*A benchmark in IB and IG tutoring*
*Checkpoint | IGCSE | IB | A levels*
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**BIOLOGY**

**Assignment**

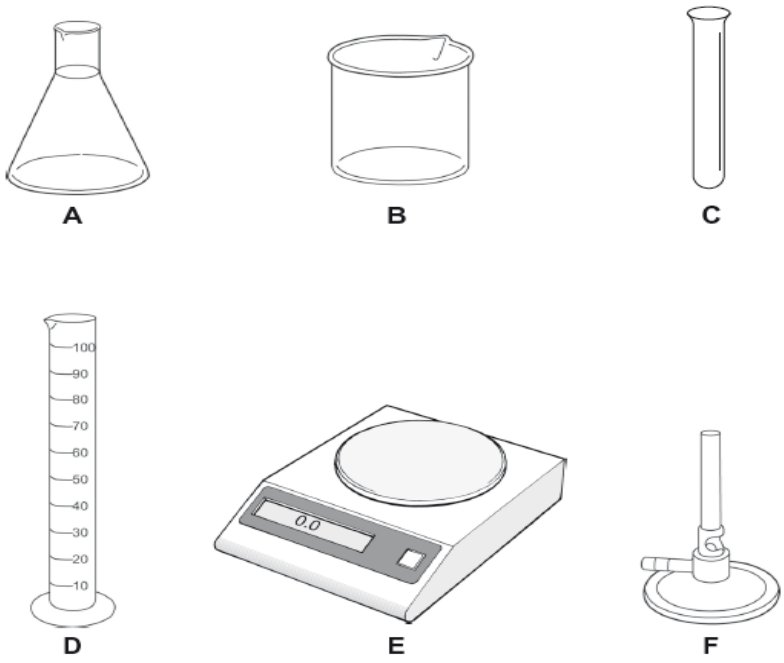
**Secondary Checkpoint**

LAUREATE

CANDIDATE NAME

## States of Matter, Particle Theory, Properties of Matter & Material , Elements & Compounds

1. The diagram below shows six pieces of equipment.




(a) Linda investigates how quickly sugar dissolves in water.

(i) Which piece of equipment does she use to weigh 5 g of sugar?
Tick the correct box.

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

(ii) Which piece of equipment does she use to measure out 90 $cm^3$ of water?
Tick the correct box.

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**(2)**

(b) Linda heats the water in a beaker.

(i) Which piece of equipment shown is a beaker?
Tick the correct box.

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

(ii) Which piece of equipment shown is used to heat water?
Tick the correct box.

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

(c) Linda adds 5 g of sugar to the hot water.

(i) She measures the time it takes for the sugar to dissolve.
The equipment used for timing is **not** shown in the diagram.

What piece of equipment is used to measure the time taken?

_____

(ii) The equipment used to measure the temperature of the water is **not** shown in the diagram.

What piece of equipment is used to measure temperature?

_____

**(4)**

2. Susie cooked sausages on a barbecue.

(a) Fat and water in the sausages changed state.

Draw **one** line from each statement to the correct change of state.
Draw only **two** lines.

| statement | change of state |
|---|---|
| | liquid to gas |
| fat melted | gas to liquid |
| | liquid to solid |
| water evaporated | solid to liquid |
| | solid to gas |

**(2)**

(b) Susie uses charcoal as the fuel for the barbecue.

(i) Which statement is true about all fuels?
Tick the correct box.

| | | | |
|---|---|---|---|
| All fuels are sources of energy. | ☐ | All fuels are black. | ☐ |
| All fuels are made from wood. | ☐ | All fuels are solid. | ☐ |

