**DISGESTION**

**1.** What are the names of the organs labelled I and II in the diagram below?



|  |  |  |
| --- | --- | --- |
|  | **I** | **II** |
| A. | pancreas | liver |
| B. | small intestine | large intestine |
| C. | gall bladder | pancreas |
| D. | esophagus | stomach |

(Total 1 mark)

**2.** *Helicobacter pylori* infection is a cause of stomach ulcers. It affects SLC26A9, which is a membrane protein present in the epithelial lining of the stomach. SLC26A9 takes part in the reversible transport of chloride and hydrogen carbonate ions into and out of the epithelial cells in order to raise the pH at the membrane to neutral levels. Entry of chloride ions into epithelial cells and removal of hydrogen carbonate ions both cause extracellular pH to increase.

To assess the function of SLC26A9, this process was reversed by artificially raising the external pH. The rate of change of extracellular pH was measured with normal epithelial cells and with modified cells with extra SLC26A9. The tests were also performed in the presence of DIDS, an inhibitor of SLC26A9.



[Reproduced with permission of the American Physiological Society from American Journal of Physiology. J Xu et al. 2005. *Cell Physiology*. Vol 289. Pp 493–505.]

(a) Calculate the difference in the rate of decrease of pH between the control cells and the modified cells without DIDS.

..................................... pH min–1

(1)

(b) State the effect of DIDS on the rate of decrease of the extracellular pH.

......................................................................................................................................

......................................................................................................................................

(1)

(c) Scientists hypothesized that *Helicobacter pylori* alters the ability to maintain neutral pH at the epithelial cell surface by inhibition of SLC26A9. Evaluate this hypothesis.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(2)

(d) In further experiments, scientists observed that the levels of mRNA of SLC26A9 increased in epithelial cells when infected by *Helicobacter pylori*. Suggest a possible explanation for this increase.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(1)

(e) Predict, with a reason, the effect of DIDS on stomach pH if given to an experimental subject.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(2)

(Total 7 marks)

**3.** Which of the following parts of the digestive system secrete proteases?

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Stomach** | **Small Intestine** | **Large Intestine** |
| A. | Yes | Yes | Yes |
| B. | Yes | No | Yes |
| C. | Yes | No | No |
| D. | No | No | No |

(Total 1 mark)

**4.** (a) (i) Define *hormones*.

...........................................................................................................................

...........................................................................................................................

(1)

(ii) State **one** type of hormone, giving an example.

...........................................................................................................................

...........................................................................................................................

(1)

(b) Compare gastric juice and pancreatic juice.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(3)

(c) Outline the reason for **one named** substance found in food not being digested and absorbed by humans.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(2)

(Total 7 marks)

**5.** Researchers extracted an enzyme from the human digestive system and tested its activity at different pH values on proteins extracted from the blood of cows. The results are shown in the graph below.



(a) Deduce from where in the human digestive system this enzyme was extracted.

......................................................................................................................................

(1)

(b) Outline the need for enzymes in the digestive system.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(2)

(c) State **one** function of the large intestine.

......................................................................................................................................

(1)

(d) Explain how the structure of the villus is adapted for absorption.

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

......................................................................................................................................

(3)

(Total 7 marks)

**6.** What is the main function of the large intestine?

A. Absorption of water

B. Digestion of fats and proteins

C. Absorption of nutrients

D. Recycling of digestive enzymes

(Total 1 mark)