East Spring Secondary School

Towards Excellence and Success

Name: ..... ( )

Class: .....

First Semestral Assessment 2022
Secondary 2 Express

Science

10 May 2022
Tuesday

2 hours
0800 – 1000

Additional materials:
1 sheet of OTAS

INSTRUCTIONS TO CANDIDATES

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

Section A [30 marks]
Answer **all** questions in soft pencil on the OTAS.

Section B [30 marks]
Answer **all** questions.
Write your answers in the spaces provided.

Section C [40 marks]
Answer question **C1** and **any three** of the other four questions.
Write your answers in the spaces provided.

A copy of the Periodic Table is given on page 28.
The number of marks is given in brackets [ ]
at the end of each question or part question.

Section	Marks
A	/ 30
B	/ 30
C	/ 40
Total:	/ 100

This question paper consists of **28** printed pages including the cover page.

Section A [30 marks]

Answer **all** the questions on the OTAS provided.

A1 A balloon expands if it is placed in a large beaker of warm water because the higher temperature causes the gas particles in the balloon to .....

I increase in number
II expand in size
III move further apart

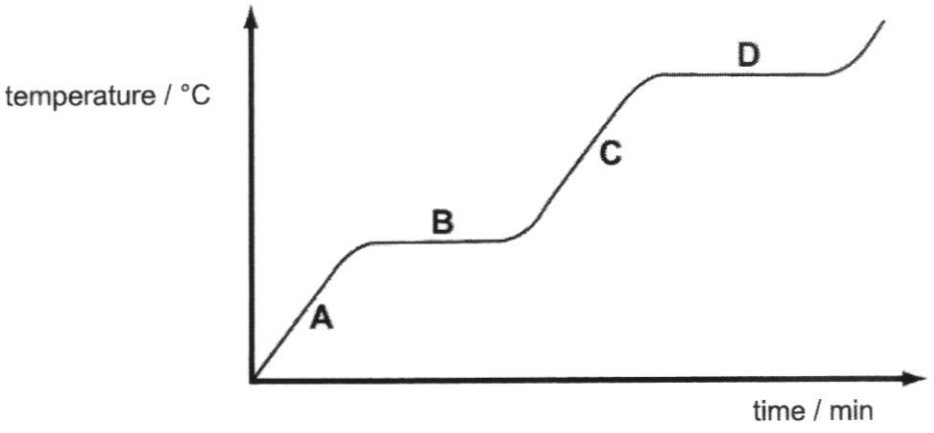
A III only
B I and II only
C II and III only
D I, II and III

A2 In which of the following conversions do the particles change from sliding past each other to vibrating about fixed positions?

A ice → water
B steam → water
C water → ice
D water → steam

A3 The graph shows the change in temperature of a substance as it is heated.

Which part of the graph represents boiling?



A4 The table shows the physical states of a substance Z at 20 °C, 110 °C and 200 °C.

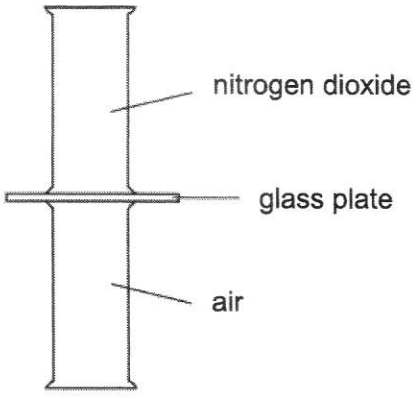
temperature / °C	physical state of substance Z
20	solid
200	gas
110	liquid

Which set of readings shows the possible melting point and boiling point of substance Z?

	melting point / °C	boiling point / °C
A	15	112
B	108	150
C	112	145
D	110	210

A5 Nitrogen dioxide is a dark brown gas, and is denser than air which is colourless.

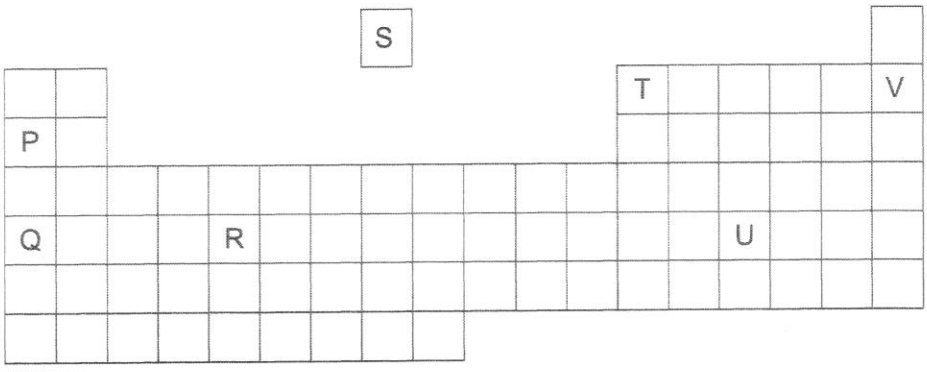
A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of another gas jar containing air.



The glass plate is removed. Which of the following correctly describes the colours inside the gas jars after a long period of time?

	upper gas jar	lower gas jar
A	brown	brown
B	dark brown	colourless
C	colourless	dark brown
D	light brown	dark brown

A6 The diagram below shows an outline of the Periodic Table with seven elements.



Which pairs of letters represent one metallic and one non-metallic element?

A P and Q
B R and U
C S and U
D V and T

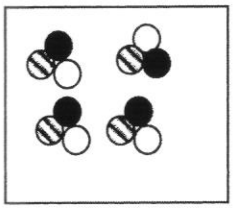
A7 The table shows the number and the type of atoms in one molecule of four different substances.

	chemical formula	number of atoms	type of atoms
I	CF_4	5	2
II	HBr	2	2
III	H_2SO_4	7	3
IV	S_8	1	8

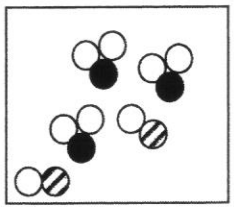
Which of the following is **not** correct?

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

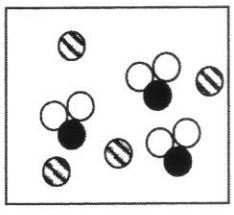
A8 Which diagram represents a mixture of molecules of compounds?



