**Year 9**

**PPE - Higher**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Question** | **Topics covered** | **☺** | **😐** | **☹** |
| 1 | Animal and bacteria cellsStructure of the leafMagnification |  |  |  |
| 2 | Osmosis |  |  |  |
| 3 | The digestive system |  |  |  |
| 4 | The heartCoronary heart disease |  |  |  |
| 5 | Group 1 metalsBalancing equationsRelative mass of compounds |  |  |  |
| 6 | The periodic tableAtomic structure |  |  |  |
| 7 | The periodic tableAtomic structure |  |  |  |

**Q1.**

**Figure 1** shows an animal cell and a bacterial cell.

**Figure 1**

****

(a)     Compare the structure of the cells in **Figure 1**.

Complete the sentences.

Choose the answers from the box.

|  |  |  |
| --- | --- | --- |
| **cell membrane** | **cell wall** | **chloroplast** |
| **cytoplasm** |  | **nucleus** |

**Only** the animal cell contains a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**Only** the bacterial cell contains a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**(2)**

**Figure 2** shows a section through a leaf.

**Figure 2**

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(b)     The function of palisade cells is to photosynthesise.

Describe **one** way palisade cells are adapted to carry out their function.

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**(1)**

(c)     Complete **Table 1** to show whether each structure is a tissue, an organ or an organ system.

Tick **one** box for each structure.

|  |
| --- |
| **Table 1** |
| **Structure** | **Tissue** | **Organ** | **Organ system** |
| Leaf |   |   |   |
| Xylem |   |   |   |
| Roots, stem and leaves |   |   |   |

**(2)**

A student observed palisade cells using a microscope.

The microscope had four objective lenses, each with a different magnification.

(d)     Which objective lens should the student use first?

Tick **one** box.

Give a reason for your answer.

|  |  |
| --- | --- |
| ×4 magnification |  |
| ×10 magnification |  |
| ×40 magnification |  |
| ×100 magnification |  |

Reason \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

The student measured the width of 5 different palisade cells at a total magnification of ×400

(e)     Eyepiece lenses are usually ×5 or ×10 magnification.

What combination of eyepiece and objective lenses would give a total magnification of ×400?

Eyepiece lens \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Objective lens \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(f)      **Table 2** shows the student’s results.

|  |
| --- |
| **Table 2** |
| **Cell** | **Width of cell image in mm** |
| 1 | 12 |
| 2 | 13 |
| 3 | 16 |
| 4 | 10 |
| 5 | 11 |

(f)      Calculate the mean width of the palisade cell images.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Mean width = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

**(1)**

(g)     Calculate the real width of a palisade cell.

Use the mean width you calculated in part (f).

Use the equation:



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Real width = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mm

**(2)**

**(Total 11 marks)**

**Q2.**

Osmosis is the movement of water through partially permeable cell membranes.

A group of students investigated the effect of temperature on the rate of osmosis in potato cells. The students used five potato chips all cut to the same size.

**Figure 1** shows one chip.

**Figure 1**

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This is the method used.

1.   Half fill a boiling tube with distilled water.

2.   Heat the water to 25 °C

3.   Place one potato chip in the boiling tube.

4.   Keep the boiling tube and potato chip at 25 °C for 30 minutes.

5.   Repeat steps 1−4 at four other temperatures.

(a)  All of the potato chips gained water by osmosis.

Explain how the students would find out the rate of water uptake by osmosis in each potato chip.

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**(3)**

(b)  One of the students used a knife to cut the potato chips.

Suggest how the student could improve the method of cutting the potato chips to make sure they are all the same size.

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**(1)**

(c)  Another student cut their potato chips as shown in **Figure 2**.

**Figure 2**

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Suggest how the rate of water uptake by osmosis in this investigation was different from the investigation with the chips shown in **Figure 2**.

Give a reason for your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

(d)  The students carried out the experiment at 25 °C, 30 °C, 35 °C, 40 °C and 45 °C

Predict what you would expect the results to show as the temperature increases.

Give a reason for your answer.

Prediction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Reason \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

**(Total 8 marks)**

**Q3.**

The digestive system breaks down food into small molecules.

The small molecules can be absorbed into the blood.

The diagram below shows the human digestive system.



(a)     (i)      Which letter, **A**, **B**, **C**, **D**, **E** or **F**, shows each of the following organs?

|  |  |
| --- | --- |
| Write **one** letter in each box. |   |
| large intestine |  |
| small intestine |  |
| stomach |  |

**(3)**

(ii)     Different organs in the digestive system have different functions.

Draw **one** line from each function to the organ with that function.



**(3)**

(b)     Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

|  |  |
| --- | --- |
| Tick (✔) **one** box. |   |
| The concentration in the blood is higher. |  |
| The concentration in the blood is lower. |  |
| The concentration in the blood is the same. |  |

**(1)**

**(Total 7 marks)**

**Q4.**

**Diagram 1** shows a section through the heart.

**Diagram 1**

****

(a)     Use words from the box to name the structures labelled **A** and **B** on **Diagram 1**.

|  |  |  |  |
| --- | --- | --- | --- |
| **aorta** | **atrium** | **pulmonary artery** | **ventricle** |

**A** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**B** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

(b)     The tissue in the wall of the heart contracts.

