

## HUMAN DIGESTIVE SYSTEM ANSWERS

1. (a) The microscopic units of structure and function that comprise the bodies of organisms (b) Group of similarly specialised cells which together perform certain special functions e.g. muscle tissue, bone tissue, nerve tissue (c) Group of tissues which function together e.g. the heart is an organ composed of muscle blood and nervous tissues and which has the function of pumping blood (d) Group of organs which function together e.g. digestive system is composed of many organs including the stomach and intestines whose functions are digestion and absorption of nutrients.
2. (a) Energy source, structure e.g. cellulose in plant cell walls (b) Tissue growth and repair, energy source, hormones, enzymes, structure e.g. cell membrane component (c) Energy source, structure e.g. cell membrane component, insulating material e.g. whale blubber
3. (a) Glucose - honey, Fructose - fruit, Sucrose - table sugar (b) Pasta, potatoes, flour (c) Meat, eggs, beans (d) Oil, butter (e) Carrots, leafy vegetables (f) Wholemeal bread, some synthesised by gut bacteria (g) Citrus fruits (h) cod liver oil, synthesised by sunlight on skin (i) Green vegetables (j) Green vegetables, synthesised by gut bacteria (k) Milk, cheese (l) Meat (m) Fish
4. No. Carbohydrates are the body's first energy source producing 16.8 kilojoules per gram. Fats and oils are the second source of energy producing 37.8 kilojoules per gram. Proteins are the last energy source of the human body and are only used in under-nourished people, though they produce 16.8 kilojoules per gram.
5. No. The amount of nutrient and energy required by individuals depends on:
  - \*Age - Growing children especially teenagers have a great need for energy for growth; old people require much less as their growth and repair have slowed.
  - \*Sex - Males have a higher metabolic rate and require more energy; females whilst menstruating require more iron; pregnant and lactating women require nutrients and energy in excess of their normal amounts.
  - \*Activity - The more active a person in his/her work or exercise, the more energy is required.

6. Over-nutrition is the intake of too much of a particular nutrient, while under-nutrition is the intake of less than the body's requirement of a particular nutrient. For example, too little sodium causes cramps in muscles and impeded brain function, whereas too much sodium causes high blood pressure. It is possible that a person who eats too much of some foods e.g. pies that contain more than the body's requirements of fats, may be under-nourished as they not be getting sufficient vitamin C from fruit.

7. Carbohydrates may be divided into monosaccharides or simple sugars (e.g. glucose, fructose, galactose), disaccharides or "double" sugars (e.g. sucrose, maltose, lactose), and polysaccharides (e.g. starch, cellulose, chitin). All carbohydrates though are ultimately composed of units called monosaccharides. Proteins are composed of amino acids.

Fats and oils are composed of fatty acids and glycerol.

8. The basal metabolic rate is the amount of energy expended by the body just to keep the body alive, when no food is being digested and no muscular work is being done.

9. Enzymes are protein catalysts which accelerate specific chemical reactions within living organisms.

10. Digestion involves 3 processes - ingestion of food, digestion or mechanical and chemical breakdown of food into smaller units such as monosaccharides, and absorption of these smaller units into the bloodstream.

11. \*Mouth - intake of food, mechanical breakdown of food by chewing, saliva lubricates food, enzymes (amylases) begin the breakdown of starches into disaccharides.

\*Pharynx - the passage at the back of the mouth through which both food and air pass

\*Oesophagus - tube through which food passes to the stomach

\*Stomach - mechanical breakdown of food by churning, killing of bacteria in food by hydrochloric acid, partial breakdown of proteins by enzymes (proteases), absorption of some water, vitamins, salts and alcohol

\*Small intestine - In the first part of the small intestine called the duodenum, enzymes from the pancreas and duodenal wall complete the breakdown of all food.

Specifically, bile (not an enzyme) emulsifies fats to allow the enzymes (lipases) to break them down into fatty acids and glycerol. Amylases complete the breakdown of

carbohydrates into monosaccharides. Peptidases complete the protein breakdown. Acidic contents of the stomach are also neutralised before enzymatic action.

\*Large intestine - water absorbed from faeces, mucus lubricates faeces, some vitamins synthesised by bacteria

\*Rectum - stores faeces

12. (a) proteases and peptidases (b) amylases and lipases

13. Incisors are used to cut flesh and molars are for grinding of plant matter, therefore the animal may be an omnivore.

14. There are muscles lining the walls of the digestive tract which rhythmically contract pushing food along. This is called peristalsis.

15. The “wrong way” is down the trachea. A flap called the epiglottis covers over the entry to the trachea when we swallow so that food travels through the oesophagus.

16. Proteins are macromolecules which must be broken down into smaller amino acids before absorption into the blood. However sodium chloride readily dissolves into very small ions and is easily absorbed.

17. (a) lubrication of food, amylases break down starches into disaccharides (b) Hydrochloric acid kills bacteria, low pH allows proteases to form and begin protein breakdown (c) lipases and enzymes break down fats and proteins (d) emulsification of large fat globules into smaller fat globules (e) circular muscles which regulate passage of food into and out of the stomach, and of faeces out through the anus (f) finger-like projections on the walls of the small intestine to increase absorption of nutrients into the blood and lymph

18. The stomach has a thick lining of mucus which prevents damage by acid. Also the stimulus for the release of acid is the presence of food in the stomach.

19. The medicine contained within powdery tablets may be absorbed in the mouth or stomach. The protein coat on capsules ensures that the capsule contents will be absorbed into the blood at a delayed time after the protein coat is broken down.

20. Large intestine

21. The liver's functions include the production of bile, the conversion of excess blood glucose to stored glycogen, the manufacture of plasma proteins, and the breakdown of some of the body's toxins.

22. Herbivorous animals such as rabbits have a large functional caecum for prolonged digestion of plant matter.