Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

(a) The table below contains information on the digestion of two biological molecules.

Complete the below table.

Biological molecule	**Enzyme**	**Name of bond hydrolysed**	**Product of digestion**
Starch			Maltose
Dipeptide	Dipeptidase		

(4)

A student investigated starch digestion by mixing starch with a solution of the enzyme used to digest starch.

The student did a biochemical test for **protein** when starch digestion was completed.

(b) Describe a biochemical test to show the presence of protein.

_____

_____

_____

_____

_____

_____

(2)

(c) The student's test for protein was positive.

Explain why.

_____

_____

_____

_____

_____

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(2)

(d) An enzyme's turnover number (k_{cat}) is the number of substrate molecules converted into product molecules by one enzyme molecule in 1 second. It is determined using this equation.

$$k_{cat} = \frac{\text{Maximum rate of enzyme-controlled reaction / } \mu\text{mol dm}^{-3}\text{ s}^{-1}}{\text{Enzyme concentration / } \mu\text{mol dm}^{-3}}$$

A scientist investigated the action of a protease enzyme. The scientist prepared a reaction mixture with a protease concentration of 0.0118 μmol dm^{-3}. The k_{cat} for the protease is 110 substrate molecules per second.

Use this information and the formula to calculate the maximum rate of the protease-controlled reaction.

Give your answer to **3** significant figures.

Show your working.

Answer _____ μmol dm^{-3} s^{-1}

(2)

(Total 10 marks)

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Q2.

(a) Give **two** roles of phosphate ions in cells.

1 _____

_____

_____

2 _____

_____

_____

(2)

(b) Diseased lungs can cause carbon dioxide to build up in the blood plasma. This leads to an increase in hydrogen ion concentration in the plasma.

Describe the effect this increase in hydrogen ion concentration has on the plasma **and** on the proteins in the plasma.

Do **not** refer to the Bohr effect.

_____

_____

_____

_____

_____

_____

(2)

Scientists measured the concentration of inorganic ions in the cytoplasm of mammalian cells and in the tissue fluid surrounding those cells.

The graph below shows their results.

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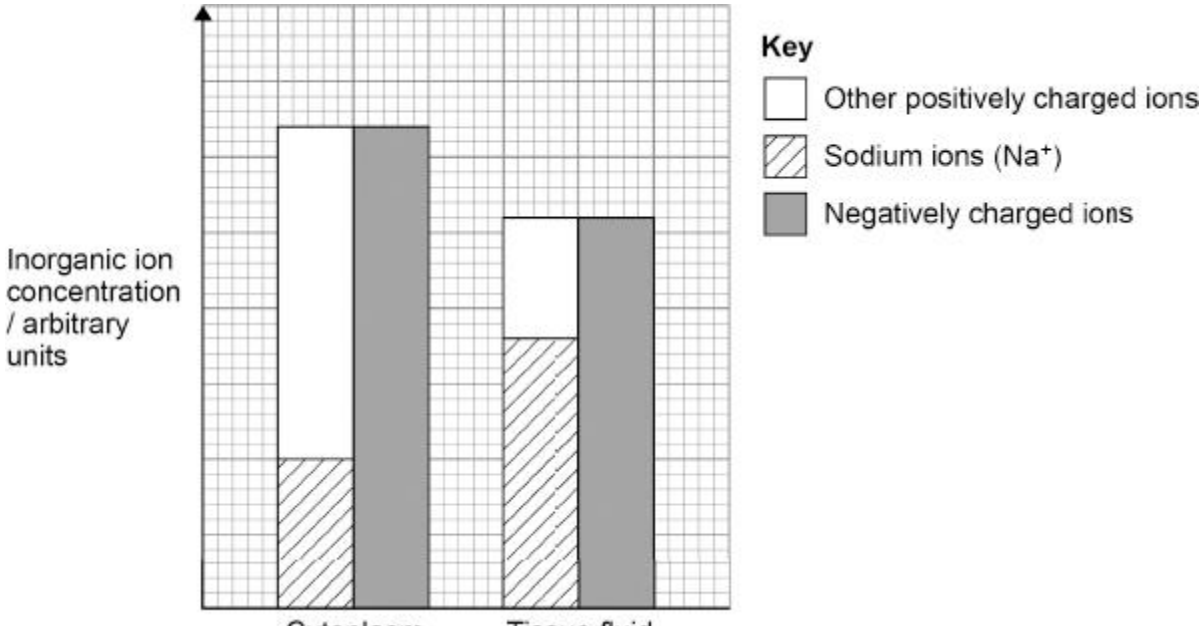

(c) Use the graph above to describe **two** patterns shown in the **total** concentrations of positively and negatively charged ions in the cytoplasm and in tissue fluid.

1 _____

_____

_____

2 _____

_____

_____

(2)

(d) In these mammalian cells, the:

- cell-surface membrane is permeable to sodium ions
- sodium ion concentration does not increase in the cytoplasm over time.

Use this information and the graph above to suggest and explain the ion transport mechanisms involved in the transport of sodium ions.

_____

_____

_____

_____

_____

_____

(2)

(Total 8 marks)

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