(i)      What type of tissue is this?

Tick () **one** box.

|  |  |
| --- | --- |
| muscular |  |
| glandular |  |
| epithelial |  |

**(1)**

(ii)     What does the heart do when this tissue contracts?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(c)     Draw arrows on **Diagram 2** to complete the route taken by deoxygenated blood through the heart.

**Diagram 2**

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**(2)**

(d)     The graph shows the percentage (%) of adults in the UK who have coronary heart disease.

 
Age group

(i)      Look at the graph.

Which group of people is **most** at risk of having coronary heart disease in the UK?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

(ii)     Explain what happens to the heart in coronary heart disease.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(3)**

**(Total 11 marks)**

**Q5.**

This question is about Group 1 metals.

The graph below shows the melting points of Group 1 metals plotted against their atomic number.



(a)  Describe the trend shown by the melting points of Group 1 metals as the atomic number increases.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(b)  Determine the atomic number and melting point of caesium.

Use the graph above.

Atomic number of caesium = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Melting point of caesium = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ °C

**(1)**

Lithium is a Group 1 metal.

(c)  A lithium atom can be shown as 

How many electrons does the **outer shell** of a lithium atom contain?

Tick **one** box.

|  |  |
| --- | --- |
| 1 |  |
| 3 |  |
| 4 |  |
| 7 |  |

**(1)**

(d)  Lithium reacts with oxygen to produce lithium oxide.

Draw **one** line from each substance to the correct description of the substance.

|  |  |  |
| --- | --- | --- |
| **Substance** |   | **Description** |
|   |
|   |   | compound |
|   |
| Lithium oxide |   | element |
|   |
|   |   | metal |
|   |
| Oxygen |   | mixture |
|   |
|   |   | polymer |

**(2)**

(e)  Balance the equation for the reaction of lithium with oxygen.



**(1)**

(f)  What type of bonding is present in lithium oxide?

Tick **one** box.

|  |  |
| --- | --- |
| Covalent |  |
| Ionic |  |
| Metallic |  |

**(1)**

(g)  Calculate the relative formula mass (*M*r) of lithium oxide (Li2O).

Relative atomic masses (*A*r): Li = 7 O = 16

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Relative formula mass = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(2)**

**(Total 9 marks)**

**Q6.**

This question is about the periodic table.

In 1864 John Newlands suggested an arrangement of elements.

**Figure 1** shows the arrangement Newlands suggested.

**Figure 1**

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(a)     Give **two** differences between column 1 in **Figure 1** and Group 1 in the modern periodic table.

Use the periodic table to help you.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **(2)**

(b)     In 1869 Mendeleev produced his periodic table.

Complete the sentence.

Choose the answer from the box.

|  |  |  |  |
| --- | --- | --- | --- |
| **insoluble** | **magnetic** | **undiscovered** | **unreactive** |

Mendeleev left gaps in his periodic table for elements that were

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**(1)**

(c)     How are the elements ordered in the modern periodic table?

Tick **one** box.

|  |  |
| --- | --- |
| Atomic mass |  |
| Atomic number |  |
| Melting point |  |
| Reactivity |  |

**(1)**

**Figure 2** shows part of the modern periodic table.

**Figure 2**

****

(d)     Complete the sentences about the elements in **Figure 2**.

Choose the answers from the box.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **D** | **E** | **G** | **J** |

Sodium is an alkali metal and is represented by the letter \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

An element in group 3 is represented by the letter \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

A gaseous non-metal element is represented by the letter \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**(3)**

(e)     **Figure 3** shows the electronic structure of an atom.

**Figure 3**

****

This element is in the shaded group on **Figure 2**.

Why is this element unreactive?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(1)**

(f)      Name the group of elements in the shaded column on **Figure 2**.

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**(1)**

**(Total 9 marks)**

**Q7.**

John Newlands arranged the known elements into a table in order of atomic weight.

**Figure 1** shows part of Newlands’ table.

                                    **Figure 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Group** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|   | H | Li | Be | B | C | N | O |
|   | F | Na | Mg | Al | Si | P | S |
|   | Cl | K | Ca |   |   |   |   |

(a)     What are the names of the elements in Group 5 of Newlands’ table?

Tick **one** box.

|  |  |
| --- | --- |
| Calcium and sulfur |  |
| Carbon and silicon |  |
| Chlorine and silver |  |
| Chromium and tin |  |

**(1)**

(b)     In what order is the modern periodic table arranged?

Tick **one** box.

|  |  |
| --- | --- |
| Atomic mass |  |
| Atomic number |  |
| Atomic size |  |
| Atomic weight |  |

**(1)**

(c)     Give **two** differences between Group 1 of Newlands’ table and Group 1 of the periodic table.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**(2)**

(d)     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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**(4)**

(e)     Models are used to show the differences between elements, compounds and mixtures.

Which circle shows a model of a mixture?

Tick **one** box.



**(1)**

(f)     **Figure 3** shows a model of carbon dioxide.

**Figure 3**

****

What does each line between the atoms in **Figure 3** represent?

Tick **one** box.

|  |  |
| --- | --- |
| Covalent bond |  |
| Intermolecular force |  |
| Ionic bond |  |
| Metallic bond |  |

**(1)**

**(Total 10 marks)**