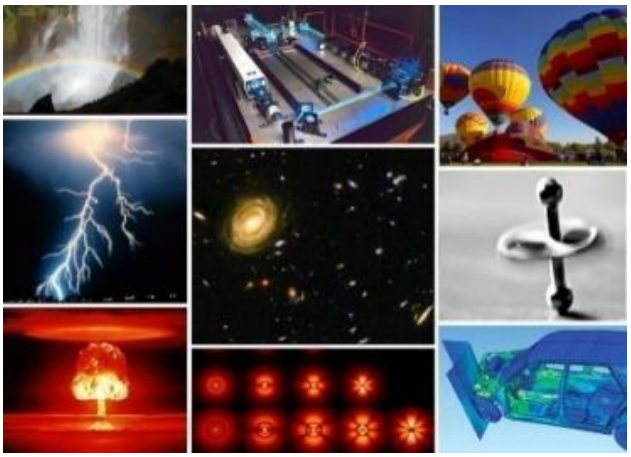
Montsaye ACADEMY
Excellence Resilience Aspiration

KS4 Year 10 Trilogy Homework Booklet

Term 3



Homework 1	**Biology** exam question - complete at home bring to class to be self/peer marked
Homework 2	**Chemistry** exam question - prepare answer at home, complete in class, marked by teacher
Homework 3	**Physics -** exam question – complete at home bring to class to be self/peer marked
Homework 4	**Biology -** exam question - complete at home bring to class to be self/peer marked
Homework 5	**Chemistry -** exam question - complete at home bring to class to be self/peer marked
Homework 6	**Physics -** exam question – prepare answer at home, complete in class, marked by teacher

Homework 1 - Q1.

This question is about cell structures.

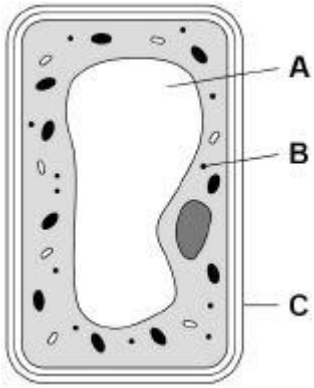
(a) Draw **one** line from each cell structure to the type of cell where the structure is found.

Cell Structure	Type of cell where the structure is found
Nucleus	Prokaryotic cells
Permanent vacuole	Plant cells only
Plasmid	Eukaryotic cells

(2)

(b) **Figure 1** shows a plant cell.

Figure 1



What are the names of structures **A**, **B** and **C**?

Tick **one** box.

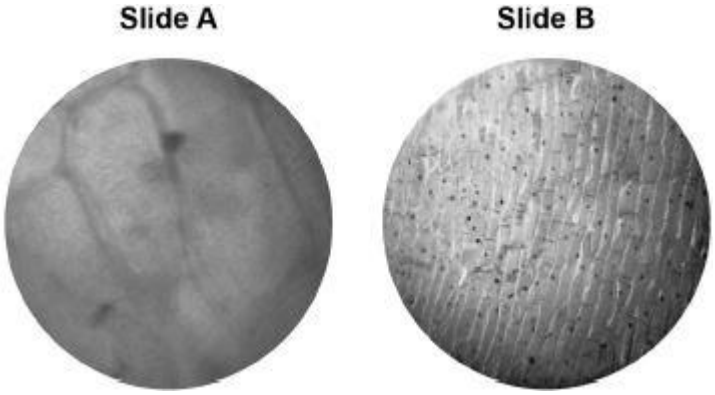
Structure A	Structure B	Structure C	
Chloroplast	Vacuole	Cell wall	☐
Nucleus	Chloroplast	Cell membrane	☐
Vacuole	Mitochondrion	Cell membrane	☐
Vacuole	Ribosome	Cell wall	☐

(1)

A student observed slides of onion cells using a microscope.

Figure 2 shows two of the slides the student observed.

Figure 2



The cells on the slides are **not** clear to see.

(c) Describe how the student should adjust the microscope to see the cells on Slide A more clearly.

