Name		Class				Index Number		

BROADRICK SECONDARY SCHOOL
SECONDARY 1 EXPRESS / SECONDARY 1 NORMAL (ACADEMIC) SBB
END-OF-YEAR EXAMINATION 2020

LOWER SECONDARY SCIENCE

Additional Materials:
Multiple Choice Answer Sheet (OTAS)

October 2020
1 hour 45 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
A copy of the Periodic Table is printed on page **2**.

Section A [30 marks]
Answer **all** questions.
Shade your answers in the OTAS provided.

Section B [40 marks]
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section C [30 marks]
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

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

For Examiner's Use	
Section A	
Section B	
Section C	
Total	

This document consists of **31** printed pages including this cover page.

Setter: Ms Lim Shu Feng

Section A (30 marks)

Answer **all** questions.
Shade your answers in the OTAS provided.

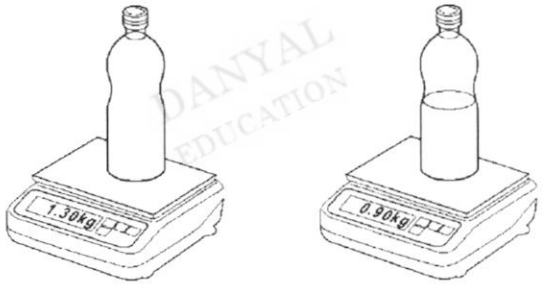
1 Which of the following describes an **unacceptable** scientific attitude?

A repeating an experiment
B recording the observations without making any changes
C changing the observations to agree with the experimental results
D constructing a hypothesis before carrying out an experiment to determine whether the results agree with the hypothesis

2 Which of the following is **not** an SI unit?

A °C
B m
C s
D Pa

3 The mass of a full bottle of oil is 1.30 kg. When exactly half the oil has been used, the mass of the bottle with the remaining oil is 0.90 kg.



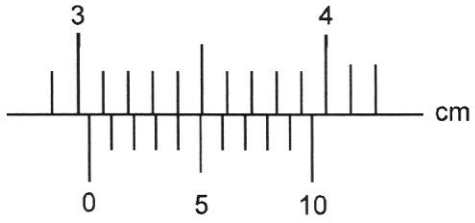
What is the initial mass of the oil only?

A 0.40 kg
B 0.45 kg
C 0.75 kg
D 0.80 kg

4 Which of the following does **not** explain why glass is chosen to make beakers?

A They have high melting point.
B They have high density.
C They are transparent.
D They are waterproof.

5 The diagram shows the thickness of a book measured using a pair of Vernier calipers.



What is the thickness of the book?

A 3.04 cm
B 3.14 cm
C 3.40 cm
D 3.44 cm

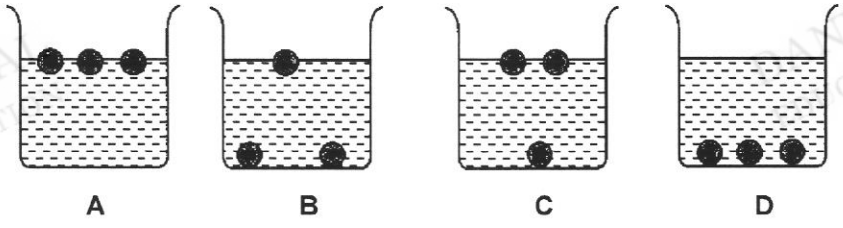
6 A student took three balls with densities of 0.9 g/cm^3, 1.1 g/cm^3 and 1.3 g/cm^3 respectively. He immersed the balls in four beakers containing different liquids.

The densities of the four different liquids are shown in the table below.

liquid	density (g/cm^3)
oil	0.8
water	1.0
corn syrup	1.4
mercury	13.6

He noted the positions of the balls in the different liquids as shown in the figure below.

Which beaker contains water?



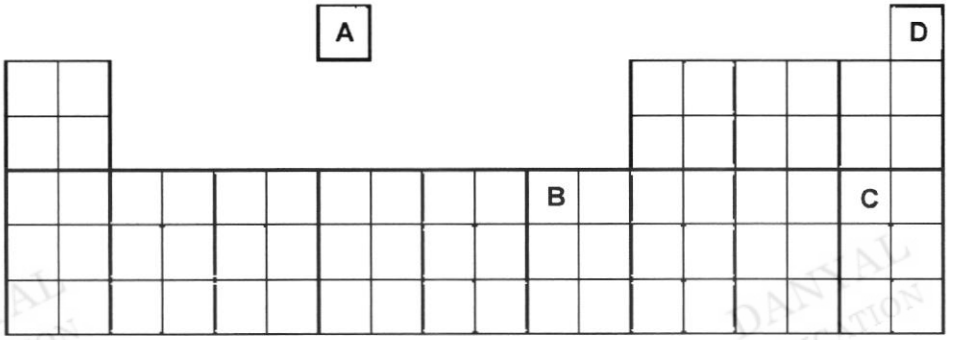
7 The chemical formula for ethanoic acid is CH_3COOH.

How many different elements are present in the compound?

A 2
B 3
C 4
D 8

8 An element has a high melting point, is ductile and is a good conductor of electricity.

Where is this element likely to be found in the Periodic table?

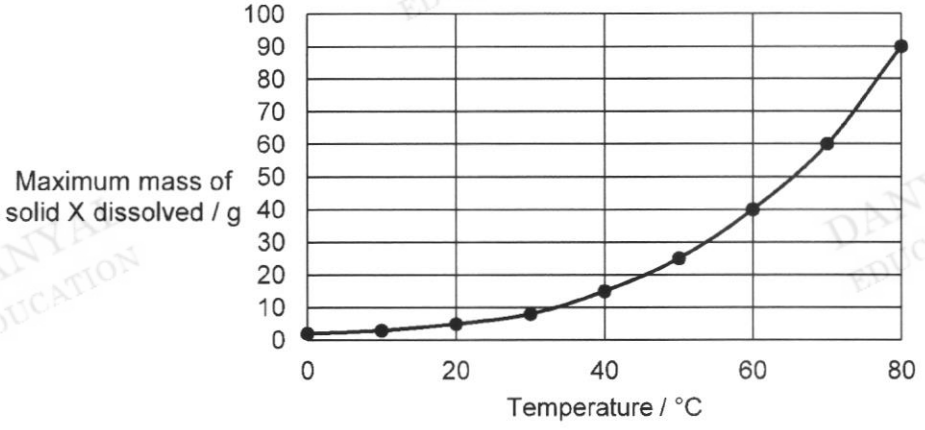


9 Which of the following about alloys is true?

A It can be made from different proportions of metals.
B It can be separated into their individual metals by chemical reactions only.
C It has a fixed melting and boiling point.
D It has different properties as its constituent elements.

10 A student is trying to dissolve 60 g of solid X in 100 mL of water.

The graph below shows how temperature affects the solubility of solid X in 100 mL of water.

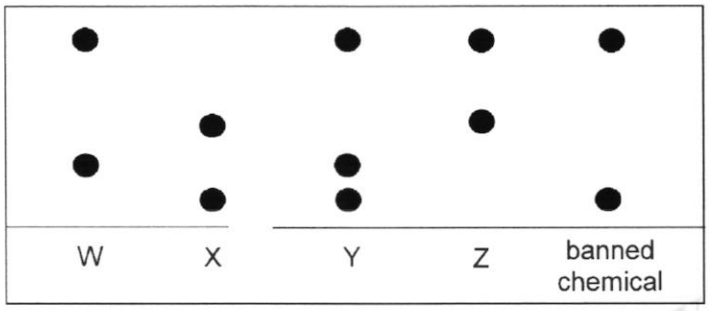


At what temperature would she be left with 20 g of undissolved solid X?

A 15 °C
B 40 °C
C 60 °C
D 70 °C

[Turn over

11 Four food dyes, W, X, Y and Z, are tested to analyse whether they are free from banned chemicals.



Which of the food dye(s) contain(s) the banned chemical?

A Y only
B W and Z only
C X and Y only
D All of the above

12 Which statement explains why substances can be separated using paper chromatography?

A They have different colours.
B They have different densities.
C They have different mass.
D They have different solubilities.

13 A mixture containing substances X and Y is placed in different solvents. The mixture is then filtered using filter paper. The results of the filtration are shown in diagrams 1 and 2.

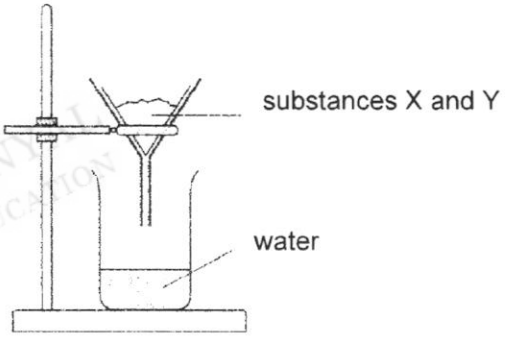


diagram 1

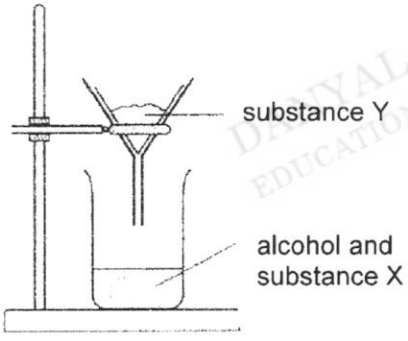


diagram 2

Which of the following statements **cannot** be concluded from the experiment?

