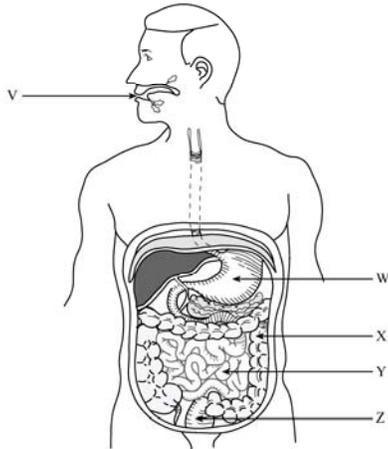


Digestive System

1.

Label the parts on the diagram.

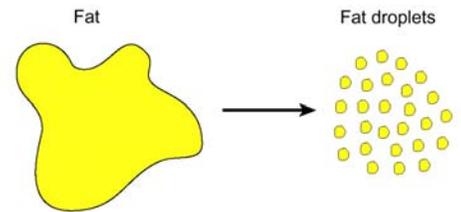


- V: Mouth
- W: Stomach
- X: large intestine
- Y: small intestine
- Z: rectum

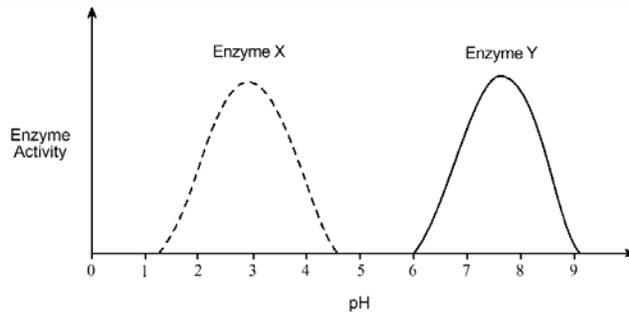
2.

Secretions from which of the following would have the effect shown in the diagram?

- A. liver** B. mouth C. stomach D. large intestine



3.



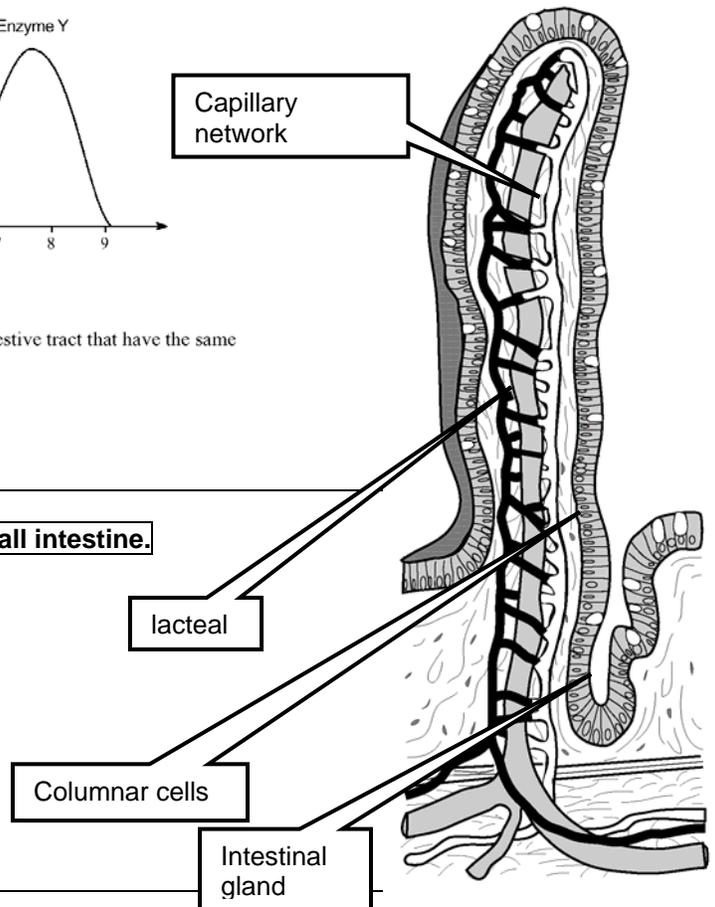
The graph shows the activity of two different enzymes in the digestive tract that have the same substrate. What is enzyme Y?