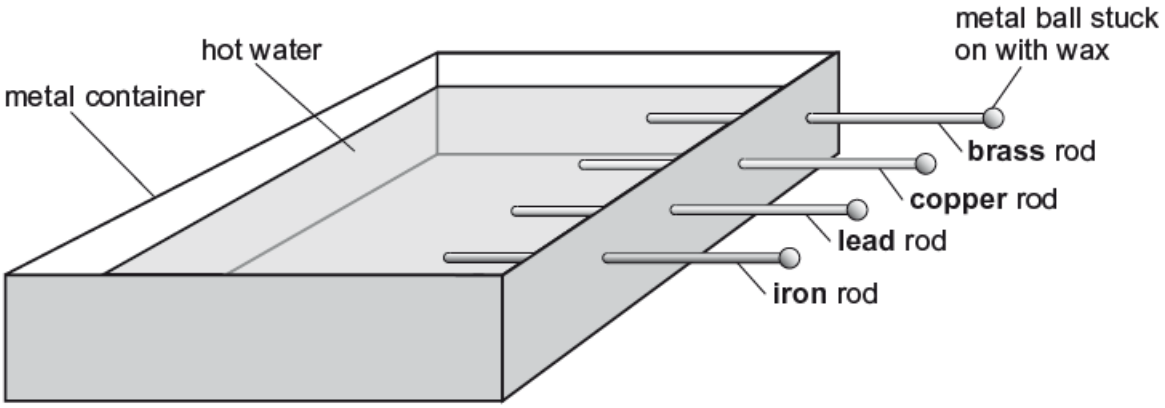
(ii) Which gas in the air is needed for fuels to burn?
Tick the correct box.

| | | | |
|---|---|---|---|
| water vapour | ☐ | oxygen | ☐ |
| nitrogen | ☐ | carbon dioxide | ☐ |

**(2)**

**3**

5. Leanne had four rods, each made from a different metal.
She wanted to find out which metal was the best conductor of heat.
The diagram shows some of Leanne's equipment.




(a) Leanne's results are shown in the table.

| metal rod | time for metal ball to drop off (seconds) |
|---|---|
| brass | 36 |
| copper | 24 |
| lead | 246 |
| iron | 132 |

What measuring equipment did Leanne use to get her results?

_____

**(1)**

(b) Give **two** things Leanne must do to carry out a fair test.

1. _____

2. _____

(c) Which metal in the table was the best conductor of heat?
Tick the correct box.

| | | | |
|---|---|---|---|
| brass | ☐ | copper | ☐ |
| iron | ☐ | lead | ☐ |

(d) Leanne left the rods in the water for a week.
One of the metal rods went rusty.

Which metal rod went rusty?
Tick the correct box.

| | | | |
|---|---|---|---|
| brass | ☐ | copper | ☐ |
| iron | ☐ | lead | ☐ |

**(4)**

**4**

(a) The table below shows information about five elements.

| element | melting point (°C) | boiling point (°C) | conducts electricity | colour |
|---|---|---|---|---|
| A | –7 | 59 | no | brown |
| B | –218 | –183 | no | colourless |
| C | 1535 | 2750 | yes | silvery |
| D | 113 | 445 | no | yellow |
| E | 1083 | 2567 | yes | orange |

(i) Which **two** of these elements are likely to be metals?
Write the letters.

_____ and _____

(ii) Which element in the table is liquid at room temperature?
Write the letter.

_____ **(3)**

(b) What is the chemical symbol for copper?
Tick the correct box.

Cr ☐ Cu ☐ C ☐ Co ☐ Ca ☐ **(1)**

(c) How many atoms of iron and oxygen are there shown in the formulas for FeO and $Fe_2O_3$?

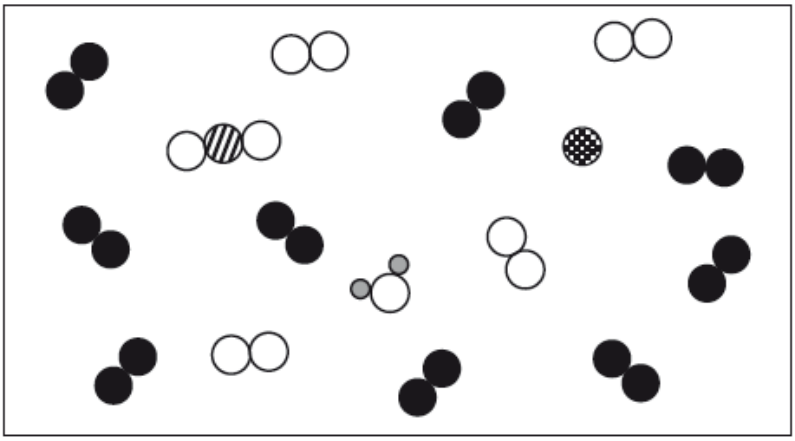
Complete the table below.