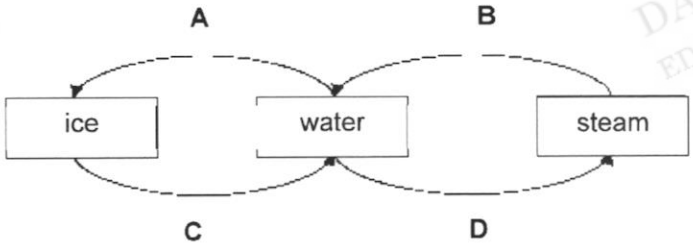
A Substance X forms a suspension in alcohol.
B Substance X is soluble in alcohol.
C Substance Y is insoluble in both water and alcohol.
D Water cannot dissolve both substances X and Y.

14 A student wants to separate a substance using simple distillation. The water that runs through the water jacket of the condenser is about 25 °C.

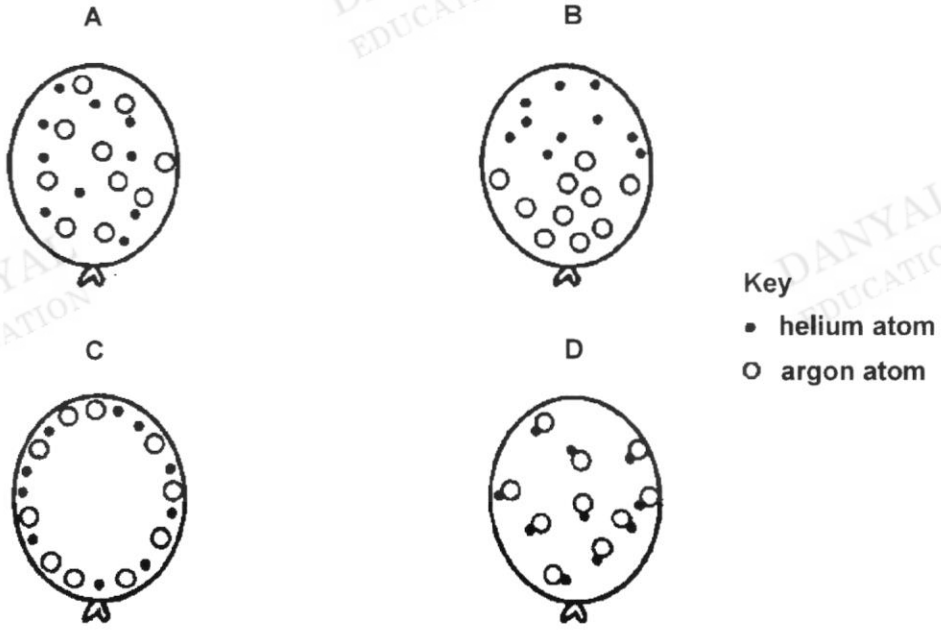
Which substance can be obtained by the condenser?

	melting point	boiling point
A	-78	-33
B	-7	59
C	52	300
D	113	184

15 Which process best represents water molecules gaining kinetic energy to move freely, rapidly and far apart?



16 Which diagram shows the arrangement of particles inside a balloon filled with a mixture of helium and argon?

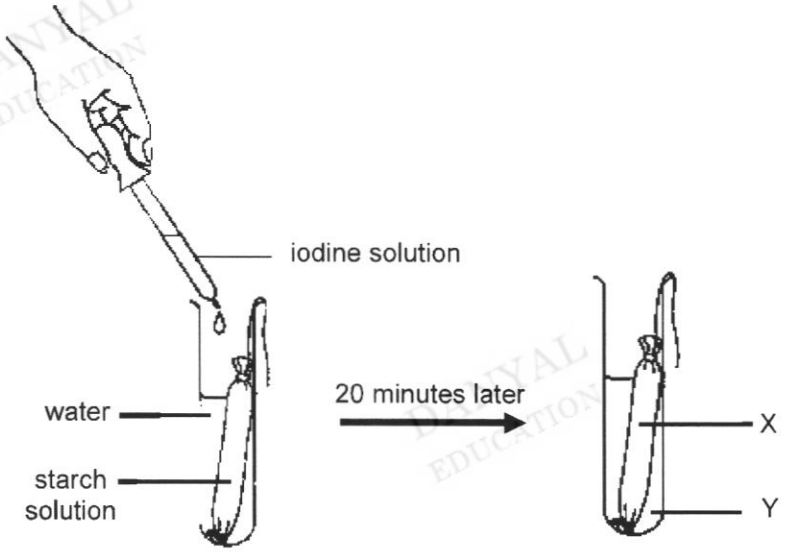


17 Which of the following explains why there is a change in density when a liquid turns into a gas?

A change in the arrangement of particles
B change in the distance between particles
C change in the mass of particles
D change in the size of particles

18 A piece of Visking tubing is filled with starch solution and placed in a boiling tube containing water. A few drops of iodine solution were then added to the water in the boiling tube and left to stand for 20 minutes.

In the presence of starch, iodine solution turns from yellowish-brown to blue-black.



Which of the following shows the colour of liquid X and Y after 20 minutes?

	liquid X	liquid Y
A	blue-black	blue-black
B	blue-black	yellowish-brown
C	yellowish-brown	blue-black
D	yellowish-brown	yellowish-brown

19 Which of the following shows the process and movement of oxygen in the lungs of humans?

	process	movement of oxygen
A	diffusion	blood → lungs
B	diffusion	lungs → blood
C	osmosis	blood → lungs
D	osmosis	lungs → blood

20 An experiment was carried out to investigate the effect of different concentrations of sugar solution on potato tissue.

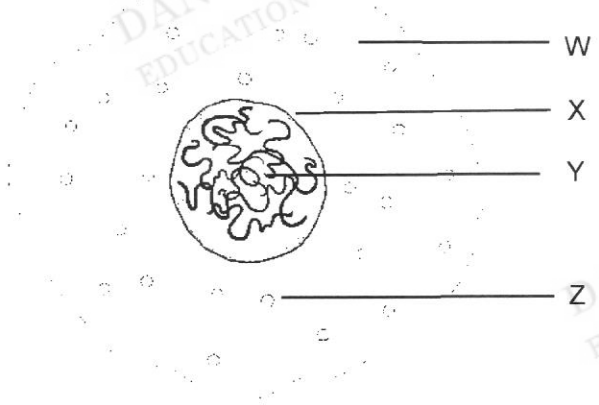
The table below shows the results of the experiment.

sugar solution (mol/dm^3)	initial mass of potato (g)	final mass of potato (g)
W	2.29	2.23
X	2.31	2.36
Y	2.23	2.27
Z	2.18	2.14

Which sugar solution is the most concentrated?

A W
B X
C Y
D Z

21 The diagram below shows an animal cell.



All the members of the Chan family have blue eyes.

Which part of the cell determines the colour of their eyes?

A W
B X
C Y
D Z

[Turn over

22 Which of the following statements is/are true of a cell wall?

I gives cell a regular shape
II made up of cellulose
III partially permeable
IV protects cell from mechanical injury

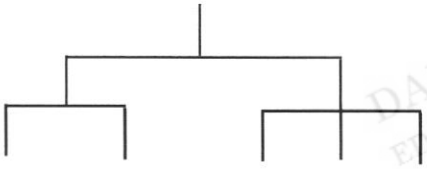
A I only
B I and IV only
C II and III only
D I, II and IV only

23 Where is light energy trapped in plant cells?

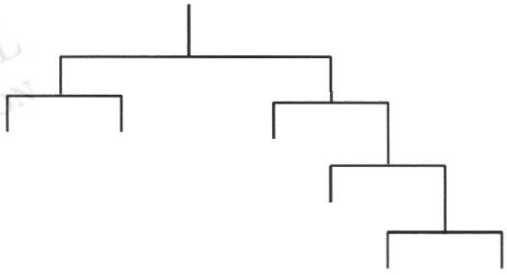
A chloroplast
B cytoplasm
C nucleus
D vacuole

24 Which diagram shows the branches of a dichotomous key used to classify five organisms?

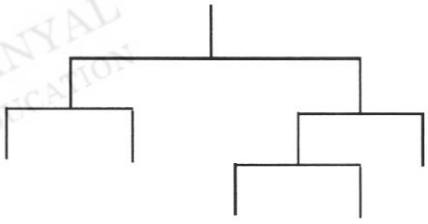
A



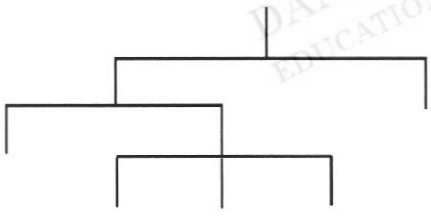
B



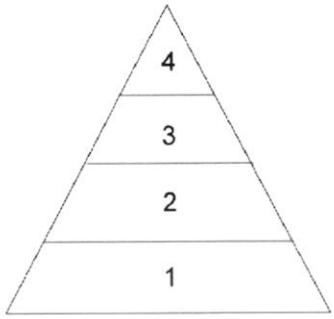
C



D



25 The diagram below shows the pyramid of energy consisting of green plant, eagle, mouse and snake.



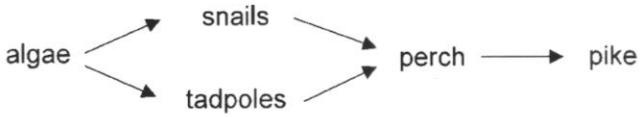
Which organism is most likely to be found in trophic level 2?