A



B



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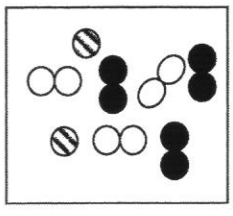


D

A9 An ion, X^+, has mass number of 22 and 10 electrons.

What does the nucleus of X^+ contain?

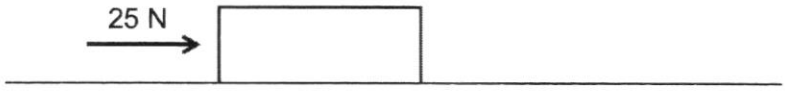
	number of protons	number of neutrons
A	9	13
B	10	12
C	11	11
D	12	10

A10 The table below shows the mass and weight of an object on the surface of four different planets.

Which planet has the lowest gravitational constant (g)?

	mass / kg	weight / N
A	5	50
B	10	20
C	5	20
D	10	50

A11 The diagram below shows a block being pushed across a smooth horizontal floor by a 25 N force.



The total work done on the object is 125 J. What is the distance moved by the object?

A 0 m **B** 0.2 m **C** 5 m **D** 3125 m

A12 Which of the following correctly shows the energy conversions taking place in a battery–operated torch which is switched on?

A chemical potential energy → electrical energy → light energy + heat energy
B electrical energy → kinetic energy → light energy + heat energy
C electrical energy → chemical potential energy → light energy + heat energy
D kinetic → electrical energy → light energy + heat energy

A13 A crane lifts a yacht from the water onto land. The fuel that is burnt in the crane's engine releases 60 000 J of energy. During the lifting, 3000 J of the energy is lost as sound and heat energy.

What is the work done to lift the yacht?

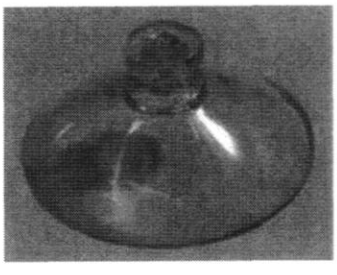
A 3000 J
B 57 000 J
C 60 000 J
D 63 000 J

A14 A box experienced a pressure of 10 Pa when its surface area in contact with the ground is 2.5 m^2.

What is the force applied on the box?

A 0.25 N **B** 4 N **C** 7.5 N **D** 25 N

A15 Which of the following best describes how a suction cup 'holds on' to a surface?



A Air pressure inside the suction cup is less than the air pressure outside.
B Air pressure inside the suction cup is more than the air pressure outside.
C The suction cup itself is sticky.
D Air pressure inside the suction cup is equal to the air pressure outside.

A16 A piece of land has a number of geysers and hot springs.

Which form of alternative energy can be tapped on this land to generate electricity?

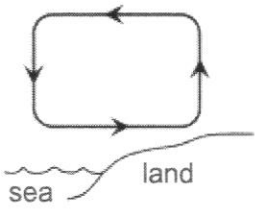
A wind energy
B nuclear energy
C solar energy
D geothermal energy

A17 For the same decrease in temperature, ...

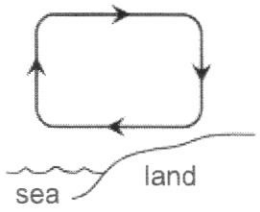
A liquids contract less than solids but more than gases
B liquids contract more than solids but less than gases
C liquids expand less than solids but more than gases
D liquids expand more than solids but less than gases

A18 Which of the following diagrams best represents the air circulation in a coastal area during the day?

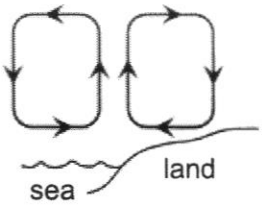
A



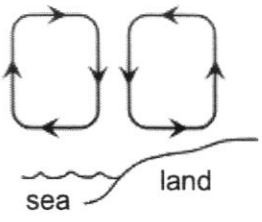
B



C



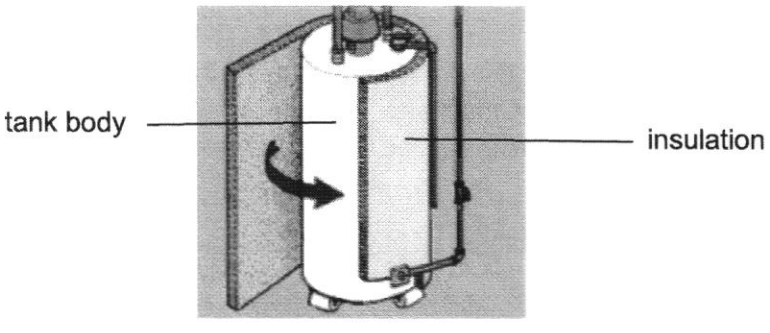
D



A19 Four bars, all exactly the same size, are placed with one end in water at 90 °C.

The time taken for the temperature of the other end to increase by 2 °C is measured.

material of bar	time for 2 °C rise / s
cobalt	20
copper	5
cork	800
styrofoam	1200



To construct a metal tank with the least heat loss to surroundings, which materials should be used for the tank body and its insulation?

	tank body	insulation
A	cobalt	cork
B	cobalt	styrofoam
C	copper	cork
D	copper	styrofoam

A20 Which of the following statements is correct?

A Water is a good conductor of heat.
B Convection can occur in solids, liquids and gases.
C The greater the surface area, the lower the rate of radiation.
D Vacuum is able to prevent heat transfer due to conduction and convection.

A21 Which of the following is **not** a chemical change?

A corrosion of buildings by acid rain
B decomposition of calcium carbonate
C drying clothes in a dryer
D electroplating a layer of silver on a coin

A22 What are the colours observed when a few drops of Universal Indicator are added separately to an acid of pH 6 and an alkali of pH 13?

	acid of pH 6	alkali of pH 13
A	red	violet
B	red	blue
C	yellow	blue
D	yellow	violet

A23 The table shows three indicators and their colours as seen at various pH.

indicator	pH							
	0	2	4	6	8	10	12	14
methyl orange	red			yellow				
bromothymol blue	yellow				blue			
phenolphthalein	colourless					red		

What is the colour of the resulting mixture if methyl orange, bromothymol blue and phenolpthalein are all added to a solution of pH 5?

A blue **B** orange **C** red **D** yellow

A24 The garden in the school is an example of a community. What is a community?