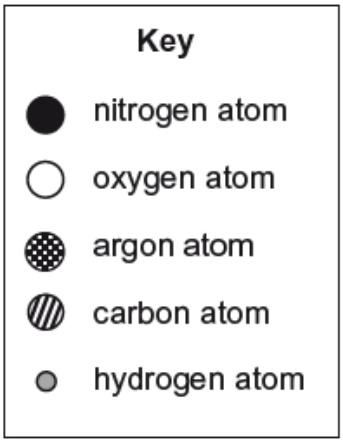
| compound | number of atoms of iron | number of atoms of oxygen |
|---|---|---|
| FeO | | |
| $Fe_2O_3$ | | |

**(2)**

LAUREATE

**5** The diagram below represents the particles found in air.






(a) Complete the following table. Use the diagram and key above to help you.

| name | symbol | chemical formula |
|---|---|---|
| argon |  | Ar |
| nitrogen |  | |
| oxygen | | $O_2$ |
| |  | |

(b) Air is a **gas** at room temperature.
What evidence in the diagram above shows this?

_____ **(1)**

(d) In 1902, the scientist Carl von Linde cooled air to produce **liquid oxygen**.

The table below shows the melting points and boiling points of four substances that are found in air.

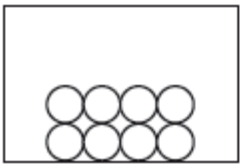
| substance | melting point (°C) | boiling point (°C) |
|---|---|---|
| argon | –189 | –186 |
| oxygen | –218 | –183 |
| nitrogen | –210 | –196 |
| water | 0 | 100 |

Before Linde, scientists tried to produce **liquid air** by cooling it to –190°C.
Give a reason why liquid air was not produced.

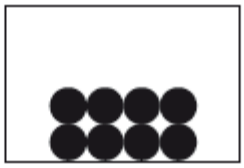
_____

_____ **(2)**

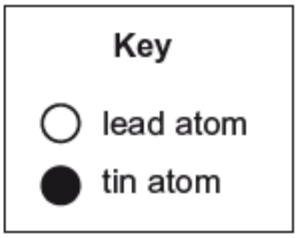
The diagrams below show the arrangement of atoms in solid samples of pure lead and pure tin.



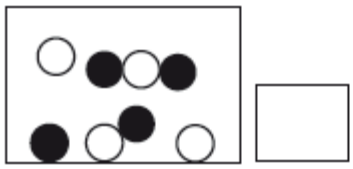
pure lead

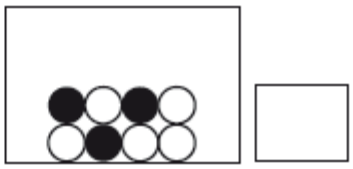


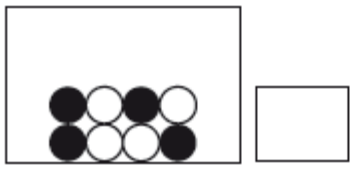
pure tin

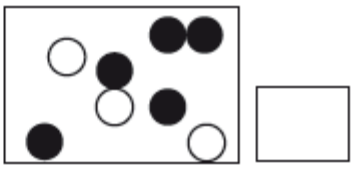



Which box shows the correct arrangement of the lead atoms and tin atoms in a sample of solder that has a melting point of 212°C at room temperature?
Use the table on the opposite page.
Tick the correct box.