A eagle
B green plant
C mouse
D snake

26 Which of the following is found at the start of a food chain?

A producer
B primary consumer
C secondary consumer
D sun

27 The food web shows feeding relationships in a lake.



All the perch are killed by water pollution.

How will this affect the food web?

	algae population	snails population	tadpoles population	pike population
A	decrease	decrease	decrease	decrease
B	decrease	increase	increase	decrease
C	increase	increase	decrease	increase
D	increase	decrease	increase	increase

28 Which of the following is true about the force of gravity?

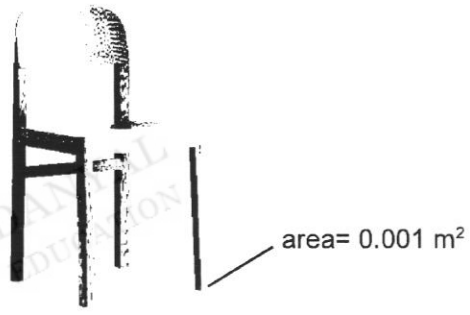
A It changes with mass.
B It changes with location.
C It slows down a moving object.
D Its SI unit is N/m^2.

29 The table shows the masses and weights of some objects on the surface of four different planets.

Which planet has greatest gravitational field strength?

	mass (kg)	weight (N)
A	10	138
B	20	196
C	30	264
D	40	152

30 A chair weighing 20 N stands on four legs, each having an area of contact of 0.001 m^2.



What is the pressure of the chair on the floor?

A 5000 Pa
B 50 000 Pa
C 20 000 Pa
D 200 000 Pa

Section B (40 marks)
Answer **all** questions in the spaces provided.

B1 The diagram below shows a student heating some liquid obtained from the bottle as seen in Fig. 1.1.

For Examiner's Use

Fig. 1.1

(a) (i) Name an apparatus that the student should use to hold the test tube when heating.

..... [1]

(ii) State a possible consequence of heating the liquid in the bottle.

.....

..... [1]

(iii) State one other safety hazard seen in Fig.1.1.

.....

..... [1]

[Turn over

For Examiner's Use

(b) (i) A student suggested the following procedure in lighting the Bunsen burner.

1. Hold the lighter right beside the barrel of the Bunsen burner
2. Click the lighter then on the gas tap
3. Turn the collar to open the air-hole of the Bunsen burner
4. Turn the collar to close the air-hole of the Bunsen burner

Correct the mistakes in the procedures and rearrange the steps in correct sequence.

Step 1: .....

.....

Step 2: .....

.....

Step 3: .....

.....

Step 4: .....

..... [3]

(ii) Explain why leaving a Bunsen burner unattended with an open air-hole is more dangerous than with a closed air-hole.

.....

..... [1]

[Total: 7 marks]

B2 Some properties of four solids, P, Q, R and S are shown in Table 2.1.

For Examiner's Use

Table. 2.1

Substance	Information
P	A grey solid. Remains as a grey solid upon strong heating.
Q	A good conductor of electricity. When it is heated strongly in air, it reacts with oxygen to form one substance.
R	A blue liquid. When it is distilled, a colourless liquid is collected as distillate, leaving behind a blue dye in the round-bottomed flask.
S	A white solid. Heat and light given off when this substance is formed.

(a) Classify each of the solids as either an element, a compound or a mixture and complete the table below by placing a tick (✓) in one box in each row.

solid	element	compound	mixture
P			
Q			
R			
S			

[2]

(b) Given that ⊘ and ◯ represent different types of atoms, draw in the box below a mixture of an element and a compound.

[1]

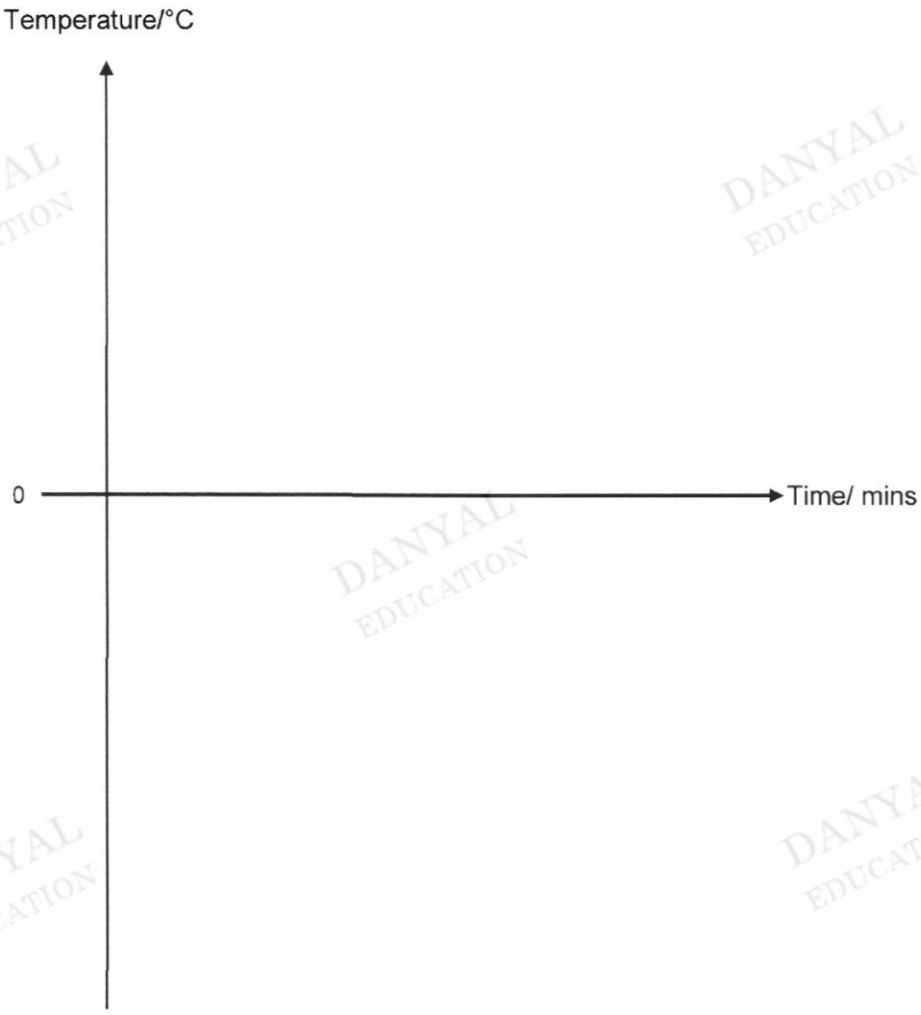
[Total: 3 marks]

B3 Ethanol found in alcoholic drinks has a melting point of -114 °C and a boiling point of 78 °C.

For Examiner's Use

(a) Sketch a temperature-time graph when ethanol is cooled from 100 °C to -120 °C.

Indicate the melting and boiling points on the temperature axis.



[2]

For Examiner's Use

(b) Fig. 3.1 shows an experiment using a gas syringe.

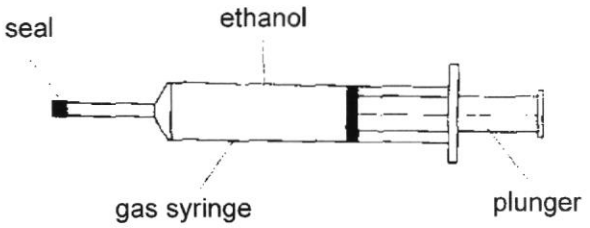


Fig. 3.1

The gas syringe is filled with ethanol at different temperatures. The plunger is then pushed towards the seal of the syringe. The final volume is recorded in Table 3.1.

Table 3.1

temperature/ °C	initial volume (before push) / cm^3	final volume (after push) / cm^3
X	50.0	41.8
Y	50.0	50.0
Z	50.0	49.0

(i) Based on your understanding of the melting (-114 °C) and boiling (78 °C) point of ethanol, suggest an appropriate temperature for X, Y and Z when ethanol is cooled from 100 °C to -120 °C.

X: ..... °C

Y: ..... °C

Z: ..... °C [3]

(ii) Which temperature (X, Y or Z) is ethanol in gaseous state? Explain your answer using the particulate nature of mattter.

.....

.....

..... [2]

[Turn over

For Examiner's Use

(iii) Explain, in terms of particulate nature of matter, why the plunger moves in the opposite direction when the gaseous ethanol inside the syringe is heated.

.....

.....

..... [2]

[Total: 9 marks]

B4 Fig 4.1 shows two pieces of apparatus set up to investigate the movement of substances.

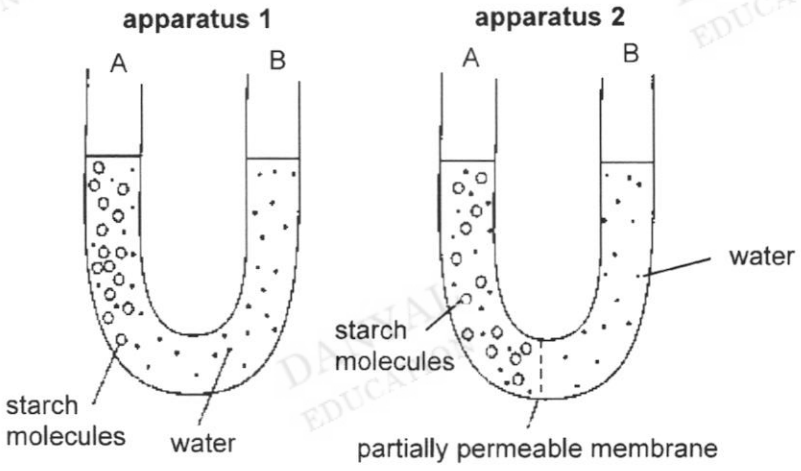


Fig 4.1

(a) After one hour, the water level at A and B in **apparatus 1** remained the same.