- A. pepsin
- B. trypsin**
- C. amylase
- D. peptidase

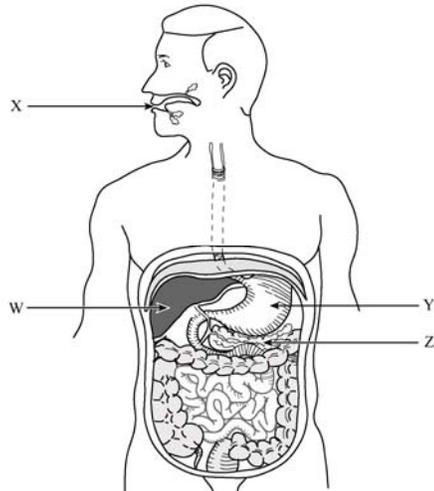
4.

The to the left is found lining the walls of the
 A. colon. B. stomach. C. esophagus. **D. small intestine.**

Label the following on this drawing:
 lacteal, capillary network,
 columnar cells, intestinal gland



5.



Which organ releases an enzyme that digests fats?

- A. W B. X C. Y **D. Z**

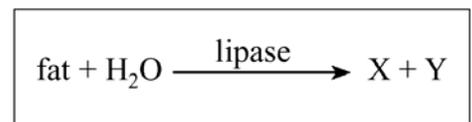
Which organ functions to kill bacteria, store food and digest protein?

- A. W B. X **C. Y** D. Z

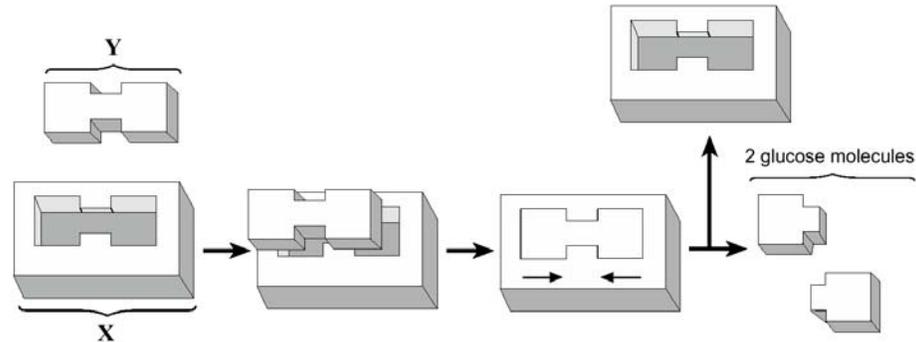
6. In the following reaction, product X could be a(n)



- A. peptide. **B. fatty acid.** C. nucleotide. D. amino acid.



7.

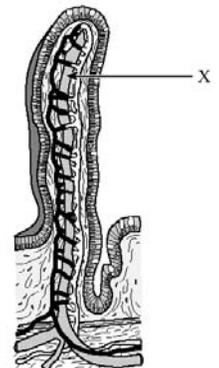


a) The diagrams illustrate a reaction that occurs in the small intestine. Give the specific name for each of the following.

- Molecule X: **(1 mark) maltase**
- Molecule Y: **(1 mark) maltose**

8. Which of the following substances is absorbed into the structure labelled X ?

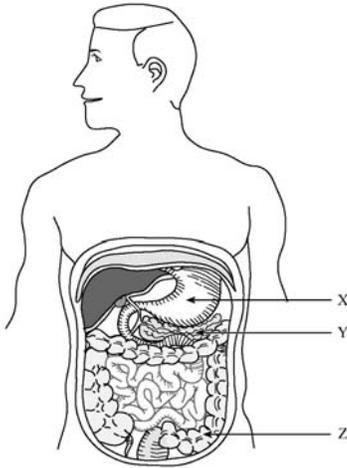
- A. Fat.** B. Urea. C. Glucose. D. Amino acids.



