Digestion Systems Worksheet

1. What are the four main stages of food processing?
   - ingestion, digestion, absorption, elimination

2. In digestion, macromolecules are large organic molecules like proteins, polysaccharides, and triglycerides.

3. Polysaccharides are digested into maltoses (disaccharides) and then glucoses (monosaccharides).

4. Fats are digested to glycerol molecules and fatty acid molecules.

5. Proteins are digested to small polypeptides and then amino acid molecules.

6. Nucleic acids are digested to nucleotides.

7. The enzymatic process for digestion is termed chemical digestion.

8. There is a mechanical component to digestion. Why is it preferable to break food items into smaller pieces? To increase its total surface area, and thus make chemical digestion occur more rapidly and easily.

9. What is Extracellular Digestion? Digestion that occurs outside of your body cells; it occurs in cavities, rather than in the cells themselves.

Oral Cavity
10. What enzyme is released into the oral cavity? Salivary amylase

11. What is the substrate for this enzyme? Starch molecules

12. What are the main products from the action of this enzyme? Maltose molecules (disaccharides)

Esophagus
13. What is the function of the Esophagus? To bring food to the stomach (peristalsis)

14. What type of muscle contraction moves the food through the Esophagus? Peristalsis

Stomach
15. What are the functions of the Stomach? To store food, to kill germs, to contribute to mechanical digestion (churning), to contribute to chemical digestion of protein molecules (pepsin)

16. What is gastrin? What affects its release and inhibition? A hormone that signals for the release of more gastric juice. A pH of 3 or 4 (in the stomach) would signal its release, whereas a stomach pH of 1 or 2 would signal its inhibition. Also, stomach stretching and presence of proteins signal its release.

17. What substances are present in Gastric Juice? Pepsinogen (inactive pepsin molecules), HCl, and mucus

18. What are the functions of the acid in Gastric Juice? To kill germs and to activate pepsinogen. In the presence of acid (HCl), pepsinogen changes its 3D shape, such that a new groove forms in its tertiary structure. This new groove is a functional active site. Thus, the pepsinogen molecule is now called pepsin, to signify that it now has a folded shape that allows it to be a functional enzyme.
19. What is Pepsin? An enzyme that chemical digests (hydrolyzes) protein molecules (such as albumin) into small polypeptide molecules.

20. What is the substrate for Pepsin and what are the products of its action? Substrate = protein molecules (such as albumin); products = small polypeptide molecules.

21. What prevents Pepsin from destroying the cells of the stomach? Two reasons – 1. There is a mucus lining 2. The pepsinogen and the HCl are made by different cells of the stomach, so the two don’t combine until they are actually in the stomach cavity, which is lined with mucus.

22. What is the Pyloric Sphincter and what does it do? It’s the valve that controls the flow of acid chyme (acidic, partially-digested food stored in the stomach) from the stomach into the duodenum (first region of small intestine).

**Small Intestine**

23. The first part of the small intestine, the duodenum, receives secretions via ducts from two other glands/organs. Name these structures. The pancreas and the gall bladder (bile originally made in the liver).

24. What substances come from the Pancreas? Pancreatic juice, which contains different enzymes along with bicarbonate ions.

25. What substance(s) come from the Liver? Bile.

26. What enzymes are involved in the digestion of carbohydrates? Amylase, maltase, lactase, sucrase.

27. What enzymes are involved in the digestion of proteins? Pepsin, trypsin.


29. What is emulsification and why is it important? Would you consider this mechanical or chemical digestion? Emulsification is the MECHANICAL digestion of fat molecules. Fats are especially difficult to chemically digest, as fats are hydrophobic (nonpolar) whereas the enzymes that digest fats are hydrophilic (polar). Thus, fats get an extra step of mechanical digestion. Along with chewing, peristalsis, and churning, they are also emulsified. Thus, they have a lot of surface area after these FOUR steps of mechanical digestion, making their subsequent chemical digestion less of a challenge than it would otherwise have been.

30. What structures increase surface area for absorption of nutrients? Folds, Villi, and microvilli.

31. How many cell membranes must the nutrients pass through to get from the inside of the intestine to the bloodstream? 4 (one to get into intestine cell, one to get through other side of intestine cell, one to get into the capillary lining cell, and one to get through into the capillary).

32. Which substances are absorbed into the villus capillary system? Glucose (monosaccharides), amino acids, fatty acids, glycerol, nucleotides.

**Large Intestine**

33. What are the main functions of the Large Intestine? To allow water to get out of the digestive canal, and get into the bloodstream; also, to house bacteria, which help produce vitamins such as vitamin K.