Explain why this is so.

.....

.....

..... [2]

(b) However in **apparatus 2**, it was observed that the water level changed.

Explain if the water level at A would rise, fall or remain the same.

.....

.....

.....

.....

..... [3]

[Total: 5 marks]

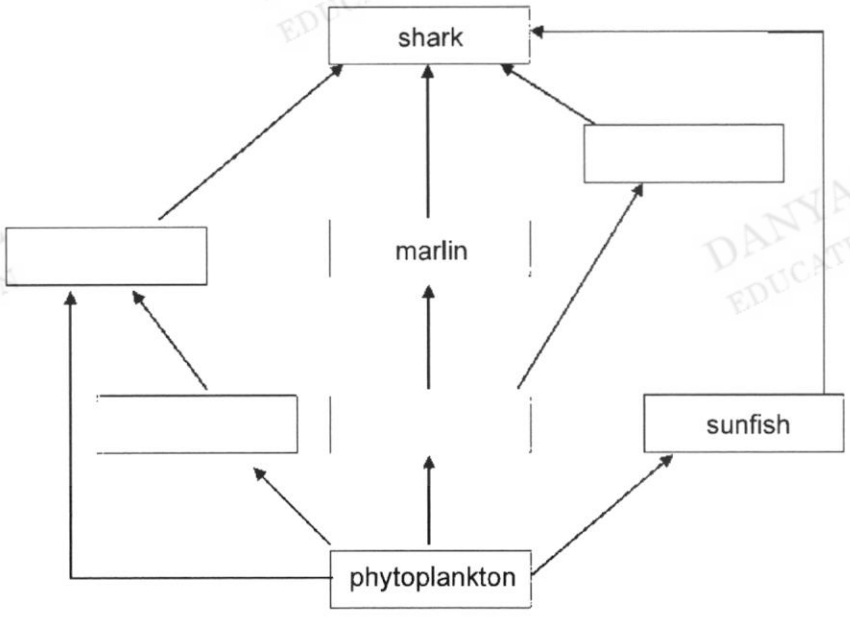
For Examiner's Use

B5 An ecologist was studying the relationship of organisms living in an ocean.

Her observations were recorded below.

- Phytoplankton is a producer.
- The tunas feed on the phytoplankton as well as the mackerels.
- The sharks are the top predators.
- The lantern fishes that feed on the phytoplankton are eaten by the marlins and squids.

(a) (i) Based on the observations recorded, complete the food web.



[2]

[Turn over

For Examiner's Use

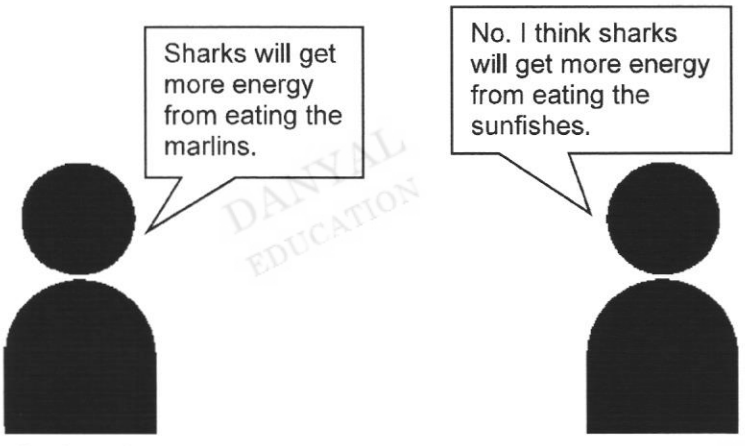
(ii) Based on the food web in **(a)(i)**, how many food chains consist of four trophic levels?

..... [1]

(b) **(i)** Starting with 2500 kJ of energy in the phytoplankton, calculate the energy, in kJ, received by the **marlin**.

energy = ... [1]

(ii) Two students were discussing about the energy received by sharks when they feed on the marlins and sunfishes.



Which student is correct? Explain your answer.

.....

.....

.....

.....

..... [3]

[Total: 7 marks]

B6 The three-toed sloth is a slow-moving mammal found in Central and South America that spends most of its life living in trees.

For Examiner's Use

Fig. 6.1

The thick, long grey fur of the sloth (as seen in Fig. 6.1) has a green appearance. Individual hairs of the sloth have grooves in them where water can collect.

Research has shown that the green colour is due to algae living on the fur. These algae can photosynthesise. This green colour acts as a good camouflage for the sloth against predators.

Many other species of non-photosynthetic organisms are also found living on the fur. These include the ticks that feed on the sloth's blood, and other insects that feed on the algae in the sloth's fur.

Thus, the sloth's fur can be described to be a small ecosystem.

(a) State an abiotic factor that affects this ecosystem (the sloth's fur).

.....

.....

[1]

(b) Based on the information above, describe the various symbiotic relationships with the sloth.

For Examiner's Use

(i) Mutualism:

.....

.....

[1]

(ii) Commensalism:

.....

.....

[1]

[Turn over

For Examiner's Use

(iii) Parasitism:

.....

..... [1]

[Total: 4 marks]

B7 Fig. 7.1 shows a block with surfaces labelled A and B.

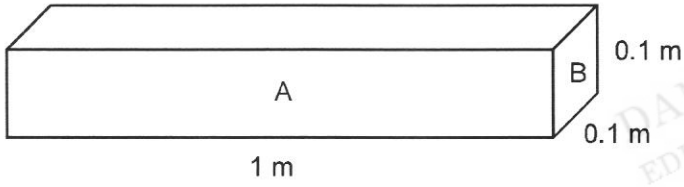


Fig. 7.1

(a) Given that the block has a mass of 800 g and the gravitational field strength on Earth is 10 N/kg, calculate the weight of the block.

weight = ... [1]

(b) Calculate the pressure acting on the ground if the block is placed on:

(i) surface A

pressure = ... [1]

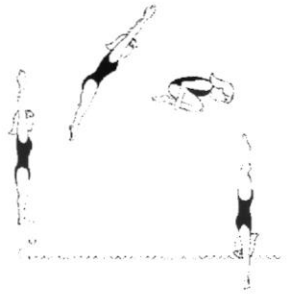
(i) surface B

pressure = ... [1]

(c) In order to score high points in the Olympic games, divers are trained to dive and enter the water with no splash, which is known as "rip entry dives".

For Examiner's Use

The amount of pressure generated when the diver enters the water will determine the amount of splash they create.



Technique A

Technique B

Based on your understanding in **(b),** explain why diving technique A creates lesser splash than diving technique B.

.....

.....

..... [2]

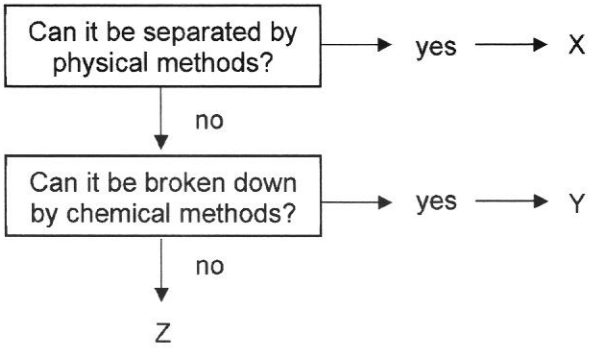
[Total: 5 marks]

[Turn over

Section C (30 marks)
Answer **all** questions in the spaces provided.

For Examiner's Use

C1 Three substances, X, Y and Z, have been mixed up. A student wants to determine the identity of the substances through the flowchart below.



(a) (i) Based on the flowchart, identify which substance is iron filings, water and a mixture of chalk and salt.

X: .....

Y: .....

Z: ..... [1]

(ii) Describe the steps to obtain the **dry solid** samples of iron filings, chalk and salt from the mixture of substances.

.....

.....

.....

.....

..... [3]

(b) The student set up the following apparatus in Fig. 1.1 to obtain water from the salt solution instead.

For Examiner's Use

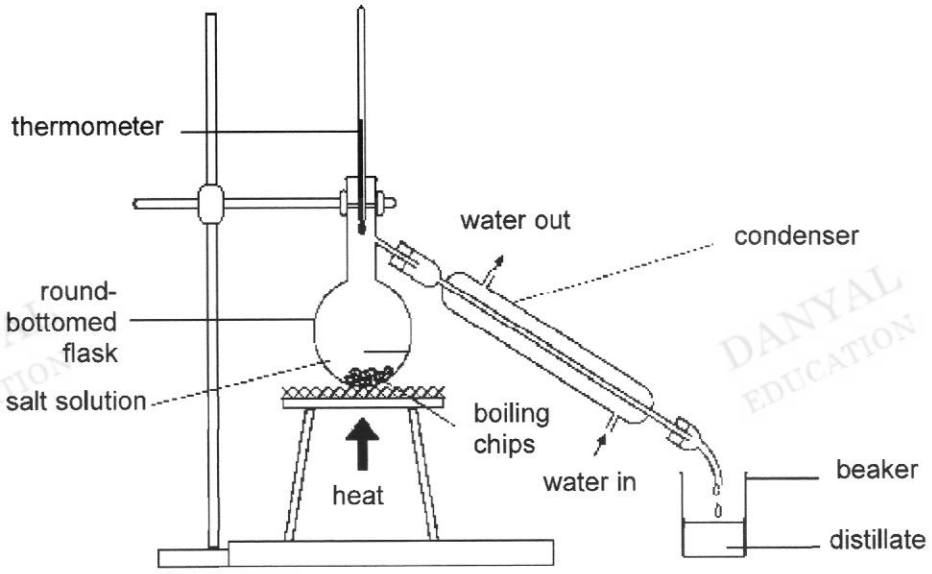


Fig. 1.1

(i) Explain why water should enter the condenser from the bottom and leave from the top.