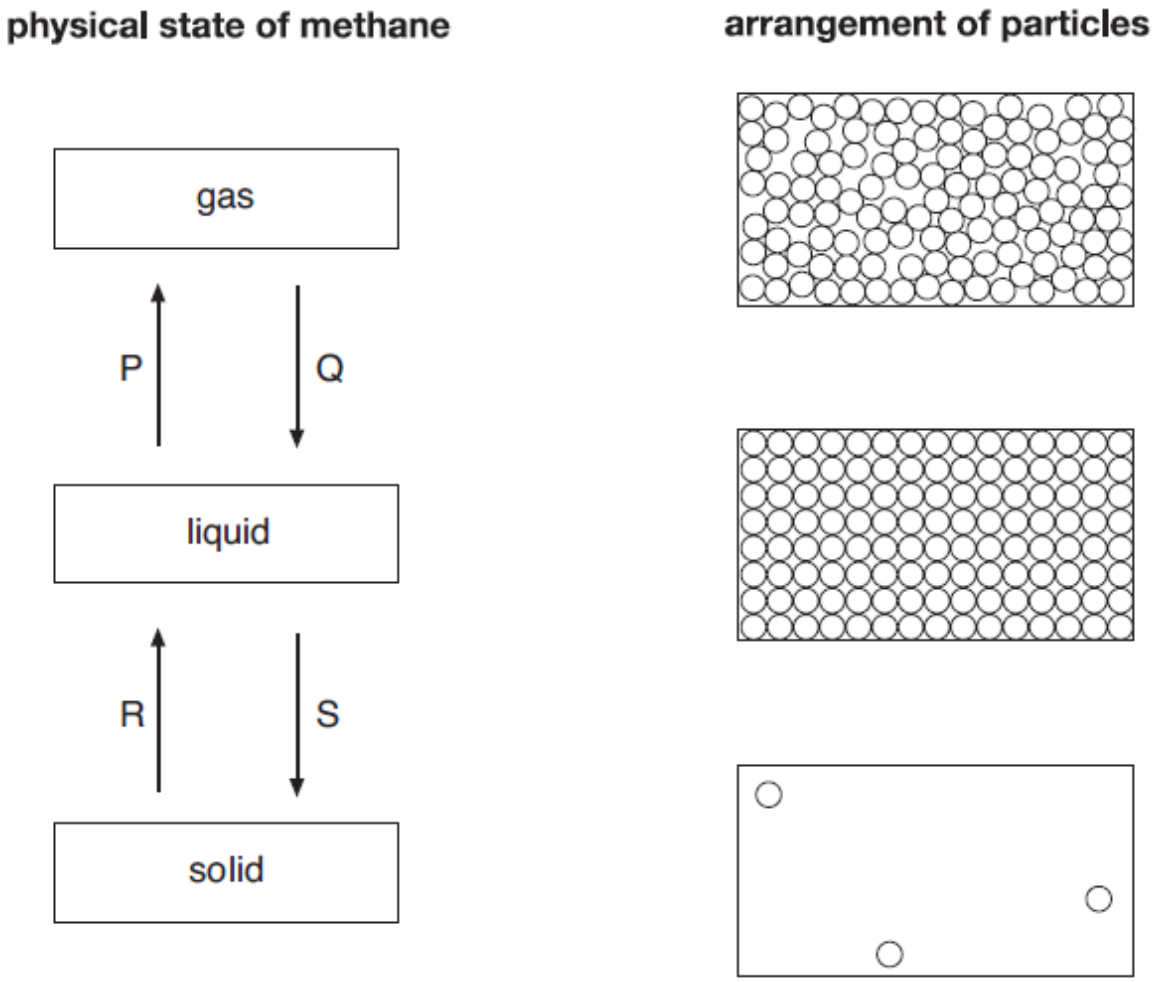




**(1)**

6 (a) Methane can be a gas, a liquid or a solid. In the diagram below, arrows P, Q, R and S represent changes of state.

The boxes on the right show the arrangement of particles of methane in the three different physical states.
Each circle represents a particle of methane.




(i) Draw a line from each physical state of methane to the arrangement of particles in that physical state.
Draw only **three** lines.