(1)

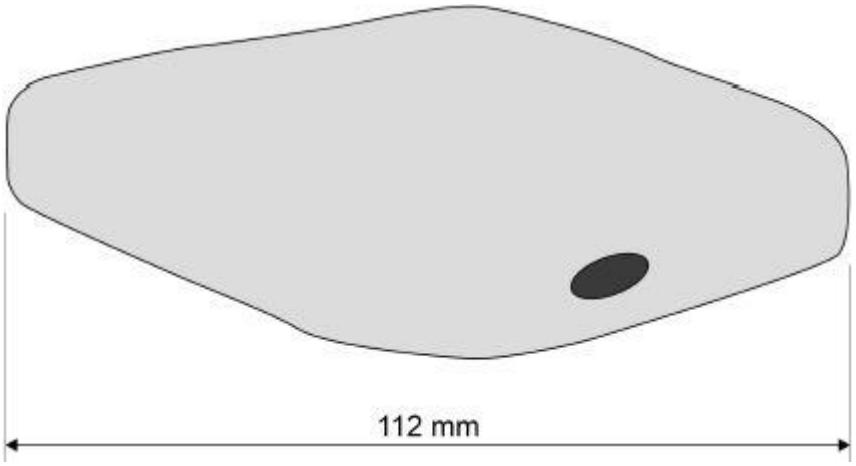
(d) Describe how the student should adjust the microscope to see the cells on Slide B more clearly.

(2)

(e) The student made the necessary adjustments to get a clear image.

Figure 3 shows the student's drawing of one of the cells.

Figure 3



The real length of the cell was 280 micrometres (μm).

Calculate the magnification of the drawing.

(3)

(Total 9 marks)

Homework 2 - Q2.

This question is about the Earth's atmosphere.

(a) Carbon dioxide is a greenhouse gas.

What is another greenhouse gas?

Tick **one** box.

Argon ☐

Methane ☐

Nitrogen ☐

Oxygen ☐

(1)

(b) Greenhouse gases cause global climate change.

Give **two** effects of global climate change.

(2)

(c) 4.1 kg of a plastic, used to make plastic bottles, has a carbon footprint of 6.0 kg of carbon dioxide.

Calculate the carbon footprint of **one** plastic bottle of mass 23.5 g

(2)

(d) Give **one** way that carbon dioxide emissions can be reduced when a plastic bottle is manufactured.

(1)

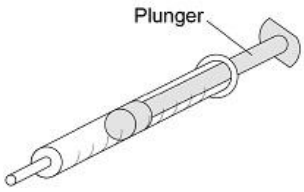
(e) Explain how the percentages of nitrogen, oxygen and carbon dioxide in the Earth's atmosphere today have changed from the Earth's early atmosphere.

(6)

(Total 12 marks)

Homework 3 - Q3.

The diagram shows a syringe containing air.



The gas particles in the syringe are moving.

(a) What happens to the average kinetic energy of the gas particles if the temperature decreases? Tick (✓) **one** box.

The average kinetic energy decreases ☐

The average kinetic energy increases ☐

The average kinetic energy stays the same ☐

(1)

(b) What happens to the average speed of the gas particles if the temperature decreases?Tick (✓) **one** box.

The average speed decreases ☐

The average speed increases ☐

The average speed stays the same ☐

(1)

(c) The syringe plunger is pulled outwards.

Why does air move into the syringe as the plunger is pulled outwards?

Tick (✓) **one** box.

gas pressure outside the syringe = gas pressure inside the syringe ☐

gas pressure outside the syringe < gas pressure inside the syringe ☐

gas pressure outside the syringe > gas pressure inside the syringe ☐

(1)

(d) Write down the equation that links density, mass and volume.

(1)

The mass of air in the syringe is 0.031 g

(e) Which mass is the same as 0.031 g?

Tick (✓) **one** box.

- 0.000031 kg ☐
- 0.00031 kg ☐
- 3.1 kg ☐
- 31 kg ☐

(1)

(f) The volume of the air in the syringe is 0.000025 m^3

Calculate the density of the air inside the syringe.

Give your answer to 2 significant figures.

(3)

(g) A helium balloon is released and rises through the air.

What does this show about the density of the helium in the balloon compared with the density of the surrounding air?