.....

.....

..... [2]

(ii) Using Fig. 1.1, describe how the student can confirm that the distillate obtained is pure water.

.....

..... [1]

[Turn over

(c) To obtain large amounts of pure water from sea water in the industry, reverse osmosis is used as shown in Fig. 1.2.

For Examiner's Use

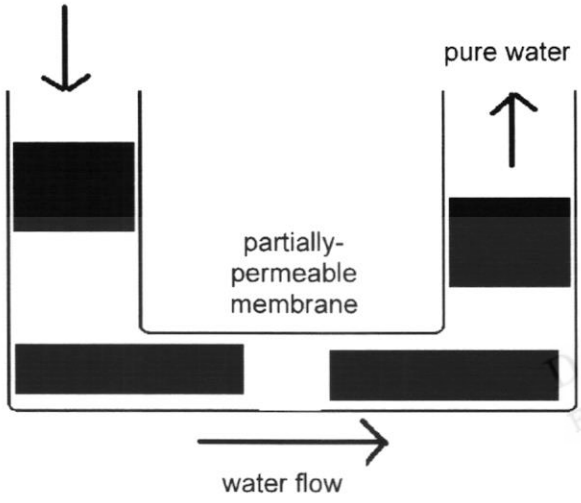


Fig. 1.2

(i) Explain how reverse osmosis works to obtain pure water from sea water.

.....

.....

.....

..... [2]

(ii) State an advantage of using reverse osmosis as compared to distillation.

.....

..... [1]

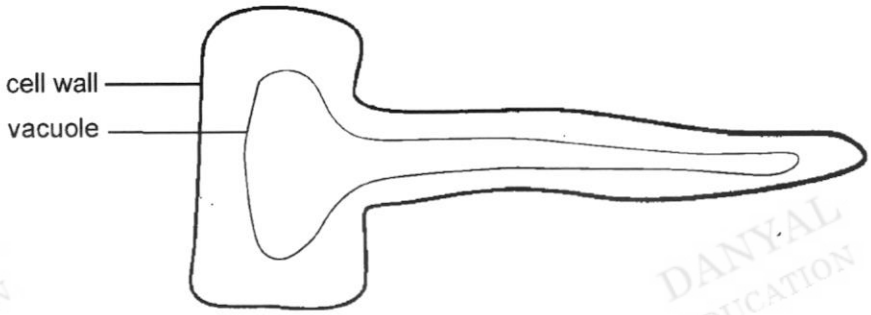
[Total: 10 marks]

C2 Fig. 2.1 shows the outline of a root hair cell of a plant.

For Examiner's Use

Draw and label the **nucleus** and **cell membrane** in Fig. 2.1. The cell wall and vacuole has been drawn and labelled for you.

(a)



[2]

Fig. 2.1

(b) Explain why root hair cells do not have chloroplasts.

.....

..... [1]

(c) Fig. 2.2 shows some cells, W, X and Y, in the root of a plant that was placed in well-watered soil, Z.

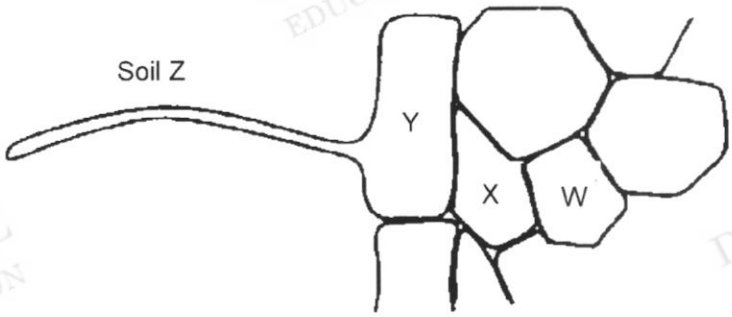


Fig. 2.2

(i) Define the process through which the root cells absorb water from the soil.

.....

.....

.....

..... [3]

[Turn over

For Examiner's Use

(ii) Arrange W, X, Y and Z in decreasing order of water potential.

..... [1]

(iii) A student watered a plant with seawater. She noticed that the plant withered and died after a few days.

Explain what happened to the plant cells.

.....

.....

.....

.....

..... [3]

[Total: 10 marks]

For Examiner's Use

C3 Scientists brought back a big rock from Mars to Earth to be investigated.

The mass of the big rock is 40 kg on Mars. The gravitational field strength on Earth is 10 N/kg and on Mars is 3.7 N/kg.

(a) (i) What is the mass of the big rock on Earth?

..... [1]

(ii) What is the weight of the big rock on Mars?

..... [1]

(b) To find the density of the rock, it has to be crushed into smaller pieces in order to find its volume.

Fig. 3.1 shows a hydraulic device that is used to break up the big rock into smaller pieces.

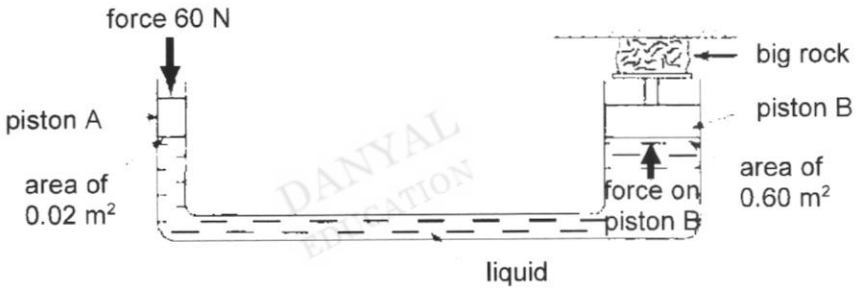


Fig. 3.1

A force applied at piston A creates a pressure that is transferred to piston B.

(i) Calculate the pressure produced by piston A.

pressure = ... [1]

[Turn over

(ii) Calculate the force exerted on piston B.

For Examiner's Use

force = ... [1]

(c) After the big rock was crushed, a small piece of the rock with mass of 5 g was submerged in water to find its volume. 1 division represents 1 cm^3. The results are as shown in Fig. 3.2.

Fig. 3.2

(i) Calculate the density of the small piece of rock.

density = ... [2]

(ii) What is the density of the original big rock?

..... [1]

(iii) As temperature on Mars is much colder than on Earth, the rock expanded when it is brought to Earth.

State how density of the rock will change when it is on Earth.

..... [1]

(d) Fig. 3.3 shows that the rock sinks when placed in 200 cm^3 of pure water. However, when a certain mass of salt was added to the water, the rock suspended in the middle of the liquid.

For Examiner's Use

The density of pure water is 1.0 g/cm^3.

Fig 3.3

(i) Explain why the rock was suspended in the middle of the liquid after salt was added to the pure water.

.....

..... [1]

(ii) Assuming that the amount of salt added does not affect the volume of liquid, calculate the mass of the liquid after salt was added.

mass of solution = ... [1]

[Total: 10 marks]

-End of Paper-

[Turn over

Section A: Multiple Choice Questions (30 Marks)

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

Section B (40 marks)

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

B1 The diagram below shows a student heating some liquid obtained from the bottle as seen in Fig. 1.1.

For Examiner's Use

Fig. 1.1

(a) (i) Name an apparatus that the student should use to hold the test tube when heating.

Test tube holder ..... [1]

[Turn over

(ii) State a possible consequence of heating the liquid in the bottle.

The liquid catches fire.

[1]

(iii) State one other safety hazard seen in Fig.1.1.

Long hair not tied/ not wearing safety goggles/ looking directly into the test tube. (accept flammable liquid as ecf if (ii) is incorrect.) [1]

(b) **(i)** A student suggested the following procedure in lighting the Bunsen burner.

1. Hold the lighter right beside the barrel of the Bunsen burner
2. Click the lighter then on the gas tap
3. Turn the collar to open the air-hole of the Bunsen burner
4. Turn the collar to close the air-hole of the Bunsen burner

Correct the mistakes in the procedures and rearrange the steps in correct sequence.

Step 1: **Turn the collar to close the air hole of the Bunsen burner.**

Step 2: **Hold the lighter right <u>above</u> the barrel of the Bunsen burner.**

Step 3: **<u>On the gas tap</u> then <u>click the lighter</u>.**

Step 4: **Turn the collar to open the air hole of the Bunsen burner.**

[3]

Correct sequence: [1] <u>steps 1 & 2 interchangeable</u>, each corrected statement: [1]

(ii) Explain why leaving a Bunsen burner unattended with an open air-hole is more dangerous than with a closed air-hole.

The flame is non-luminous so it <u>cannot be seen easily</u>.

[1]

[Total: 7 marks]

B2 Some properties of four solids, P, Q, R and S are shown in Table 2.1.

For Examiner's Use

Table. 2.1

Substance	Information
P	A grey solid. Remains as a grey solid upon strong heating.
Q	A good conductor of electricity. When it is heated strongly in air, it reacts with oxygen to form one substance.
R	A blue liquid. When it is distilled, a colourless liquid is collected as distillate, leaving behind a blue dye in the round-bottomed flask.
S	A white solid. Heat and light given off when this substance is formed.