A the place where an organism lives
B groups of different living organisms in a habitat
C the role played by organisms in an environment
D a group of the same organisms living in a habitat

A25 Clownfish and sea anemone have a mutualistic relationship. Sea anemone protects the clownfish from stinging predators.

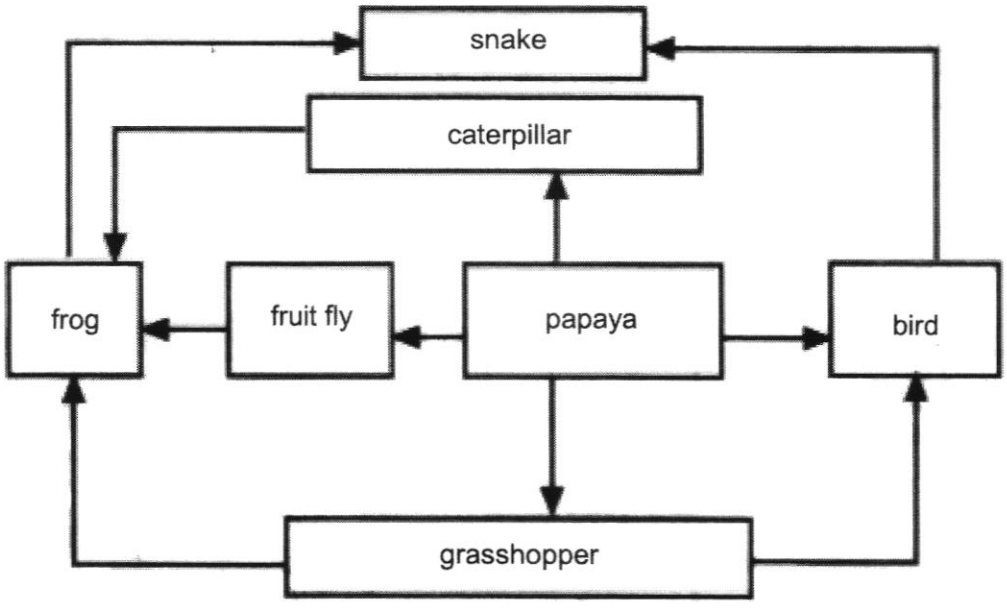
Which of the following statements about clownfish is correct?

A Clownfish feeds on the sea anemone.
B Clownfish does not harm or benefit the sea anemone in any way.
C Clownfish provides nutrients for the sea anemone with its food scraps.
D Clownfish hinders the growth of sea anemone by competing with it for nutrients.

A26 Which of the following statements describes a behaviour adaptation of an organism?

A The brown colour of a moth allows it to camouflage on a tree bark.
B Bears hibernating in winter.
C Eagles catching prey using sharp claws.
D The eyes on top of a mudskipper's head help it to watch out for predators.

A27 The diagram shows a food web.



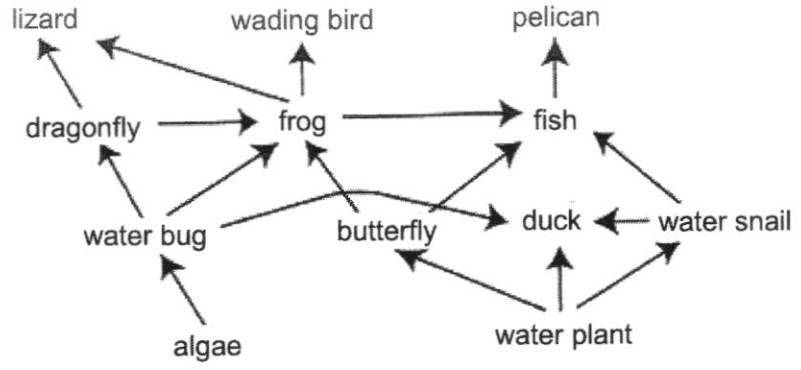
How many food chains are there that make up this food web?

A 4 **B** 5 **C** 8 **D** 10

A28 Which of the following food chains is most energy efficient?

A grass → grasshopper → bird → snake
B grass → cow → human
C caterpillar → bird → fox
D plant → sheep → fox → tiger

A29 The diagram shows a food web in a wetlands ecosystem.



Which organism is both a primary and a secondary consumer in this ecosystem?

A butterfly
B frog
C duck
D water snail

A30 Fungi and bacteria play a role in decomposition in an ecosystem.

What is the importance of decomposition within the ecosystem?

A It ensures that no energy is wasted.
B It produces energy for the ecosystem.
C It ensures that nutrients are recycled within the ecosystem.
D It releases oxygen into the atmosphere.

End of Section A

Section B [30 marks]

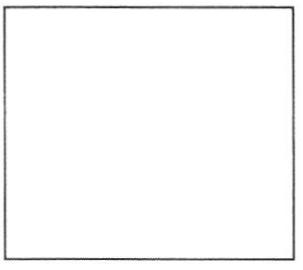
Answer **all** the questions in the spaces provided.

B1 The gas in a can of hairspray is made up mainly of a substance X. The boiling point of the substance X is -5 °C and its melting point is -120 °C.

(a) Complete the Table B1.1 by making use of the information above. **[2]**

temperature / °C	physical state(s) of substance X
30	
-25	
-60	
-120	

(b) If 'O' represents a molecule of substance X, show the arrangement of the molecules at -25 °C in the box below.



[1]

(c) Substance X is usually kept as a liquid in aerosol sprays by pressurising it. When the seal on the aerosol can is opened, the pressure is reduced. This allows the liquid to turn into a gas.

State one advantage of carrying substance X as a liquid rather than a gas.

.....

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

B2 **(a)** Complete Table B2.1 by writing down the electronic configuration of the elements stated below. **[2]**

Table B2.1

element	electronic configuration
magnesium	
sodium	
chlorine	
oxygen	

(b) **(i)** Describe how an oxide ion is formed from an oxygen atom.

.....

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

(ii) Draw the dot-and-cross diagram in the space below, showing how the electrons are arranged in the oxygen atom and oxide ion.

oxygen atom:

oxide ion:

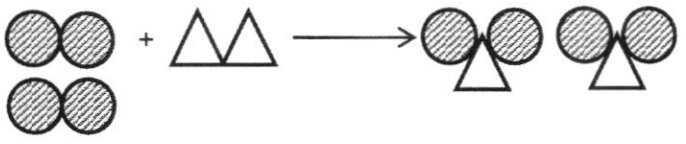
[2]

B3 Substances in our environment exist as atoms or molecules. Table B3.1 shows the chemical formula of some substances.