Tick (✓) **one** box.

- The density of helium is the same as the density of air ☐
- The density of helium is less than the density of air ☐
- The density of helium is more than the density of air ☐

(1)

(h) Describe how the water displacement method could be used to determine the density of a small stone.

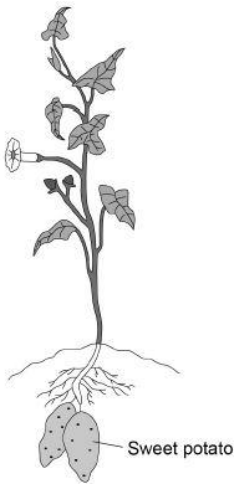
(3)

(Total 12 marks)

Homework 4 - Q4.

The diagram below shows a sweet potato plant.

The sweet potatoes grow underground and can be cooked and eaten.



The table below shows some of the nutrients in cooked sweet potato.

Nutrient	**Mass in grams per 100 grams of cooked sweet potato**
Water	73.83
Protein	2.01
Fat	0.15
Total carbohydrate of which sugars	20.71 6.55
Fibre	3.30

(a) After cooked sweet potato is digested, sugars (including glucose) pass into the blood.

Give **two** other soluble molecules that would pass into the blood after cooked sweet potato is digested.

(2)

(b) Calculate the mass of sugars in 180 g of cooked sweet potato.

Use the information from the table above.

(1)

(c) The sweet potatoes found underground contain starch.

Explain how starch in the sweet potato is produced from carbon dioxide in the air.

(6)

(Total 9 marks)

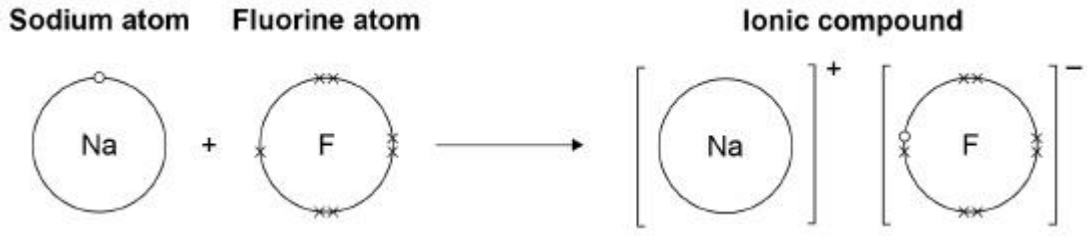
Homework 5 - Q5.

A sodium atom and a fluorine atom react together to form an ionic compound.

Figure 1 shows the electron arrangements in the atoms and the ionic compound.

Only the outer shell electrons are shown.

Figure 1



(a) What is the name of the ionic compound shown in **Figure 1**?

Tick **one** box.

Sodium fluorate ☐

Sodium fluoride ☐

Sodium fluorine ☐

(1)

(b) What type of force acts between the ions in an ionic compound?

Tick **one** box.

Electrostatic ☐

Frictional ☐

Gravitational ☐

Magnetic ☐

(1)

(c) What are **two** properties of ionic compounds?

Tick **two** boxes.

Conducts electricity when molten	☐
High melting point	☐
Low boiling point	☐
Small molecules	☐
Weak bonds between particles	☐

(2)

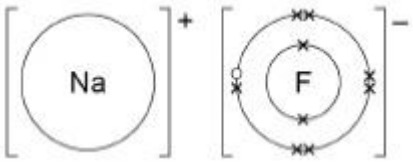
(d) Describe what happens when a sodium atom reacts with a fluorine atom to form an ionic compound.

Use **Figure 1**.

(4)

(e) **Figure 2** shows the structure of the ionic compound formed in the reaction.

Figure 2



Suggest **one** limitation of using **Figure 2** to show the structure of this compound.

(1)

(Total 9 marks)

Homework 6 - Q6.

In a sport called far-leaping, an athlete uses a long pole to cross a river.

Figure 1 shows an athlete far-leaping.

