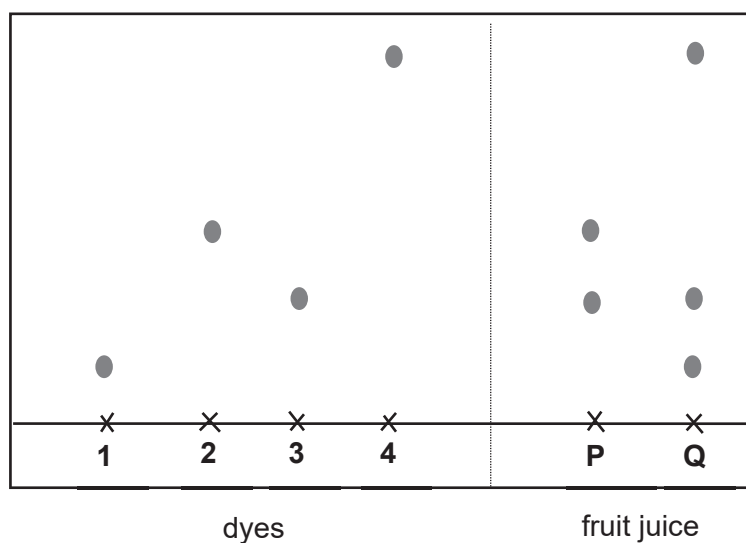


Fig. 28.1

- (a)** Which dye is most soluble in the solvent?

..... [1]

- (b)** Which dye(s) is/are found in Q?

..... [1]

- (c)** Are both fruit juices safe to drink? Explain your answer.

.....
 [2]

[Total:4]

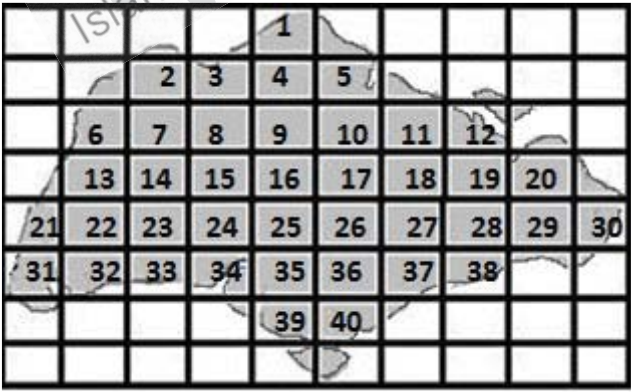
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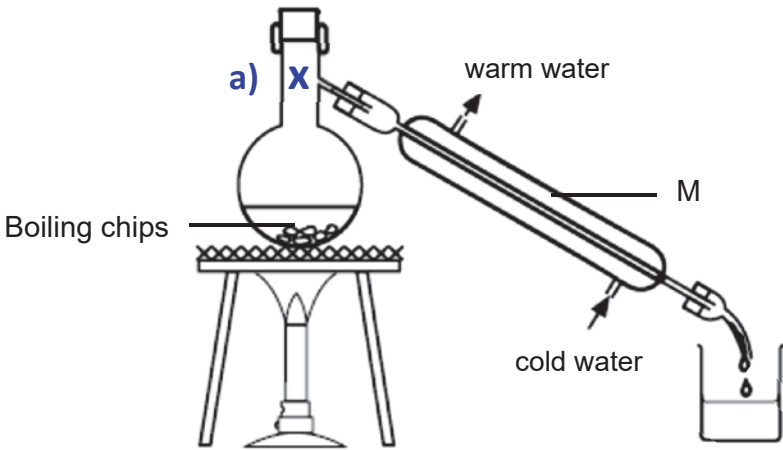
Marking Scheme
Section A – Multiple Choice Questions [10 marks]

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	C	D	C	C	D	B	B	D
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
C	B	D	C	A	C	A	C	A	D

Section B- [40 marks]