Table B3.1

substance	carbon	chlorine	hydrogen	methane	oxygen	carbon dioxide	water	hydrogen chloride
formula	C	Cl_2	H_2	CH_4	O_2	CO_2	H_2O	HCl

Example: Hydrogen and oxygen can react to form water.



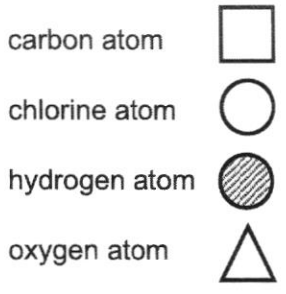


Fig. B3.2

(a) Hydrogen and chlorine can react to form hydrogen chloride.

Using the information in Table B3.1 and Fig. B3.2, draw a model to represent the reaction of hydrogen with chlorine.

[2]

(b) Methane and oxygen can react to form water and carbon dioxide.

Using the information in Table B3.1 and Fig. B3.2, draw a model to represent the reaction of methane with oxygen.

[2]

B4 Two geologists are collecting rocks from the bottom of a cliff. The rocks are loaded into a basket and then pulled up the cliff by a rope, as shown in Fig. B4.1. The basket of rocks is brought to rest at the top of the cliff.

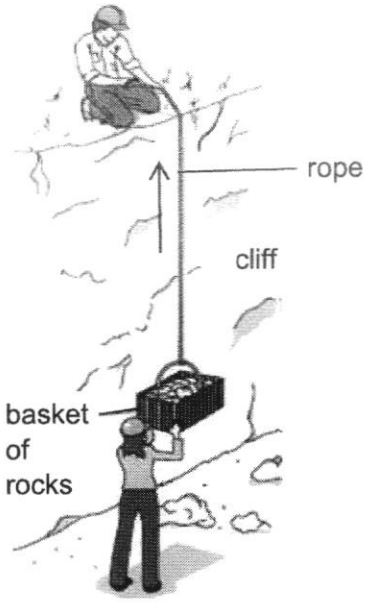


Fig. B4.1

(a) State the energy that increases as the basket of rocks moves from the bottom of the cliff to the top of the cliff.

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

(b) The man at the top of the cliff needs energy to pull the basket up.

State the energy that is in the man to pull the basket up.

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

(c) State the *Law of Conservation of Energy*.

.....

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

(d) Given that the basket of rocks weighs 500 N, calculate the work done by the geologist pulling the rope 6 m up.

work done = ... J **[1]**

B5 A person went camping on a sunny day.

(a) Explain why wearing a light blue shirt is better at keeping a person cool in the hot weather compared to a dark blue shirt.

.....

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

(b) At night, the person wore a sweater made of wool and cotton to keep warm.

Explain how the sweater kept the person warm.

.....

.....

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

(c) The next day, the person left a metal mug and a pair of wooden chopsticks in the open for 20 minutes. The temperature of the surrounding was about 25 °C.

(i) State whether the metal mug or wooden chopsticks felt cooler when touched by the person's hand.

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

(ii) Explain your answer in **(c)(i)**.

.....

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

B6 Fig. B6.1 shows a rock pool, which is a shallow pool of water found on some rocky shore. A marine ecosystem may exist in a rock pool.

Fig. B6.1

When the temperature of the water decreases, the amount of dissolved oxygen in the rock pool also decreases.

(a) State one other physical factor that can affect life in the rock pool.

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

(b) State two actions that can help to conserve the environment.

1. .....

.....

2. .....

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

B7 Oxides of elements can be classified based on the flow chart as shown in Fig. B7.1.

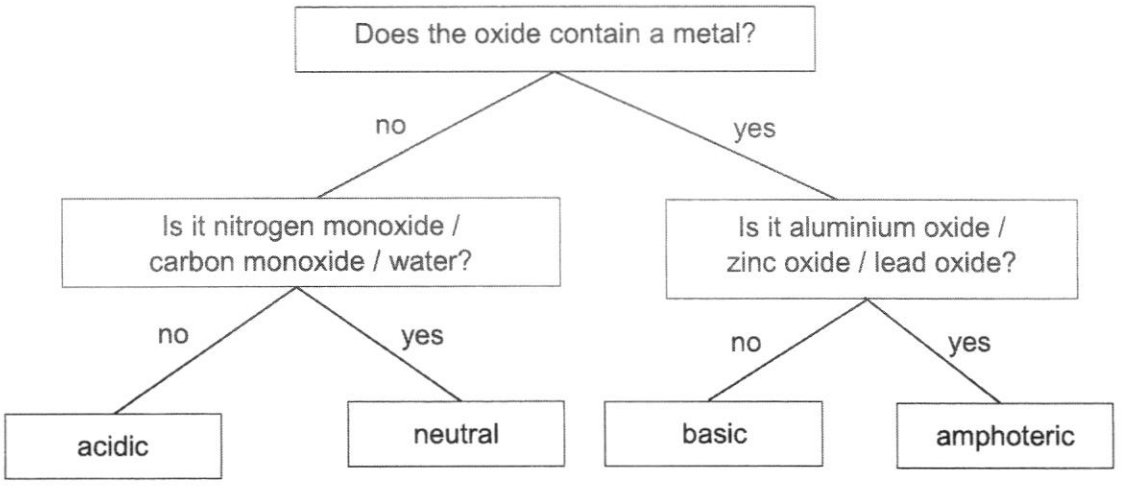


Fig. B7.1

Acidic oxides are oxides that react with alkalis to form salt and water.

Neutral oxides are oxides that do not react with any substances.

Basic oxides are oxides that react with acids to form salt and water.

Amphoteric oxides are oxides that react with both alkalis and acids.

(a) Based on the above classification, identify the group which the following oxides belong to:

(i) aluminium oxide: ..... **[1]**

(ii) iron oxide: ..... **[1]**

(iii) silicon dioxide: ..... **[1]**

(b) **(i)** Using the information given, name one substance that can react with iron oxide.

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

(ii) Write the word equation for the reaction in **(b)(i)**.

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

End of Section B

Section C [40 marks]

Answer **C1 and any three** questions in the spaces provided.

C1 **(a)** Table C1.1 shows information about five different particles, S, T, U, V and W.