Figure 1

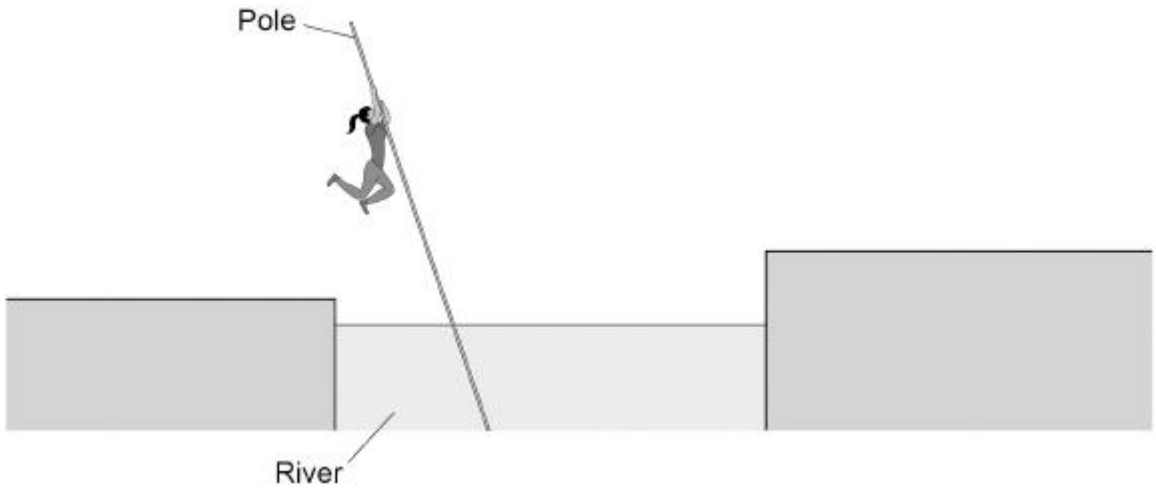
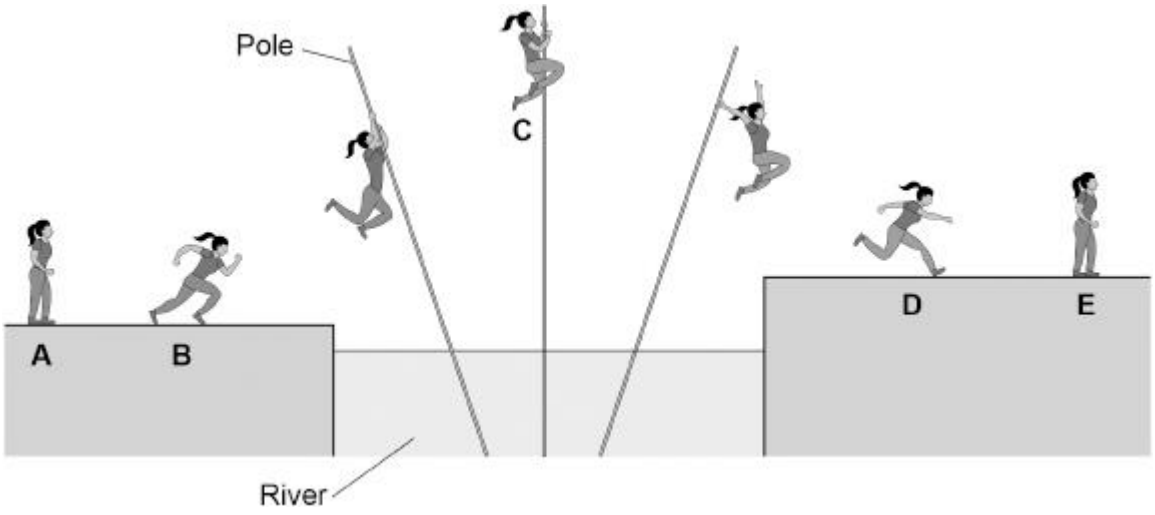


Figure 2 shows the athlete in different stages of far-leaping.

Figure 2



(a) Complete the sentence.

Choose answers from the box.

chemical	**nuclear**	**kinetic**
elastic potential	**gravitational potential**	

Between positions **A** and **B** the athlete speeds up. There is

an increase in the athlete's _____ energy and

a decrease in the athlete's _____ store of energy.

