Year 9 Cycle 3a

Science Mastery Homework

Name: _____

Class / Advisory: _____

Teacher: _____

Every two weeks, you will complete two short tasks: one comprehension task and one exam style GCSE question

Keep your work neat; complete all answers in this booklet.

You will then mark this in lesson with your teacher so you must ensure it is brought in on the correct day.

How to use this booklet:

- Complete both tasks by the deadline.
- Bring the booklet to Thursday Week 1 lessons to mark the work.
- Record your score on the tracking table.

Weekly Contents	Due Date	Completed	Score
1. Specialised Exchange Surfaces	Thursday 23rd April		
2. Development of the Model of an Atom	Thursday 7th May		
3. Gas Pressure	Thursday 21st May		

Homework 1 – Specialised Exchange Surfaces Due: Thursday 23rd April

Task 1: Read the text and answer the questions below

In living things, many important materials need to move in and out of cells. Oxygen must enter the body so cells can release energy, and waste gases like carbon dioxide must leave. Nutrients from food must also move into the blood so they can be carried around the body. To make this movement happen quickly and efficiently, organisms have **specialised exchange surfaces**.

An exchange surface is a part of the body where substances move from one place to another. This movement usually happens by **diffusion**, where particles move from an area of high concentration to an area of low concentration.

Exchange surfaces are specially adapted to make diffusion faster. One important feature is a **large surface area**. A larger surface means more space for substances to move across at the same time. Another important feature is a **thin surface**. If the surface is thin, substances do not have to travel very far to get through it.

Many exchange surfaces also have a **good blood supply**. Blood carries substances away once they have crossed the surface and brings new substances that are needed. This helps keep the difference in concentration high, which keeps diffusion happening quickly.

Different parts of the body have different exchange surfaces. In the lungs, tiny air sacs help oxygen move into the blood. In the small intestine, tiny finger-like structures called **villi** help digested food move into the bloodstream.

These adaptations allow organisms to get the materials they need for life as quickly and efficiently as possible

1. What is an exchange surface?

2. Name two substances that must enter or leave the body through exchange surfaces.

3. Why does a large surface area help diffusion happen faster?

4. Why is it useful for an exchange surface to be thin?

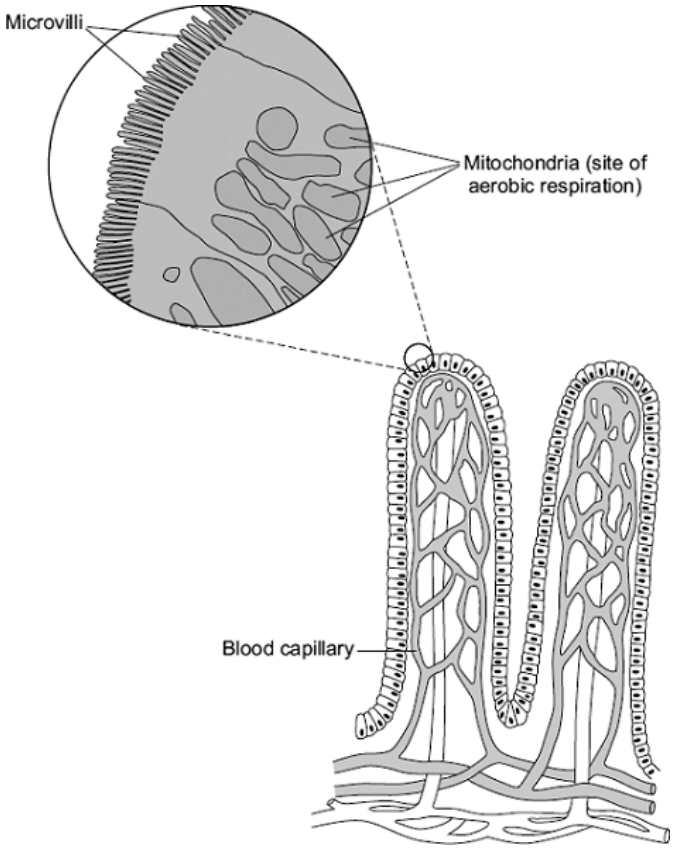
5. How does a good blood supply help an exchange surface work effectively?

6. Where in the body are air sacs used as exchange surfaces?

Task 2:

The villi of the small intestine absorb the products of digestion.

The diagram shows two villi. It also shows parts of some of the surface cells of a villus, as seen with an electron microscope.



Describe and explain how the villi are adapted to maximise the rate of absorption of the products of digestion.

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(Total 5 marks)

Homework 2 – Development of the Model of an Atom Due: Thursday 7th May

Task 1: Read the text and answer the questions below

Everything around us is made from tiny particles called atoms. Scientists have spent many years trying to understand what atoms look like and how they are structured. Over time, new experiments helped scientists improve their ideas. This is called the development of the model of the atom.

In the early 1800s, the scientist John Dalton suggested that atoms were tiny solid spheres. In his model, atoms were like small, hard balls that could not be split into smaller parts. Dalton's ideas helped scientists understand that all matter is made from atoms.

Later, in 1897, J. J. Thomson discovered the electron, a very small negatively charged particle. This showed that atoms were not solid spheres after all. Thomson suggested the plum pudding model. In this model, the atom was a ball of positive charge with tiny negative electrons spread throughout it, like raisins in a pudding.

In 1909, Ernest Rutherford carried out an important experiment called the gold foil experiment. He fired tiny particles at a very thin sheet of gold. Most particles passed straight through, but a few bounced back. This surprising result showed that atoms have a tiny, dense centre called the nucleus. Rutherford's new model showed that most of the atom is empty space with a small positive nucleus in the middle.