Table C1.1

particle	number of electrons	number of protons	number of neutrons
S	18	17	18
T	6	6	6
U	10	10	10
V	10	13	14
W	17	17	18

Write the letter(s) of the particle(s) that represent(s):

(i) an element found in Period 2,

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

(ii) an element from Group 13,

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

(iii) a negative ion,

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

(iv) an unreactive element,

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

(v) an atom and an ion of an element.

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

(b) Complete Table C1.2 to show the relative masses and relative charges of a proton, a neutron and an electron. **[2]**

Table C1.2

	proton	neutron	electron
relative mass			
relative charge			

(c) Isotopes are atoms of the same element with the same number of protons but different number of neutrons.

Carbon exists in the form of three isotopes, carbon-12, carbon-13 and carbon-14. The numbers 12, 13 and 14 of the three isotopes represent the mass number of the isotopes respectively.

Measuring carbon-14 levels in human tissue could help forensic scientists determine the age and year of death in cases involving unidentified human remains.

Fig. C1.3 shows an incomplete diagram of a carbon-14 isotope.

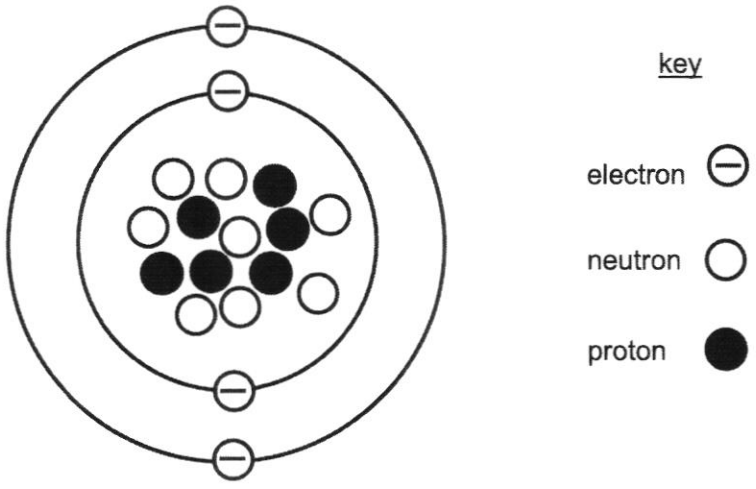


Fig. C1.3

(i) Using the information given, complete Fig. C1.3. **[1]**

(ii) Complete Table C1.4 to show the number of protons and neutrons present in a carbon-12 isotope and a carbon-14 isotope. **[2]**

Table C1.4

isotope	number of protons	number of neutrons
carbon-12		
carbon-14		

C2 **(a)** Fig. C2.1 shows part of a food web in a forest.

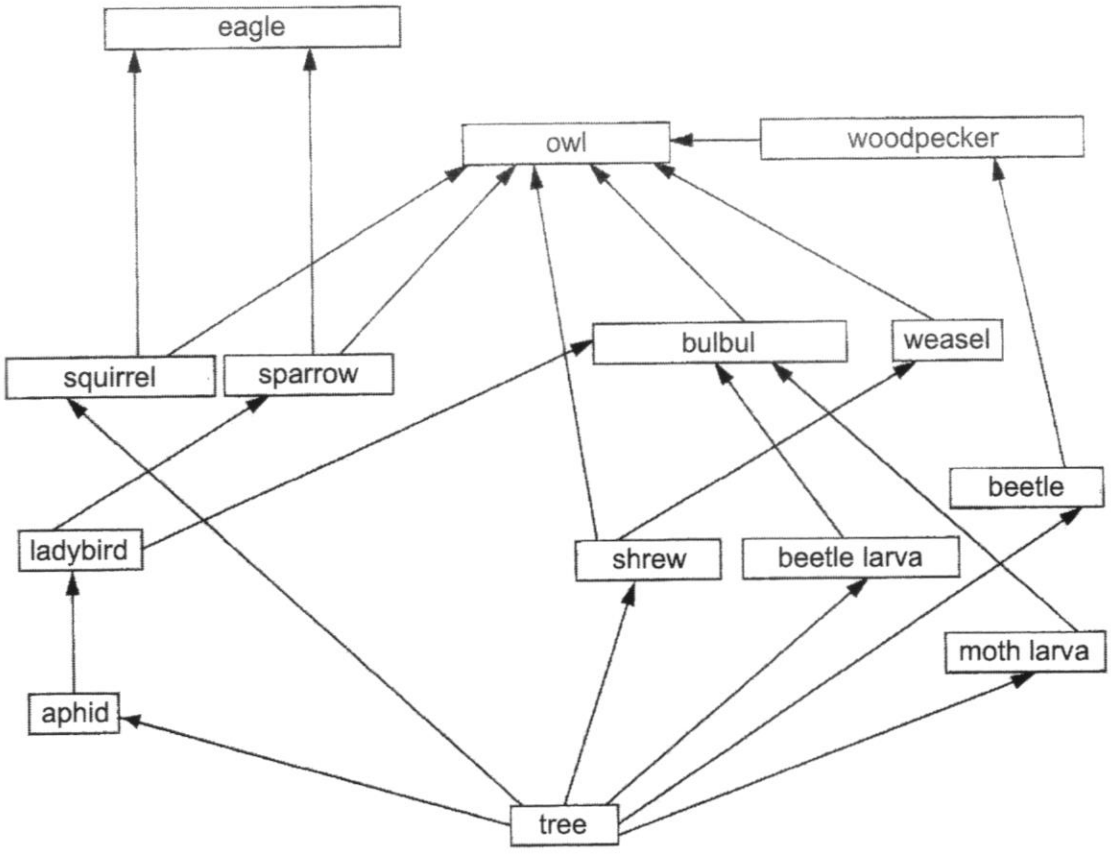


Fig. C2.1

(i) Caterpillars are primary consumers and are preyed on by spiders. Spiders are a source of energy for the sparrows.

Add this information on the food web in Fig. C2.1. **[1]**

(ii) Write a word equation for the process where the tree gets its energy from.

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

(iii) During one particular year, most of the beetle larvae are killed by a disease.

State and explain how this would affect the woodpecker population.

.....

.....

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

(iv) Write one food chain which has only three organisms in it.

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

(b) Fig. C2.2 shows what happens to energy as it passes through an ox.