21	a)	J: beaker K: tripod stand No marks for spelling error	B1 B1
	b)	Wear safety goggles when heating/ Long hair should be tied up when handling the Bunsen burner/ heating. Any 1 point (close air –hole: must state when turning on Bunsen Burner to prevent strike-back)	B1
	c)	<u>Non-luminous flame.</u> It is <u>hotter flame</u> . This allows <u>more efficient heating</u> . Accept: hotter flame/ burns more completely.	B1 B1
22	a)	<u>At least 3</u>	B1
	b)	If steel scratches glass, glass is less than 6. If the glass scratches fluorite, glass is more than 4. If fluorite scratches glass, glass is less than 4.	B1 B1 B1
23	ai)	1.25 kg = 1250 g	B1
	a ii)	1.44 km = 144000 cm	B1
	b)	 <p>40 grid units (accept between 40 to 43 grids) Area = $18 \text{ km}^2 \times 40 = \text{km}^2$ (accept range 720 km^2 to 774 km^2)</p>	B2

		If the grid unit counting is wrong but the step is the area calculation is correct, award 1 mark. If no step is shown, 0 mark.	
24	a)	The landfill <u>is lined with impermeable membrane, marine clay and rock layers.</u>	B1
	(b)	To trap/filter/prevent the large waste particles from entering the soil or sea.	B1
	(c)	To trap/filter/prevent the fine waste particles from entering the soil or sea.	B1
	(d)	Not all the solid waste can be filtered or trapped by the clay and rocks. [1] This also stops waste liquid from passing into the ocean. [1]	B2
	(e)	Any 1 point: With limited landspace, space for dumping waste will run out/ not be enough. [1] Some waste takes up space for a long time to breakdown e.g. non-biodegradable waste. [1]	B1
25	ai)	Mass: <u>electronic balance</u> / beam balance R: weighing scale	B1
	aii)	Volume: <u>Measuring cylinder</u> Or Displacement can and measuring cylinder.	B1
	bi)	Density of shell (H ₁ <i>physis</i>) = $9 / 5.5$ = 1.64 g/cm^3 Please note future assessments: students should expressed in decimal place to 3 significant figures	M1 A1
	bii)	O. olivacea floats <u>on the ocean/</u> sea water. [1] O. olivacea has a density of 0.57 g/cm^3 which is <u>lower than density of sea water.</u> [1]	B2
	c)	5	B1
	d)	Any one: <ul style="list-style-type: none"> • <u>Increase in temperature</u> of the <u>ocean</u> (accept decrease in temperature of ocean) • <u>Pollution</u> of the ocean • Invasion of <u>predator</u> such as crown of thorns starfish R: Marine life cause damage (too generic)	B1
26	a)	Independent variable: size of the sodium chloride/ particle size [1] R: type of sodium chloride Dependent variable: rate of dissolving/ time taken for sodium chloride to dissolve [1]	B2
	b)	Beaker B. [1] <u>Fine/small</u> particles have <u>larger surface area</u> [1] that comes in contact with the solvent.	A1 B1

27	a)	 <p>Position of X must be <u>just before</u> vapour <u>enters the condenser</u>.</p>	B1
	bi)	<u>Cools</u> the <u>vapour</u> to <u>liquid</u> . (must have all the 3 keywords)	B1
	bii)	For <u>efficiency/effective</u> of <u>cooling</u> of vapour to obtain <u>maximum amount of distillate</u> . Accept : <u>Effective</u> of <u>cooling</u> of vapour To obtain <u>maximum amount of distillate</u> .	B1
	c)	Any one: Smooth boiling is required to <u>prevent splattering</u> [1] of the <u>mixture</u> which may <u>affect the thermometer reading</u> of vapour. [1] Smooth boiling is required to <u>prevent splattering</u> [1] of the <u>mixture</u> which may affect the <u>quality/purity</u> of the <u>distillate</u> collected. [1] Violent boiling may affect the <u>stability</u> of the apparatus <u>set-up</u> [1] and cause accidents e.g. burns or damage to the apparatus [1]	B2
28	a)	Dye 4	B1
	b)	Dyes 1, 3 and 4	B1
	c)	No. One of the component in fruit juice P matches dye 2 which is banned/illegal. Accept: <u>Fruit juice P</u> is unsafe as it <u>contains dye 2 which is banned/illegal</u> .	B1 B1