Later, scientists discovered that the nucleus contains even smaller particles called protons and neutrons. Electrons move around the outside of the nucleus in shells. This is the model scientists use today.

Scientists continue to test ideas with experiments. As new evidence is discovered, scientific models can change and improve.

1. Who first suggested that atoms were tiny solid spheres?

2. What was the name of Thomson's model of the atom?

3. What experiment did Ernest Rutherford carry out?

4. What surprising result happened in Rutherford's experiment?

5. What did Rutherford discover at the centre of the atom?

6. Name two particles that are found in the nucleus.

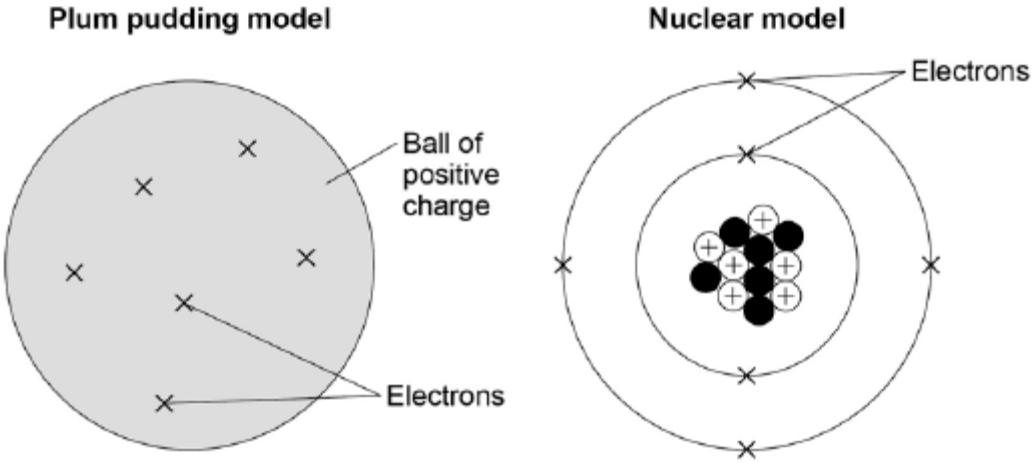
Task 2:

In 1864, atoms were thought to be particles that could not be divided up into smaller particles.

By 1898, the electron had been discovered and the plum pudding model of an atom was proposed.

Figure 2 shows the plum pudding model of an atom of carbon and the nuclear model of an atom of carbon.

Figure 2



Compare the position of the subatomic particles in the plum pudding model with the nuclear model.

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Homework 3 – Gas Pressure Due: Thursday 21st May

Task 1: Read the text and answer the questions below

Gases are made of tiny particles that are always moving. These particles move quickly in random directions and often collide with each other and with the walls of the container they are in. Even though we cannot see these particles, their movement explains many of the properties of gases.

When gas particles hit the walls of a container, they push against the surface. This creates **pressure**. Gas pressure is the force of gas particles pushing against the walls of a container. The more often the particles hit the walls, the greater the pressure becomes.

Temperature has an important effect on gas pressure. When a gas is heated, the particles gain more energy and move faster. Because they are moving faster, they collide with the walls of the container more often and with greater force. This increases the pressure of the gas if the container does not change size.

The number of gas particles also affects pressure. If more gas particles are added to a container, there will be more collisions with the walls. This means the pressure will increase.

The size of the container also matters. If the same amount of gas is squeezed into a smaller space, the particles will hit the walls more often. This increases the pressure. If the container is larger, the particles have more space to move around, so the pressure decreases.

Scientists use these ideas to explain how gases behave in everyday life. For example, gas pressure is important in bicycle tyres, aerosols, and even the air we breathe.

1. How do gas particles move?

2. What happens when gas particles hit the walls of a container?

3. What happens to gas particles when a gas is heated?

4. Why does heating a gas increase pressure in a fixed container?

5. What happens to pressure if more gas particles are added to a container?

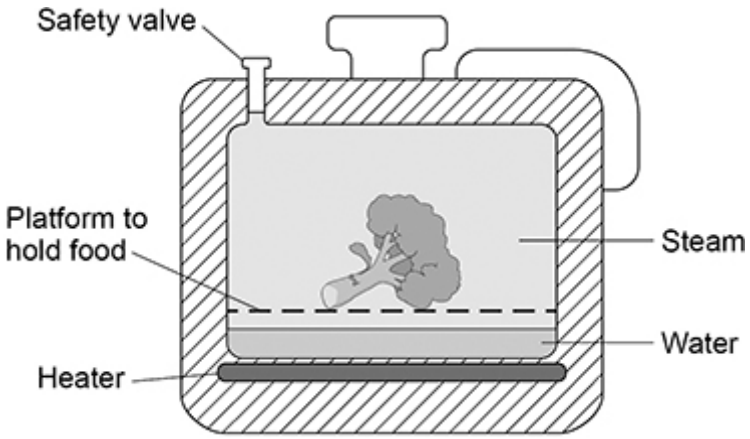
6. Why does a larger container reduce gas pressure?

Task 2:

A pressure cooker is a sealed pot that uses steam to cook food.

Figure 3 shows a pressure cooker.

Figure 3



When the water in the pressure cooker starts to boil:

- the amount of steam in the pressure cooker increases
- the temperature of the steam increases above 100 °C

Explain why these changes make the pressure in the cooker increase.

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