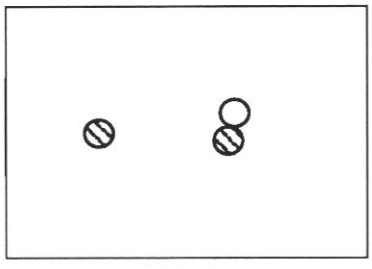
(a) Classify each of the solids as either an element, a compound or a mixture and complete the table below by placing a tick (✓) in one box in each row.

solid	element	compound	mixture
P	✓		
Q	✓		
R			✓
S		✓	

[2]

Any 2 correct: [1]

(b) Given that ⊘ and ○ represent different types of atoms, draw in the box below a mixture of an element and a compound.



Accept any other possible answers.

No marks if more than 1 type of element or compound drawn. [1]

[Total: 3 marks]

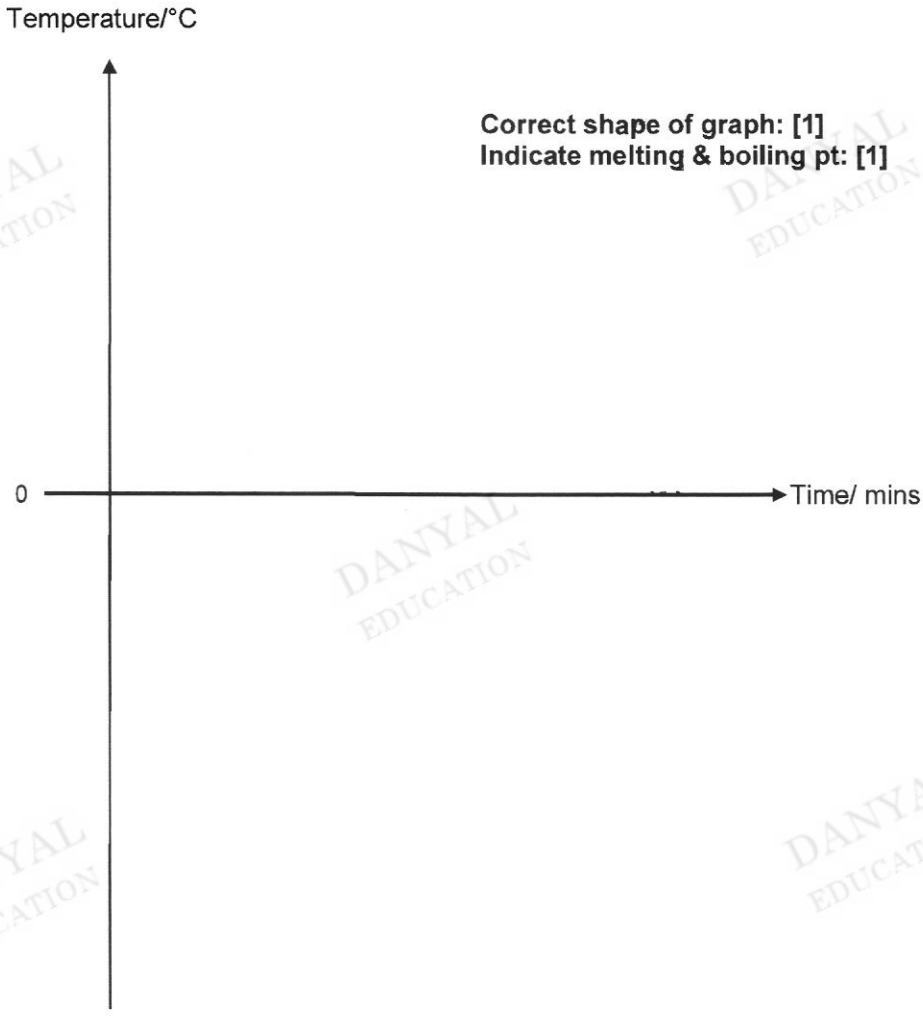
[Turn over

B3 Ethanol found in alcoholic drinks has a melting point of -114 °C and a boiling point of 78 °C.

For Examiner's Use

(a) Sketch a temperature-time graph when ethanol is cooled from 100 °C to -120 °C.

Indicate the melting and boiling points on the temperature axis.



Correct shape of graph: [1]
Indicate melting & boiling pt: [1]

[2]

For Examiner's Use

(b) Fig. 3.1 shows an experiment using a gas syringe.

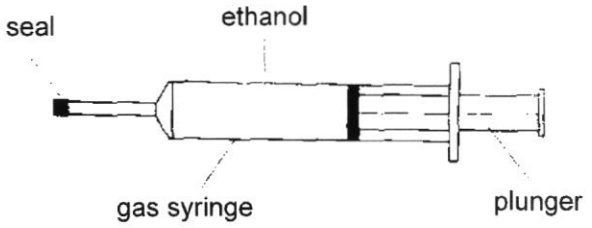


Fig. 3.1

The gas syringe is filled with ethanol at different temperatures. The plunger is then pushed towards the seal of the syringe. The final volume is recorded in Table 3.1.

Table 3.1

temperature/ °C	initial volume (before push) / cm^3	final volume (after push) / cm^3
X	50.0	41.8
Y	50.0	50.0
Z	50.0	49.0

(i) Based on your understanding of the melting (-114 °C) and boiling (78 °C) point of ethanol, suggest an appropriate temperature for X, Y and Z when ethanol is cooled from 100 °C to -120 °C.

X: ..... °C **Any temperature from 79 to 100 °C**

Y: ..... °C **Any temperature from -120 to -115 °C**

Z: ..... °C **Any temperature from -113 to 77 °C** [3]

(ii) Which temperature (X, Y or Z) is ethanol in gaseous state? Explain your answer using the particulate nature of mattter,

X [1] as the volume decreases significantly. Gas particles have large spaces [1] in between them so it can be compressed/ weak forces of attraction hence particles are far apart. [2]

[Turn over

For Examiner's Use

(iii) Explain, in terms of particulate nature of matter, why the plunger moves in the opposite direction when the gaseous ethanol inside the syringe is heated.

As the gas particles are heated, they increase in kinetic energy [1] and move further away [1] from each other, increasing the volume. [2]

[Total: 9 marks]

B4 Fig 4.1 shows two pieces of apparatus set up to investigate the movement of substances.

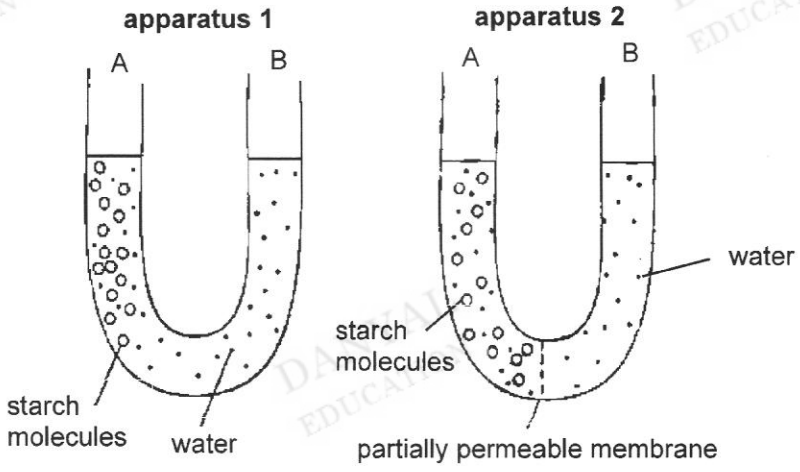


Fig 4.1

(a) After one hour, the water level at A and B in **apparatus 1** remained the same.

Explain why this is so.

In apparatus 1, there is no partially permeable membrane [1] so osmosis cannot happen. Since there is no net movement of water molecules/ no osmosis [1], the water level remains the same. [2]

If only mentioned diffusion occurs and no net movement of water- award only 1 mark. Student must explain why osmosis cannot happen.

(b) However in **apparatus 2**, it was observed that the water level changed.

For Examiner's Use

Explain if the water level at A would rise, fall or remain the same.

It will rise [1]. There is higher water potential [1] at B than A. Water molecules will move from B to A [1] by osmosis across the partially permeable membrane, causing water level at A to rise.

[3]

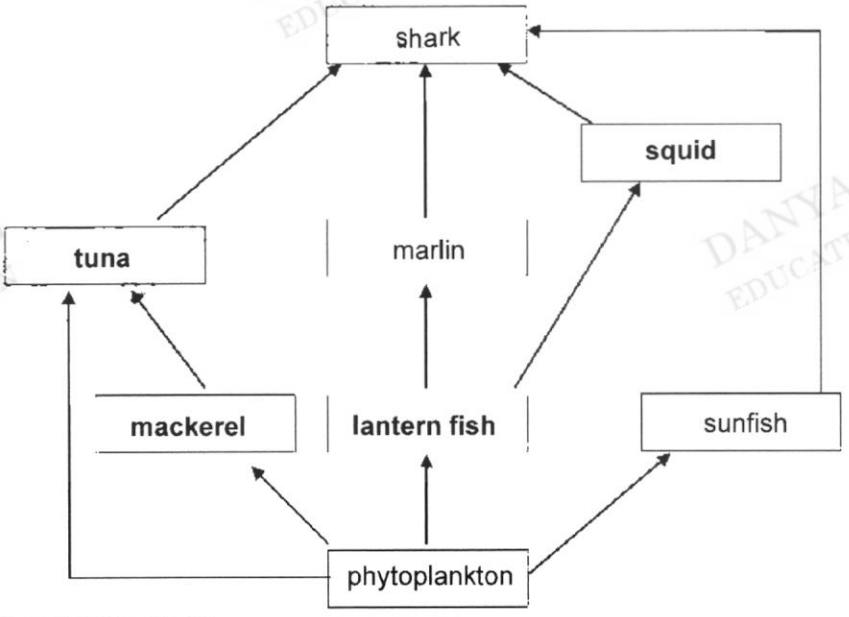
[Total: 5 marks]

B5 An ecologist was studying the relationship of organisms living in an ocean.