*1 mark*

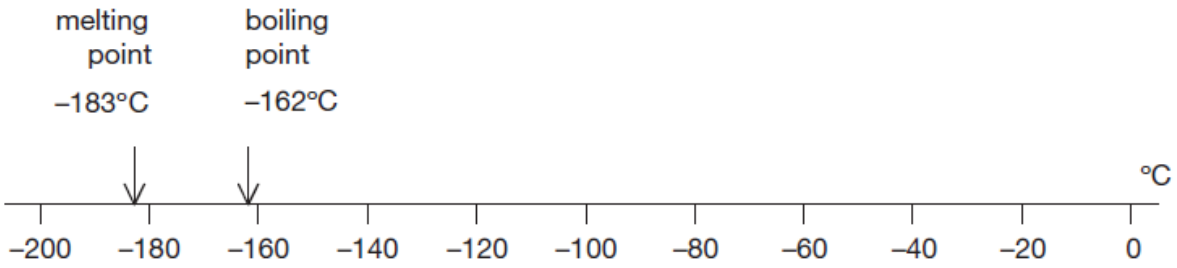
(ii) Arrows P, Q, R and S represent changes of state.
Which arrow represents:

*2 marks*

evaporation? _____

melting? _____

(b) Methane is the main compound in natural gas. The scale below shows the melting point and the boiling point of methane.




Methane has three physical states: solid, liquid and gas.

(i) What is the physical state of methane at –170°C?

*1 mark*

_____

(ii) The formula of methane is $CH_4$. The symbols for the two elements in methane are C and H.

Give the names of these **two** elements.

*2 marks*

element C _____

element H _____

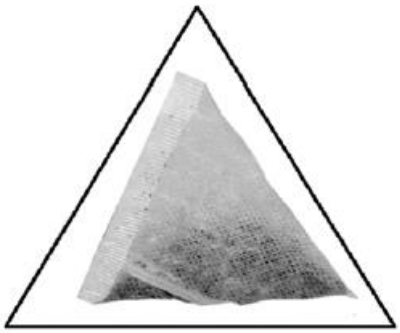
(iii) When methane burns, it reacts with oxygen. One of the products is water, $H_2O$.

Give the name of the other product.

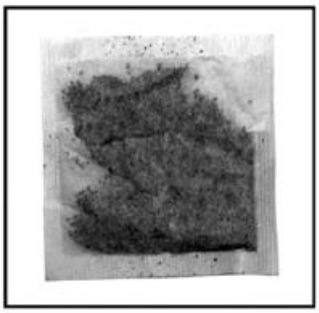
*1 mark*

_____

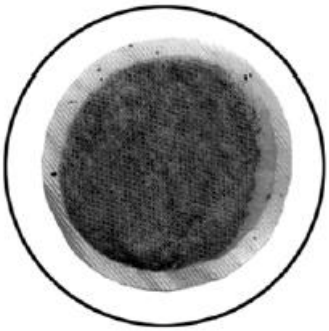
**7** Tea bags are made in different shapes.



triangle



square



circle

Some pupils want to find out which shape of tea bag lets tea dissolve most quickly.
They make two plans for their investigation as shown below.

**FIRST PLAN**

We will use 3 tea bags and 3 beakers.

**SECOND PLAN**

Collect three beakers.
Collect three different tea bags.
Put one tea bag in each beaker.
Add 150 $cm^3$ of water at 65°C.
Keep the temperature of the water the same.
Measure the time taken for the tea to dissolve.
Find out which is the quickest for making tea.

(a) How is the second plan better than the first plan?

_____

_____ **(1)**

(b) Why should they take care when they add hot water at 65°C to the tea bags?

_____

_____ **(2)**

**8** (c) Ben and Vicky drew a cross on some paper. They put each beaker, in turn, over the cross. They poured hot water into the beaker, dropped in the tea bag and watched the water change colour.



To see which shape of tea bag let the tea dissolve the quickest, they measured the time until the liquid was too dark for them to see the cross.

How did the cross help to make their test more accurate?