(2)

(b) Between positions **B** and **C** the athlete jumps to the pole and climbs up it.

Which statement describes a change in the athlete's energy between positions **B** and **C**?

Tick (✓) **one** box.

Elastic potential energy decreases.	☐
Elastic potential energy increases.	☐
Gravitational potential energy decreases.	☐
Gravitational potential energy increases.	☐

(1)

(c) The pole falls over from position **C**. The athlete lets go of the pole and lands at position **D**.

The change in height of the athlete between positions **C** and **D** is 3.0 m.

mass of athlete = 50 kg

gravitational field strength = 9.8 N/kg

Calculate the change in gravitational potential energy of the athlete between positions **C** and **D**. Use the equation:

$$\text{change in gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height}$$

(2)

(d) The kinetic energy of the athlete at position **D** is 1600 J.

mass of athlete = 50 kg

Calculate the speed of the athlete at position **D**.

Use the equation:

$$\text{speed} = \sqrt{\frac{2 \times \text{kinetic energy}}{\text{mass}}}$$

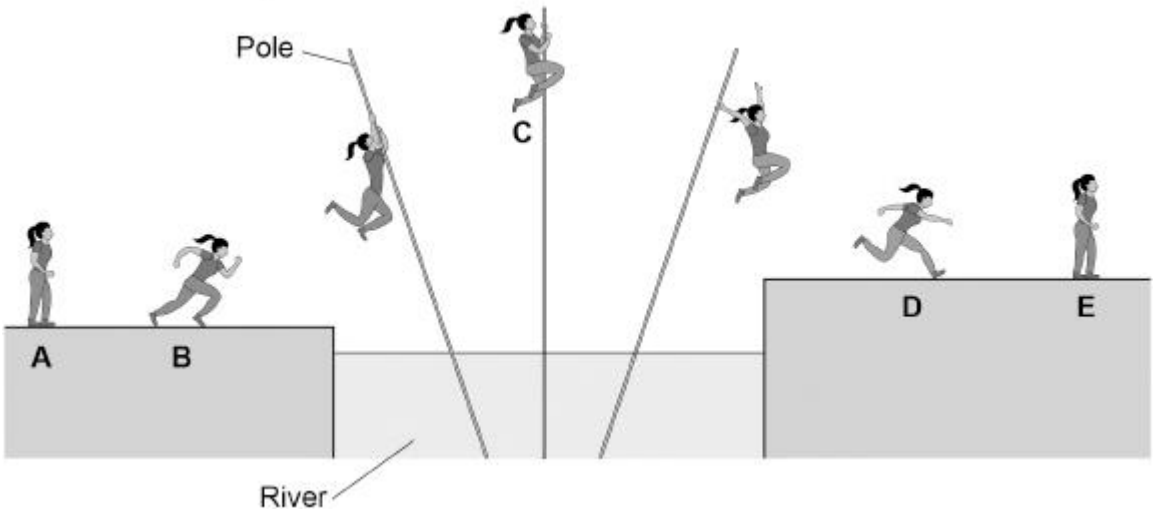
Choose the unit from the box.

m/s	**J/kg**	**J/s**

(3)

Figure 2 is repeated below.

Figure 2



(e) At positions **A** and **E**, the athlete is standing still.

Why does the athlete have less energy in position **E** than in position **A**?

Tick (✓) **one** box.

Energy has been transferred from the athlete to the air.	☐
The air temperature has decreased.	☐
The height of the athlete above the water has increased.	☐

(1)

(f) Athletes have a large power output when they are far-leaping.

What is meant by the power of an athlete?

Tick (✓) **one** box.

The rate at which the athlete transfers energy.	☐
The size of the maximum force exerted by the athlete.	☐
The total energy transferred by the athlete.	☐

(1)

(g) A second athlete crossed the same river by far-leaping.

The second athlete had less power than the first athlete when running between position **A** and position **B**.

Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

less than	**the same as**	**more than**

Two factors that could explain why the second athlete had less power than the first athlete are:

1. The time taken by the second athlete to run between position **A** and position **B** was _____ the first athlete.

2. The work done by the second athlete was _____ the first athlete.

(2)

(Total 12 marks)