Her observations were recorded below.

- Phytoplankton is a producer.
- The tunas feed on the phytoplankton as well as the mackerels
- The sharks are the top predators.
- The lantern fishes that feed on the phytoplankton are eaten by the marlins and squids.

(a) (i) Based on the observations recorded, complete the food web.



[2]

Any 2 correct: [1]

[Turn over

(ii) Based on the food web in **(a)(i)**, how many food chains consist of four trophic levels? *For Examiner's Use*

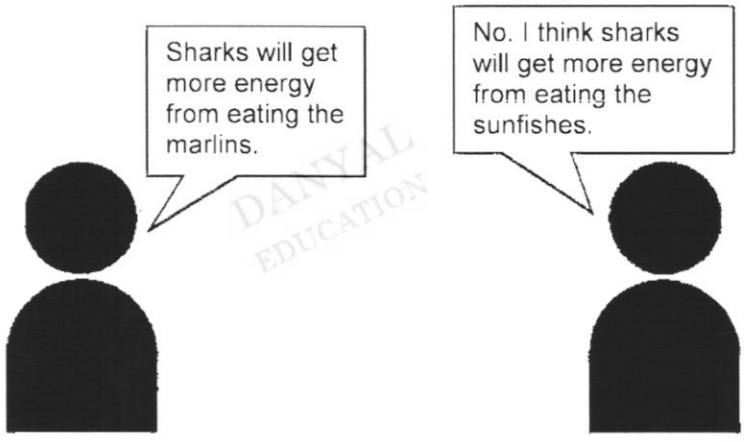
3 [1]

(b) (i) Starting with 2500 kJ of energy in the phytoplankton, calculate the energy, in kJ, received by the **marlin**.

2500 x 10% x 10% = 25

energy = **25 kJ** [1]

(ii) Two students were discussing about the energy received by sharks when they feed on the marlins and sunfishes.



Which student is correct? Explain your answer.

Student B [1]. 90% of the energy is lost/ only 10% of the energy is passed down from one trophic level to the next [1]. The greater the number of trophic levels, the greater the energy lost [1]/ vice versa.

[3]

[Total: 7 marks]

B6 The three-toed sloth is a slow-moving mammal found in Central and South America that spends most of its life living in trees.

For Examiner's Use

Fig. 6.1

The thick, long grey fur of the sloth (as seen in Fig 6.1) has a green appearance. Individual hairs of the sloth have grooves in them where water can collect.

Research has shown that the green colour is due to algae living on the fur. These algae can photosynthesise. This green colour acts as a good camouflage for the sloth against predators.

Many other species of non-photosynthetic organisms are also found living on the fur. These include the ticks that feed on the sloth's blood, and other insects that feed on the algae in the sloth's fur.

Thus, the sloth's fur can be described to be a small ecosystem.

(a) State an abiotic factor that affects this ecosystem (the sloth's fur).

water/ sunlight/ temperature [1]

(b) Based on the informatron above, describe the various symbiotic relationships with the sloth.

For Examiner's Use

(i) Mutualism:

Algae living on sloth's fur (idea about sloth providing shelter or water) and provides the sloth with camouflage [1]

(ii) Commensalism:

Insects living on sloth feeds on the algae and does not affect the sloth [1]

[Turn over

For Examiner's Use

(iii) Parasitism:

Ticks feeding on sloth's blood

..... [1]

[Total: 4 marks]

B7 Fig. 7.1 shows a block with surfaces labelled A and B.

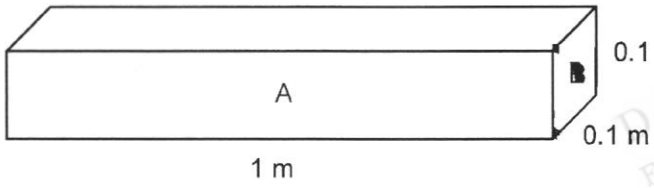


Fig. 7.1

(a) Given that the block has a mass of 800 g and the gravitational field strength on Earth is 10 N/kg, calculate the weight of the block.

W= mg

= 0.8 kg x 10N/kg

= 8 N

weight = ... [1]

(b) Calculate the pressure acting on the ground if the block is placed on:

(i) surface A

P= F/A

= 8 N/ 0 1 m²

= 80 Pa (or N/m²)

Accept ecf for force calculated in (a)

pressure = ... [1]

(i) surface B

P= F/A

= 8 N/ 0.01 m²

= 800 Pa (or N/m²)

Accept ecf for force calculated in (a)

pressure = ... [1]

For Examiner's Use

(iii) Parasitism:

Ticks feeding on sloth's blood

..... [1]

[Total: 4 marks]

B7 Fig. 7.1 shows a block with surfaces labelled A and B.

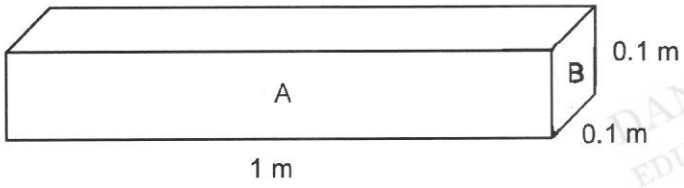


Fig. 7.1

(a) Given that the block has a mass of 800 g and the gravftational field strength on Earth is 10 N/kg, calculate the weight of the block.

W= mg

= 0.8 kg x 10N/kg

= 8 N

weight = ... [1]

(b) Calculate the pressure acting on the ground if the block is placed on:

(i) surface A

P= F/A

= 8 N/ 0.1 m²

= 80 Pa (or N/m²)

Accept ecf for force calculated in (a)

pressure = ... [1]

(i) surface B

P= F/A

= 8 N/ 0.01 m²

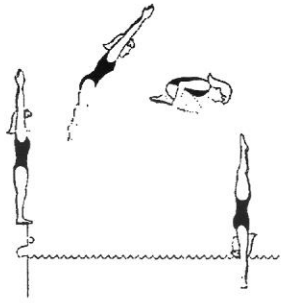
= 800 Pa (or N/m²)

Accept ecf for force calculated in (a)

pressure = ... [1]

(c) In order to score high points in the Olympic games, divers are trained to dive and enter the water with no splash, which is known as "rip entry dives". *For Examiner's Use*

The amount of pressure generated when the diver enters the water will determine the amount of splash they create.



Technique A

Technique B

Based on your understanding in **(b)**, explain why diving technique A creates lesser splash than diving technique B.

The technique A allows the divers to reduce their surface area [1]

and thus, increase the pressure [1] generated when they enter the

water allowing them to enter the water with the least splash. [2]

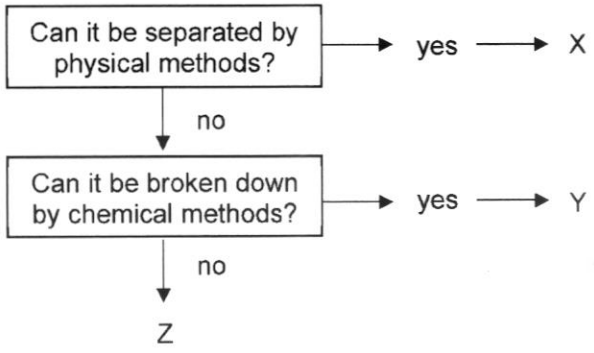
[Total: 5 marks]

[Turn over

Section C (30 marks)
Answer **all** questions in the spaces provided.

For Examiner's Use

C1 Three substances, X, Y and Z, have been mixed up. A student wants to determine the identity of the substances through the flowchart below.



(a) (i) Based on the flowchart, identify which substance is iron filings, water and a mixture of chalk and salt.

X: **mixture of chalk and salt**

Y: **water**

Z: **iron filings** [1]

(ii) Describe the steps to obtain the **dry solid** samples of iron filings, chalk and salt from the mixture of substances.

Use a magnet to attract the iron filings to remove it [1]. Next, filter the water with chalk and salt to get chalk as the residue [1]. After which, evaporate the salt water to dryness to obtain the salt crystals [1].

[3]

(b) The student set up the following apparatus in Fig. 1.1 to obtain water from the salt solution instead.

For Examiner's Use

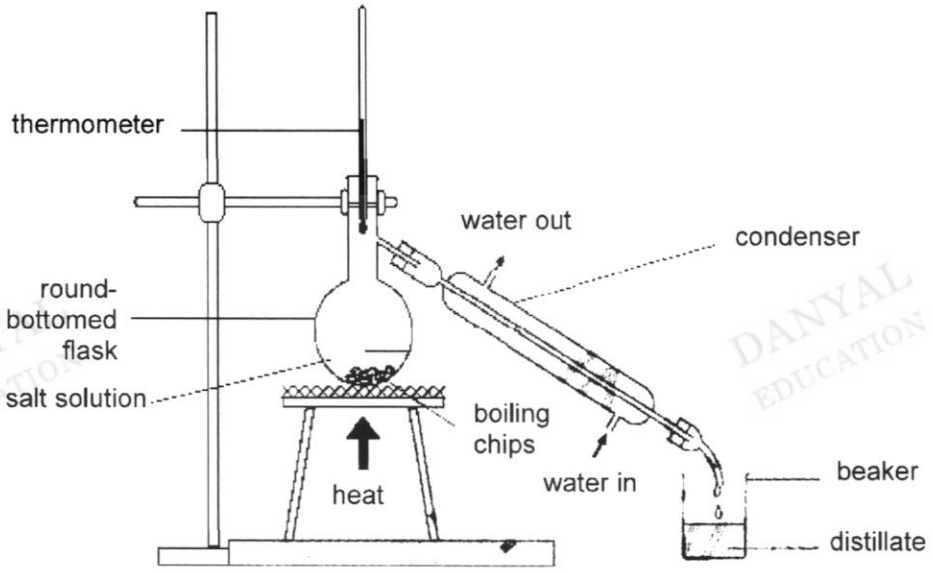


Fig. 1.1

(i) Explain why water should enter the condenser from the bottom and leave from the top.