_____ **(1)**

(d) (i) They recorded their measurements in a table as shown below.

| shape of tea bag | time taken until cross cannot be seen (minutes) |
|---|---|
| triangle | 8 |
| square | 15 |
| circle | 10 |

Which part of their investigation was recorded in the table?
Tick the correct box.

explanations ☐ results ☐

conclusions ☐ plans ☐

(ii) Give the **three** shapes of tea bags in the order in which the tea dissolved.
Use the table above to help you.

quickest _____ _____ _____ slowest **(2)**

(a) The drawings below show that different elements are used for different objects.
Draw a line from each element to the reason for using that element.
Draw only **four** lines.

| element used | reason for using the element |
|---|---|
| | It is lighter than air. |
|  **copper** for the base of a saucepan | |
| | It is a good conductor of heat. |
|  **gold** for a ring | |
| | It is a good conductor of electricity. |
|   **helium** in a balloon | |
| | It stays shiny because it does **not** react with oxygen. |
|  **mercury** in a thermometer | |
| | It is a liquid at room temperature. |

(b) Which of the four elements is **not** a metal?
Tick the correct box.

copper ☐

gold ☐

helium ☐

mercury ☐

**(4)**

**9** Sand and salt (sodium chloride) are both solids.

**(i)** Describe the arrangement and movement of the particles in a solid.

arrangement .....

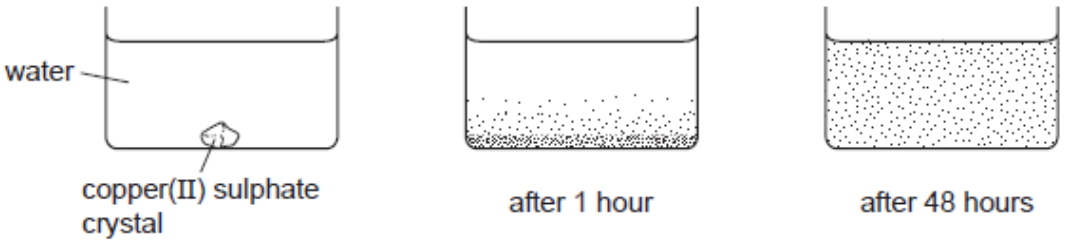
movement ..... [2]

) Describe the arrangement and motion of the particles in liquid stearic acid.

arrangement .....

motion ..... [2]

A student placed a crystal of copper(II) sulphate in a beaker of water.
After one hour the crystal had completely disappeared and a dense blue colour was observed in the water at the bottom of the beaker. After 48 hours the blue colour had spread throughout the water.




**(a)** Use the kinetic particle theory to explain these observations.

.....

.....

.....

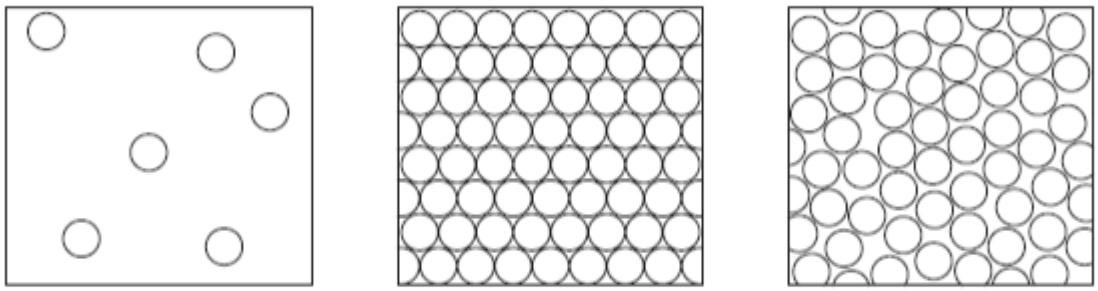
..... [2]

**10** What do you understand by the term *diffusion*?

.....

..... [1]

The diagram shows the arrangement of particles in the three different states of water.



A B C

Which of these diagrams, **A**, **B** or **C**, shows water in a solid state?

..... [1]

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