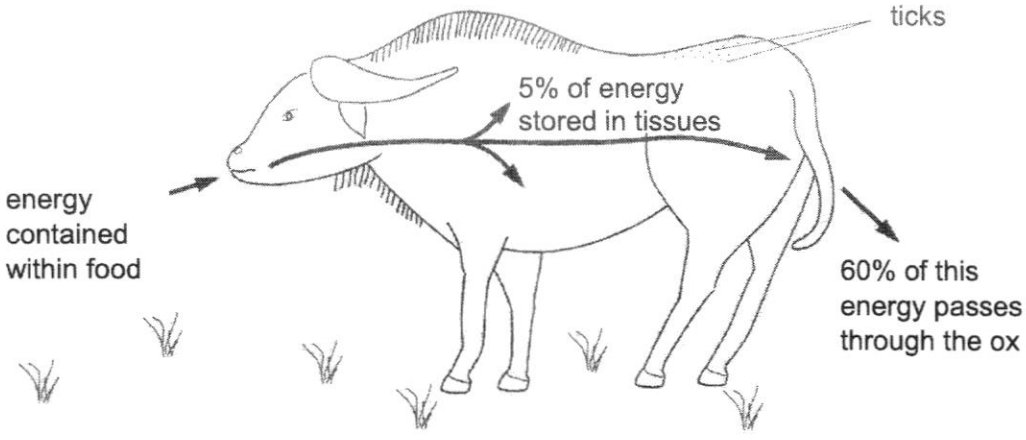


Fig. C2.2

(i) State the source of the energy in the food eaten by the ox.

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

(ii) 5 % of energy stored is in tissues and 60 % of energy is passed through the ox.

State the process that uses up the remaining 35 % of energy.

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

(iii) Ticks live by feeding on the blood of their host. This causes their host to lose essential nutrients.

State and explain the type of relationship formed by the ticks and the ox.

.....

.....

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

(iv) State one difference between the flow of energy and the flow of nutrients in the ecosystem.

.....

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

C3 **(a)** Fig. C3.1 shows an experiment to measure the friction between a stationary object and the surface of a floor.

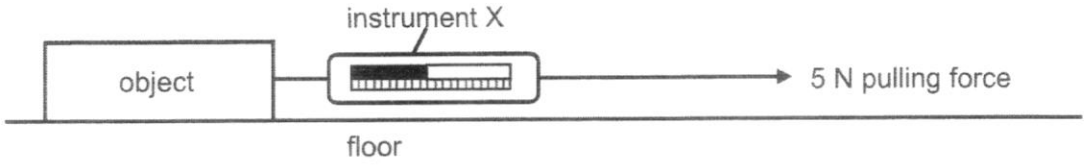


Fig. C3.1

(i) Name instrument X.

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

(ii) A pulling force of 5 N acts on the right.

State the direction of friction acting on the object.

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

(iii) State the effect of the 5 N pulling force on the object.

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

(iv) State one other force that is acting on the object.

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

(b) Fig. C3.2 below shows a stool. Each leg of the stool has a square base with a side of 5 cm.

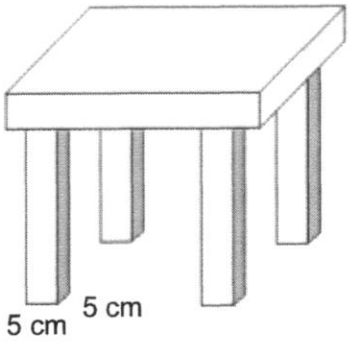


Fig. C3.2

(i) Define *pressure*.

.....

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

(ii) Calculate the pressure, in N/cm^2, exerted on the floor if the weight of the stool is 9 N.

pressure = ... N/cm^2 **[1]**

(iii) Calculate the pressure, in N/cm^2, exerted on the floor when a lady of mass 50 kg sat on the stool.

pressure = ... N/cm^2 **[2]**

(iv) The stool is now replaced by another stool of the same weight which has only three legs, each of which has a square base of side 5 cm.

State and explain how this would affect the pressure on the floor as compared to your answer in **(b)(iii)**.

.....

.....

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

C4 Fig. C4.1 shows some chemical reactions with nitric acid.

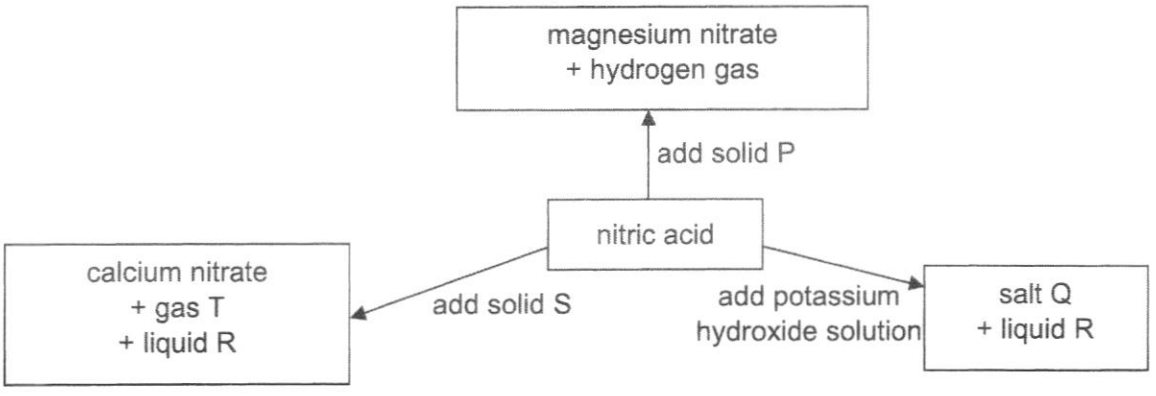


Fig. C4.1

(a) Name the unknown:

(i) solid P,

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

(ii) salt Q,

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

(iii) liquid R,

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

(iv) solid S,

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

(v) gas T.

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

(b) State the pH of liquid R.

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

(c) State the observations when red and blue litmus papers were dipped into potassium hydroxide solution.

red litmus paper: .....

blue litmus paper: ..... **[1]**

(d) State one physical property of potassium hydroxide.

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

(e) Name the type of reaction that had taken place between nitric acid and potassium hydroxide solution.

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

(f) Describe the observation for the positive test for hydrogen gas.

observation: .....

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

C5 A solar panel is mounted on the roof of a house. Fig. C5.1 shows a section through part of the solar panel.