To ensure that the water jacket is completely filled [1] to have a
.....

more efficient cooling system [1].
.....

..... [2]

(ii) Using Fig. 1.1, describe how the student can confirm that the distillate obtained is pure water.

If it is pure water, the thermometer will read 100 ^{0}C when the
.....

distillate is collected.
..... [1]

[Turn over

For Examiner's Use

(c) To obtain large amounts of pure water from sea water in the industry, reverse osmosis is used as shown in Fig. 1.2.

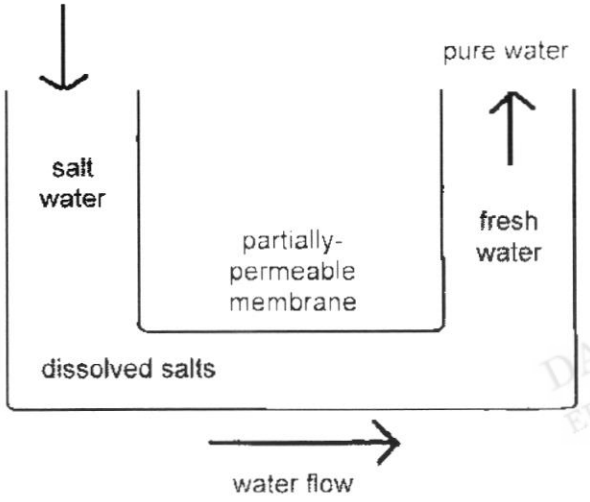


Fig. 1.2

(i) Explain how reverse osmosis works to obtain pure water from sea water.

Salt water is pumped at high pressure/ force exerted [1] through the partially permeable membrane. Only water molecules which are small enough can pass through the membrane/ the salt particles are too big to pass through hence pure water can be collected. [2]

(ii) State an advantage of using reverse osmosis as compared to distillation.

It requires less energy/ less costly/ quicker. [1]

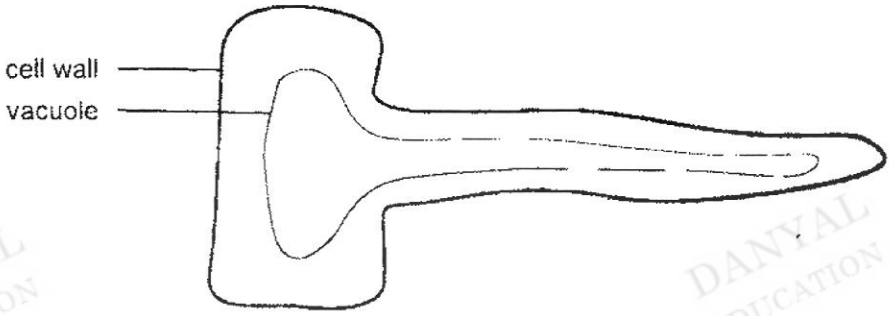
[Total: 10 marks]

C2 Fig. 2.1 shows the outline of a root hair cell of a plant.

For Examiner's Use

Draw and label the **nucleus** and **cell membrane** in Fig. 2.1. The **cell wall** and vacuole has been drawn and labelled for you.

(a)



[2]

Fig. 2.1

(b) Explain why root hair cells does not have chloroplasts.

They are underground/ cannot receive sunlight so they do not photosynthesise. [1]

(c) Fig. 2.2 shows some cells, W, X and Y, in the root of a plant that was placed in well-watered soil, Z.

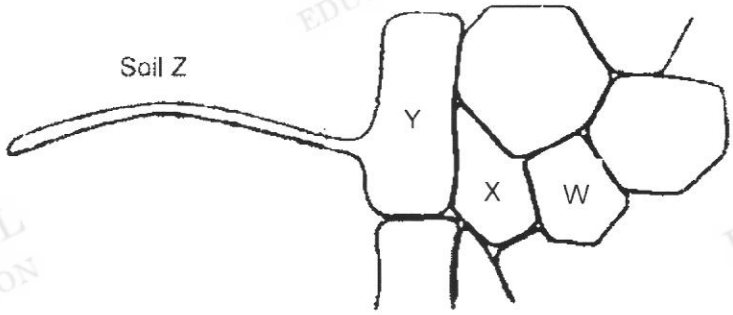


Fig. 2.2

(i) Define the process through which the root cells absorb water from the soil.

It is the net movement of water molecules [1] from a region of higher water potential to a region of lower water potential [1] through a partially permeable membrane [1]. [3]

[Turn over

For Examiner's Use

(ii) Arrange W, X, Y and Z in **decreasing order** of water potential.

Z, Y, X, W (highest to lowest) [1]

(iii) A student watered a plant with seawater. She noticed that the plant withered and died after a few days.

Explain what happened to the plant cells.

The seawater has lower water potential [1] than the root cells. Water molecules will leave the root cells into the soil by osmosis [1]. The cells will shrink and become plasmolysed [1]. [3]

[Total: 10 marks]

C3 Scientists brought back a big rock from Mars to Earth to be investigated.

For Examiner's Use

The mass of the big rock is 40 kg on Mars. The gravitational field strength on Earth is 10 N/kg and on Mars is 3.7 N/kg.

(a) **(i)** What is the **mass** of the big rock on Earth?

40 kg [1]

(ii) What is the weight of the big rock on Mars?

148 N [1]

(b) To find the density of the rock, it has to be crushed into smaller pieces in order to find its volume.

Fig. 3.1 shows a hydraulic device that is used to break up the big rock into smaller pieces.

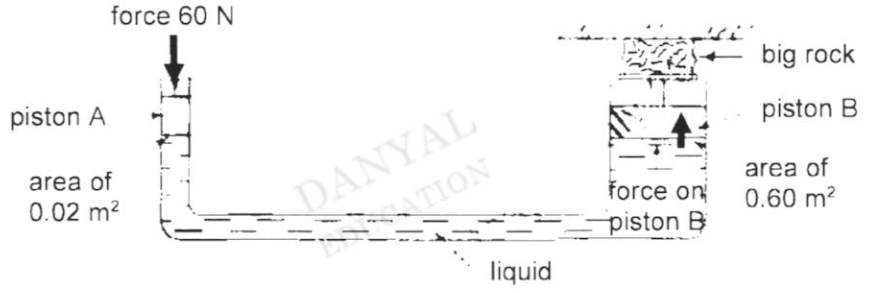


Fig. 3.1

A force applied at piston A creates a pressure that is transferred to piston B.

(i) Calculate the pressure produced by piston A.

P= F/A

= 60 N / 0.02 m²

= 3000 Pa (or N/m²)

pressure = ... [1]

[Turn over

For Examiner's Use

(ii) Calculate the force exerted on piston B.

F= P x A

= 3000 Pa x 0.60 m^2

= 1800 N

force = ... [1]

(c) After the big rock was crushed, a small piece of the rock with mass of 5 g was submerged in water to find its volume. 1 division represents 1 cm^3. The results are as shown in Fig. 3.2.

Fig. 3.2

(i) Calculate the density of the small piece of rock.

V= 82 – 78 cm^3

= 4 cm^3 [1]

D= M / V

= 5 g / 4 cm^3

= 1.25 g/cm^3 [1]

density = ... [2]

(ii) What is the density of the original big rock?

1.25 g/cm^3 (accept ecf) [1]

(iii) As temperature on Mars is much colder than on Earth, the rock expanded when it is brought to Earth.

State how density of the rock will change when it is on Earth.

The density decreases. [1]

For Examiner's Use

(d) Fig. 3.3 shows that the rock sinks when placed in 200 cm^3 of pure water. However, when a certain mass of salt was added to the water, the rock suspended in the middle of the liquid.

The density of pure water is 1.0 g/cm^3.

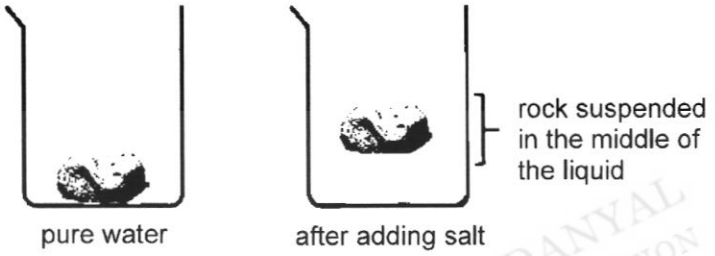


Fig 3.3

(i) Explain why the rock was suspended in the middle of the liquid after salt was added to the pure water.

The density of the liquid is equal to the density of the rock.

..... [1]

(ii) Assuming that the amount of salt added does not affect the volume of liquid, calculate the mass of the liquid after salt was added.

M= D x V

= 1.25 g/cm^3 x 200 cm^3

= 250 g [1]

mass of salt = ... [1]

[Total: 10 marks]

-End of Paper-

[Turn over