9. The reaction shown below is catalyzed by secretions from which organs?
protein + H₂O → peptides

- A. pancreas and liver B. liver and duodenum **C. stomach and pancreas** D. duodenum and stomach

10.


 a) State **two** functions of structure Z. (2 marks)

- **Reabsorption of water**
- **Formation of feces**
- **Absorb vitamins (or growth factors or some amino acids) that are produced by symbiotic bacteria (E. coli)**

11. Complete the following table for the digestive system. (4 marks: 1/2 mark each)

Source of Enzyme	Enzyme	Substrate
Stomach	PEPSIN	PROTEIN
PANCREAS	Lipase	FATS (LIPIDS)
PANCREAS	Trypsin	PROTEIN (POLYPEPTIDES)
SMALL INTESTINE	MALTASE	Maltose

12. a) The breakdown of some poisonous substances found in the blood occurs in organ

A. W B. X C. Y D. Z

b) Amylase is synthesized at the

 A. nucleus. **B. ribosome.** C. lysosome. D. mitochondrion.

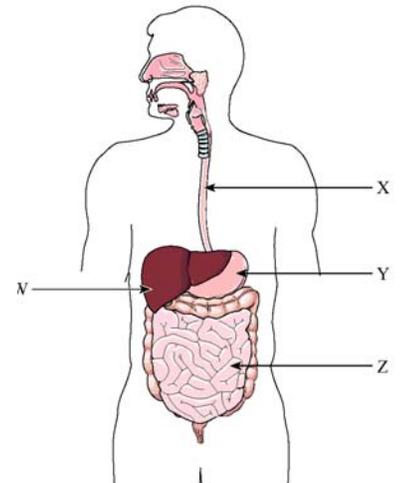
c) A role of water in cells of the human body is to

 A. emulsify fats. **B. act as a solvent.** C. act as an enzyme. D. denature proteins.

d) Which of the following is composed of nucleotides?

 A. Fat. **B. RNA.** C. Starch. D. Protein.

e) Which of the following is a polymer?

 A. ATP. B. Glucose. C. Glycerol. **D. Cellulose.**


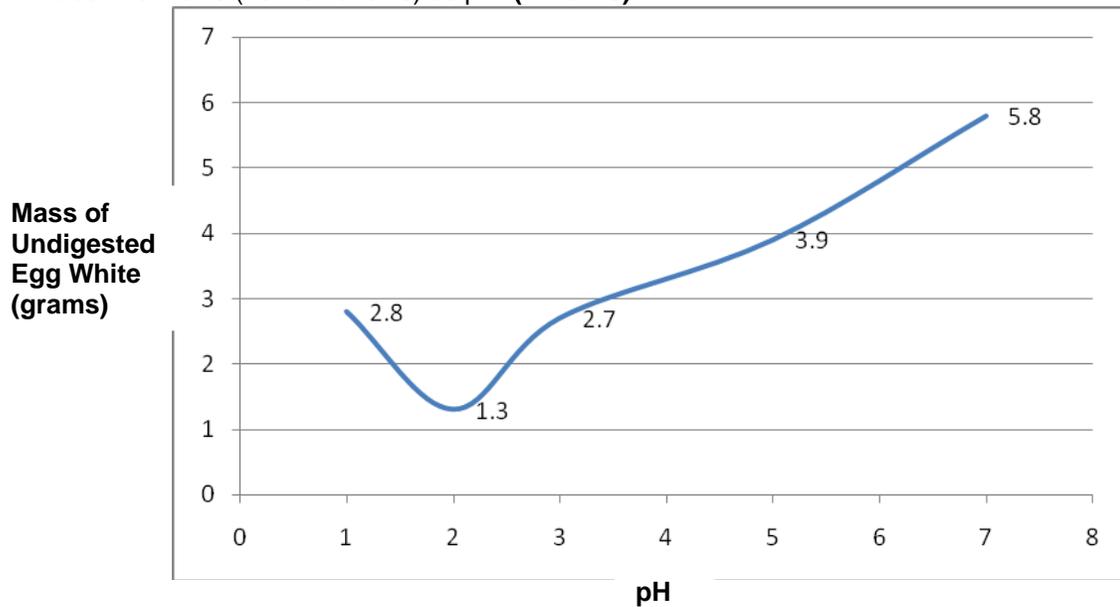
13. An experiment was conducted to determine the effects of pH on pepsin. The following steps were performed:

- Five test tubes were numbered and equal amounts of egg white and water were added to each.
- A buffer was added to each test tube to maintain its pH at the level given in the table below.
- An equal amount of pepsin was added to each test tube.