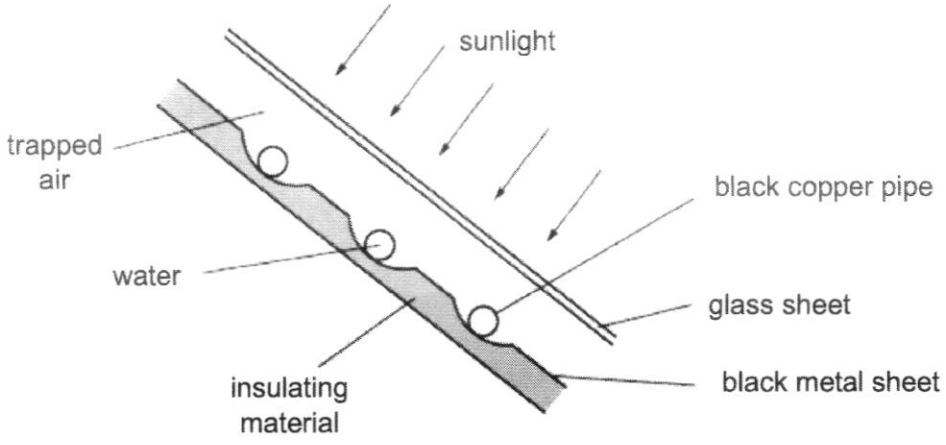


Fig. C5.1

A pump circulates water through the copper pipes. The water in the pipes is heated as it passes through the solar panel.

(a) Describe how heat is transferred by conduction in solids in terms of the particles in the solid.

.....

.....

.....

.....

..... **[3]**

(b) Explain why:

(i) the pipes are made of copper,

.....

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

(ii) the pipes and the metal sheet are painted black,

.....

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

(iii) an insulating material is attached to the metal sheet,

.....

..... [1]

(iv) the presence of the glass sheet increases the energy collected by the water.

.....

..... [1]

(c) Water can also be heated up using the heating coil in a kettle.

Describe in detail how water in a kettle is heated up.

.....

.....

.....

.....

..... **[3]**

END OF PAPER

ESSS 2022 Sec 2E Science SA 1 Mark Scheme

Section A

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

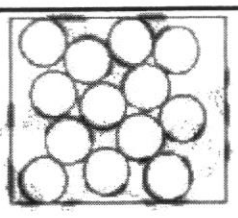
Section B

B1a

temperature / °C	physical state(s) of substance X
30	gas
-25	liquid
-60	liquid
-120	solid and liquid

4c-2
2-3c-1
0-1c-0

B1b — 1

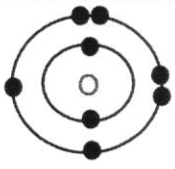


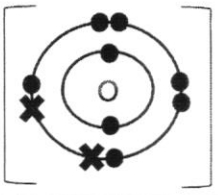
Note:
-Full circles to be drawn
-No overlap of particles
-Particles of similar size
-At least 1/2 of box filled
-Must have some particles touch bottom

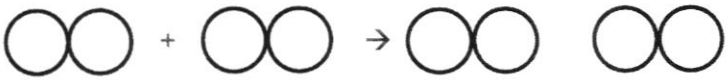
B1c — As a liquid, more X can be stored in a given space than as a gas. — 1

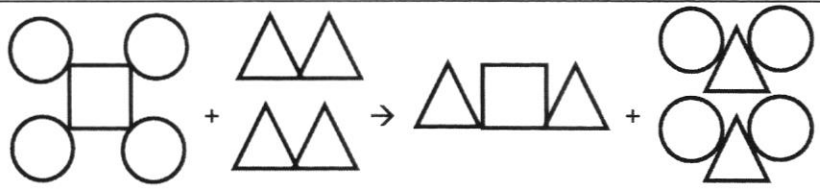
Partner in Learning
93

<table>
<tr><td>B2a</td><td>
<table>
<tr><th>element</th><th>electronic configuration</th></tr>
<tr><td>magnesium</td><td><u>2.8.2</u></td></tr>
<tr><td>sodium</td><td><u>2.8.1</u></td></tr>
<tr><td>chlorine</td><td><u>2.8.7</u></td></tr>
<tr><td>oxygen</td><td><u>2.6</u></td></tr>
</table>
</td><td>4c-2
2-3c-1
0-1c-0</td></tr>
<tr><td>B2bi</td><td>An oxygen atom <u>gains 2 electrons</u> to form an oxide ion. /

<u>2 electrons are added</u> to oxygen atom.</td><td>1</td></tr>
<tr><td>B2bii</td><td>oxygen atom: 

oxide ion:  2-</td><td>1

1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>B3a</td><td> 
[Accept any configuration as long as
reactants: there are 2 molecules; 1 molecule with 2 H atoms touching each other and 1 molecule with 2 Cl atoms touching each other
products: there are 2 molecules; both with 1 H atom and 1 Cl atom touching each other]</td><td>Correct symbols-1

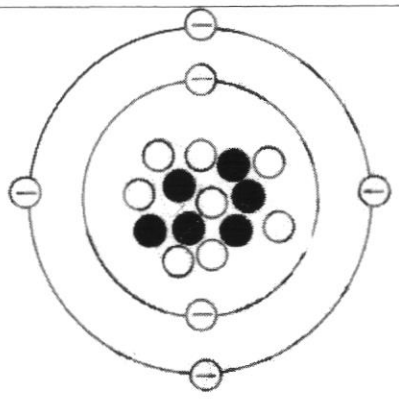
Balanced equation-1</td></tr>
<tr><td>B3b</td><td> 
[Accept any configuration as long as
reactants: there are 3 molecules; 1 molecule with 1 C atom and 4 H atoms touching the C atom, and 2 molecules with 2 O atoms touching each other</td><td>Correct symbols-1