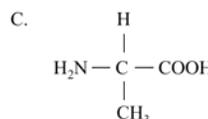
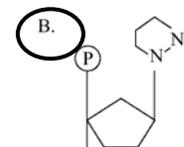
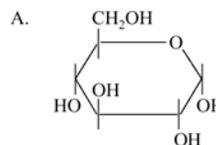
TEST TUBE	pH	MASS OF EGG WHITE (in grams)
1	1	2.8
2	2	1.3
3	3	2.7
4	5	3.9
5	7	5.8

After one hour, the mass of egg white **remaining** in each test tube was determined. The results are recorded below:

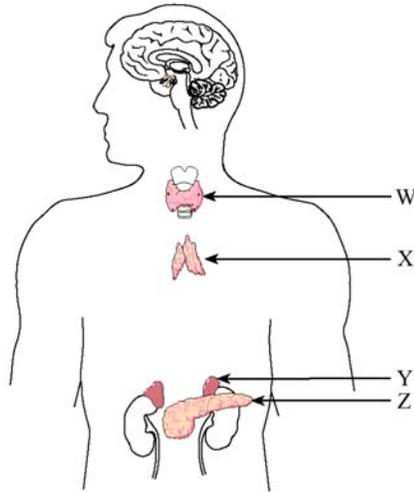
- a) Draw a graph that compares the pH to the amount of egg white remaining in each test tube. Label the x-axis (horizontal axis) as pH. **(2 marks)**



- b) What appears to be the optimum pH for pepsin? **(1 mark) pH = 2**
 c) Explain what happens to pepsin at a pH of 7, and why this affects its activity. **(2 marks)**
- at pH 7 the tertiary shape of pepsin and its active site are altered (denatured)
 - thus affecting its capacity to bind to its substrate and carry out its catalyzed reaction
-
14. a) Name the **three** glands that secrete enzymes that digest carbohydrates. **(3 marks)**
1) Salivary glands 2) intestinal gland 3) pancreas
- b) Name the structure in the small intestine that absorbs the products of carbohydrate digestion. **(1 mark)** **villi**
- c) Where does the body store the excess products of carbohydrate digestion? **(1 mark)** **liver**
-
15. Which of the following would be produced in a reaction catalyzed by enzymes known as nucleases?



16.

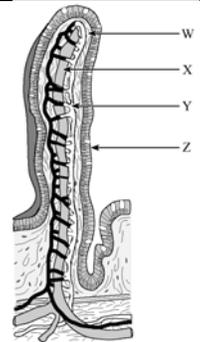


Digested polysaccharides are taken in by cells in the presence of a hormone secreted from the gland labelled

- A. W
 B. X
 C. Y
D. Z

17. In the diagram below, amino acids are transported into structure

- A. W. B. X. **C. Y.** D. Z.



18. The concentration of glucose in the blood was recorded over a set period of time and the following pattern was observed.

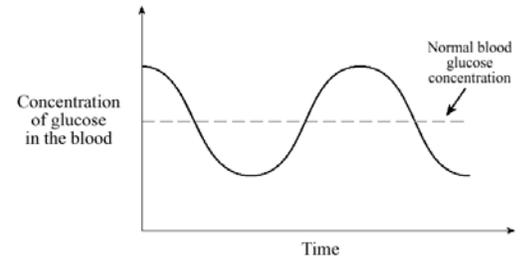
a) Does the above graph represent positive or **negative feedback**? (1 mark)

b) Explain the hormonal response when the i) blood glucose concentration is high. (2 marks)

- **pancreas releases insulin into blood**
- **glucose to be taken into liver cells (and muscle cells) and then convert to glycogen**
- **adipose tissue uses glucose to form fat**

ii) blood glucose concentration is low. (2 marks)

- **pancreas releases glucagon into blood**
- **glycogen is converted to glucose in the liver**



19. In an experiment, three different pancreatic enzymes were placed in separate test tubes. Temperature was maintained at 37° C. Vegetable oil, egg white and starch were added to each test tube and the contents were analyzed after 30 minutes.

a) Test tube A was found to contain glycerol and fatty acids. What was the enzyme added?(1 mark) **lipase**

b) Test tube B contained trypsin. Which product of digestion would it contain? (1 mark) **peptides**

c) Test tube C was found to contain a disaccharide. Identify the enzyme and product of digestion contained in test tube C. (2 marks) **enzyme = amylase; product = maltose**

d) Predict the effect on the speed of the reaction in test tube A if bile were added and give a reason for your answer. (2 marks)

- **bile increases breaks fat droplets into smaller fat droplets**
- **therefore surface area is increased and reaction rate is also increased**

20. The following procedure was conducted to observe the effect of pH on the rate of enzyme activity.
- 10 mL of a starch solution was added to each of 5 lettered test tubes.
 - A different pH buffer was added to each tube resulting in the pH shown in the table below.

Test tube	pH of the solution	Colour of a sample when IKI was added after:			
		1 minute	2 minutes	3 minutes	4 minutes
V	5	black	black	yellow	yellow
W	6	black	yellow	yellow	yellow
X	7	black	black	yellow	yellow
Y	8	black	black	black	yellow
Z	9	black	black	black	black

- An equal amount of a starch-digesting enzyme was added to each tube.
 - Fresh samples were taken from **each tube every minute** and tested with IKI, an indicator that turns from yellow to black when mixed with starch.
- Results are recorded in the table below:

- a) What do the results indicate is present in **all** the test tubes at one minute? (1 mark) **starch**
- b) What new substance is present in test tube **X** at three minutes? (1 mark) **maltose**
- c) Which test tube has the optimal pH for the enzyme? Explain your choice. (2 marks)
- **pH 6 was the optimal pH**
 - **fastest time for all starch to react**

21. Give **one** role for each of the following in the digestive system. (4 marks: 1 mark each)
- a) Pyloric sphincter: **control the movement of acidic chime out of stomach into the duodenum**
- b) Villi: **Increase surface area thus increasing the efficiency of absorption**
- c) Peristalsis: **move food (and digested food) through the digestive system** OR
- **churn food in the stomach (mechanical digestion)**
- d) *E. coli*: **provide vitamins that are absorbed in the large intestine**

22. State SIX functions of the liver. (3 marks: ½ mark each)
- **BILE PRODUCTION:**
 - **NUTRIENT PROCESSING:**
 - **GLUCOSE REGULATION:**
 - **DETOXIFICATION** of poisons
 - **PROTEIN SYNTHESIS** (e.g. fibrinogen and albumin)
 - **.MINERAL AND VITAMIN STORAGE:**
 - **BLOOD WASTE DISPOSAL:**
 - **RECYCLING RED BLOOD CELLS:**
 - **UREA PRODUCTION:**
 - **LIPID PRODUCTION**

23. People suffering from severe obesity may have part of their small intestine removed or a section of their stomach surgically closed. From your knowledge of digestion, explain the theory behind this type of surgery.
- a) Removal of a portion of the small intestine (beyond the duodenum) (3 marks)
- **Major function of SI is absorption of nutrients**
 - **SI is very long to allow for maximum absorption (longer time)**
 - **Therefore removal of part of SI would reduce the amount of nutrients being absorbed by an individual**
- b) Section of the stomach surgically closed. (2 marks)
- **Part of the function of the stomach is storage of food as it is being digested**
 - **Therefore if stomach is reduced less food can be stored and the person will feel full earlier**

-
24. A meal high in fats is consumed. Explain the activity of secretin and CCK (cholecystokinin) and GIP in the digestion of fats. (5 marks)
- **When chyme rich in fat enters duodenum GIP is released into the blood**
 - **GIP inhibits stomach peristalsis ∴ digestion in the stomach is slowed down**
 - **GIP also opposes the secretion of the hormone gastrin ∴ less gastric juices and digestion in stomach is slowed down**
 - **Chyme also causes small intestine to release CCK causing the gall bladder to release bile**
 - **Chyme also causes small intestine to release secretin and together with CCK cause the pancreas to release pancreatic juices that contain the enzyme lipase**
-
25. What is a function of each of the following in the digestive system?
- a) peristalsis (1 mark)
- **see #21**
- b) hydrochloric acid (1 mark)
- **activate pepsinogen**
 - **breakdown connective tissue in meat**
 - **kill bacteria**
- c) large intestine (1 mark)
- **see # 10**
-
26. Describe four ways the small intestine is specialized for its function. (4 marks)
- **SI is long - longer time for absorption of nutrients**
 - **Walls of SI are convoluted (many folds) ∴ increased surface area for maximum absorption**
 - **SI walls contain finger-like structures (villi) ∴ increased surface area for maximum absorption**
 - **Cell on the surface of SI contain microvilli ∴ increased surface area for maximum absorption**
 - **Duodenum contains intestinal glands that produce enzymes that finish off the digestion process**
-