Balanced equation-1</td></tr>
</table>

	products: there are 3 molecules; 1 molecules with 1 C atom and 2 O atoms touching the C atom, and 2 molecules with 1 O atom and 2 H atoms touching the O atom]	
B4a	**Gravitational potential energy**	1
B4b	**Chemical potential energy**	1
B4c	**Energy cannot be created or destroyed. It can only be converted from one form into another**.	1
B4d	Work done = 500 x 6 = **3000** J	1
B5a	Light blue is a **poorer/poor absorber of heat / radiation**. / Dark blue is a **better/good absorber of heat / radiation**. [Reject: emitter of heat / radiation]	1
B5b	**Wool / Cotton / Air** that was trapped in the sweater is a **poor conductor of heat /** , so it **losses heat slowly**. [Reject: gains heat slowly]	3c-2 1-2c-1
B5ci	**Metal mug**	1
B5cii	Metal is a **good conductor of heat**, so it **gains heat from the hand faster**. / **Heat is conducted** away **from the hand to the metal mug at a faster rate** than the wooden chopstick. [Reject: loses heat faster]	1
B6a	**pH** / **Air /** **Water / Rainfall** **Light /** **Minerals /** **Acidity** of water / **Alkalinity** of water [Any 1]	1
B6b	**Reforestation /** **Reduce usage of fossil fuel /** **Reduce consumption /** **Introduce environmentally friendly practices /** [Accept any other reasonable answers] [Any 2]	2

B7ai	**Amphoteric**	1
B7aii	**Basic**	1
B7aiii	**Acidic**	1
B7bi	**Hydrochloric acid /** **Sulfuric acid /** **Nitric acid /** **Silicon dioxide /** **Aluminium oxide**	1
B7bii	**iron oxide + hydrochloric acid → iron chloride + water /** **iron oxide + sulfuric acid → iron sulfate + water /** **iron oxide + nitric acid → iron nitrate + water** [Depends on which acid was used in B7bi]	1

Section C

<table>
<tr><td>C1ai</td><td><u>T / U</u></td><td>1</td></tr>
<tr><td>C1aii</td><td><u>V</u></td><td>1</td></tr>
<tr><td>C1aiii</td><td><u>S</u></td><td>1</td></tr>
<tr><td>C1aiv</td><td><u>U</u></td><td>1</td></tr>
<tr><td>C1av</td><td><u>S and W</u></td><td>1</td></tr>
<tr><td>C1b</td><td>
<table>
<tr><td></td><td>proton</td><td>neutron</td><td>electron</td></tr>
<tr><td>relative mass</td><td><u>1</u></td><td><u>1</u></td><td><u>$\frac{1}{1836}$</u> or <u>$\frac{1}{1840}$</u></td></tr>
<tr><td>relative charge</td><td><u>+1</u></td><td><u>0</u></td><td><u>-1</u></td></tr>
</table>
</td><td>6c-2
3-5c-1
0-2c-0</td></tr>
<tr><td>C1ci</td><td>  </td><td>1</td></tr>
<tr><td>C1cii</td><td>
<table>
<tr><td>isotope</td><td>number of protons</td><td>number of neutrons</td></tr>
<tr><td>carbon-12</td><td><u>6</u></td><td><u>6</u></td></tr>
<tr><td>carbon-14</td><td><u>6</u></td><td><u>8</u></td></tr>
</table>
</td><td>4c-2
2-3c-1
0-1c-0</td></tr>
</table>

C2ai	shows the following food chain added to given food web: **tree → caterpillar → spider → sparrow**	1
C2aii	**carbon dioxide + water** $\xrightarrow[\text{chlorophyll}]{\text{sunlight / light}}$ **glucose + oxygen**	1
C2aiii	This will lead to a **decrease in the woodpecker population**. There will be a **decrease in the population of beetle**, resulting in **lesser food**. OR This will lead to an **increase in the woodpecker population**. A **decrease in the population of beetle larvae will result in** lesser bubul and lesser owl. Hence, there will be **lesser owl to prey** on the woodpecker.	1 1 1 1
C2aiv	**tree → shrew → owl /** **tree → squirrel → eagle /** **tree → squirrel → owl**	1
C2bi	**Sunlight / Sun**	1
C2bii	**Respiration**	1
C2biii	**Parasitism** **Ticks benefit** from **harming the ox** without killing it. / **Ticks harm the ox without killing it**.	1 1
C2biv	**Flow of energy is non-cyclical / one-directional / unidirectional but flow of nutrients is cyclical**. / **Flow of energy is non-cyclical / one-directional / unidirectional but flow of nutrients is not**.	1

C3ai	**Spring balance**	1
C3aii	**Left / ← / Backward**	1
C3aiii	**Move a stationary object / Moves / Move to the right**	1
C3aiv	**Gravity / Gravitational force / Weight / Elastic force**	1
C3bi	Pressure is the **force** exerted **per unit area**.	1
C3bii	Pressure = 9 / (5 x 5 x 4) = **0.09** N/cm^2	1
C3biii	Weight of lady = 50 x 10 = **500 N** Pressure = (500 + 9) / (5 x 5 x 4) = **5.09** N/cm^2 [allow e.c.f]	1 1
C3biv	Pressure will **increase**. This is because **contact area has decreased / is lesser**	1 1
C4ai	**Magnesium**	1
C4aii	**Potassium nitrate**	1
C4aiii	**Water**	1
C4aiv	**Calcium carbonate**	1
C4av	**Carbon dioxide**	1
C4b	pH **7**	1
C4c	red litmus paper: Red litmus paper **turns blue** blue litmus paper: Blue litmus paper **remains blue / remains unchanged / stays the same / does not change colour**	1
C4d	**Feels soapy /** **Tastes bitter /** **Can conduct electricity**	1
C4e	**Neutralisation**	1
C4f	**Lighted splint extinuishes with a pop sound**.	1

C5a	Heat will be transferred from the **hot end /side to the cool end / side**. / Particles of solid are **very closely packed**. Particles near the hot end / side **gain heat energy and converts into kinetic energy / vibrate vigorously / move faster**. They **collide with their neighbouring particles** and **transfer energy** to them.	1 1 1
C5bi	Copper is a **good conductor of heat**, so it can **gain heat faster**. [Reject: lose heat faster]	1
C5bii	Black is a **good absorber of heat / radiation**. [Reject: good emitter of heat/radiation]	1
C5biii	So that the metal sheet **loses heat slowly /** To **minimise heat lost to the surrounding /** To **minimise heat conducted away from metal sheet** [Reject: gain heat slowly]	1
C5biv	The glass sheet **prevents convection current/hotter air above the pipe from rising/water from evaporating**. / The glass sheet helps **keep the air trapped**.	1
C5c	When **water at the bottom is heated, it expands / increases in volume, become less dense and rises**. The surrounding **cooler denser water sinks** to take its place. Cycle repeats to form **convection currents** to heat all water.	1 1 1