Chapter 4 - Carbohydrates KEY

Define or answer the following:

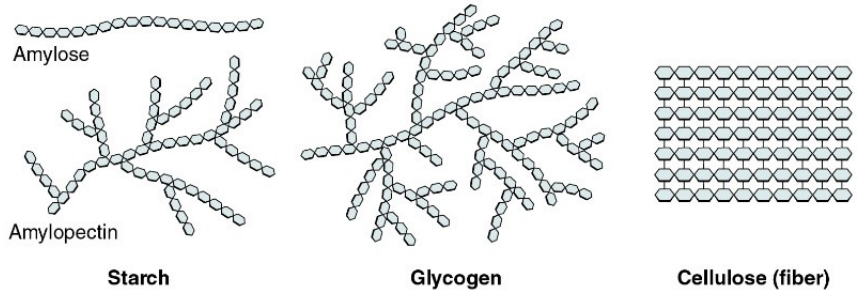
1. **Glucose**: It is the most abundant sugar. It is a monosaccharide found in combination with other sugars.
2. **Starch:** It is a polysaccharide stored in plants. Plants store glucose not as single molecules but as polysaccharides in the form of starch. The two forms of starch are *amylose* and *amylopectin*.
3. **Glycogen:** A polysaccharide stored in animals (the storage form of glucose in animals).
4. **Ketosis:** When we do not eat enough carbohydrates, our bodies seek an alternative source of fuel. Ketosis is the process by which the breakdown of fat during "fasting" results in the production of ketones as an alternative energy source.
5. **Diabetes:** A chronic disease in which the body cannot regulate glucose within normal limits. This metabolic disease is caused when the body cannot produce any or enough insulin, which causes elevated levels of glucose in the blood.

Answer the following questions:

1. **What are monosaccharides?** The simplest of carbohydrates, consisting of one sugar.
2. **List four examples of monosaccharides.** Glucose, fructose, galactose, ribose

3. **What are disaccharides?** A carbohydrate consisting of two sugars joined together.
4. **List three examples of disaccharides.** Lactose, maltose, and sucrose.
5. **Explain what makes up lactose, maltose and sucrose.**
   Lactose = glucose + galactose
   Maltose = glucose + glucose
   Sucrose = glucose + fructose

6. **What is a complex carbohydrate (polysaccharide)?** A nutrient consisting of long chains of glucose molecules such as starch, glycogen, and fiber.
7. **What is dietary fiber?** The non-digestible parts of plants that form the support structures of leaves, stems, and seeds. (Like the plant's "skeleton").
8. **List 6 benefits of dietary fiber.**
   - Reduce risk of colon cancer
   - Promotes bowel health (regularity)
   - Reduce risk of diverticulosis (the condition of having outpocketings in the colon wall)
   - Reduce risk of heart disease
   - May enhance weight loss
   - Reduce risk of type 2 diabetes
9. **Sketch (using little circles to represent glucose molecules) starch, glycogen and fiber.**



10. **Fill in this chart.**

Exercise Intensity	% Energy from Carbs	% Energy from Fat
Light	12.5	87.5
Moderate	45	55
Intense	67	33

11. **How many kcal (Cal) does one gram of carbohydrates contain?** 4 Cal/gram *or* 4 kcal/gram
12. **What is meant by "carbohydrates spare protein"?** If one's diet does not provide enough carbs, the body will make its own glucose from protein.
13. **When our bodies use protein for energy, the amino acids (building blocks of protein) cannot be used for their regular functions. List a few of the functions the proteins can no longer perform.** Proteins cannot be used to make new cells, repair tissue damage, support the immune system, and properly perform any of their other functions.
14. **What could potentially develop if a person was eating an extremely LOW carbohydrate diet for a prolonged period of time and was therefore in or near ketosis for a long period of time?** Our body takes amino acids from the blood, then other tissues such as muscle and the heart, liver and kidneys and can cause irreversible damage to these organs.

15. **Look over Figure 4.10 on p.122. Fill in the table below to explain the three-step pathway that occurs as a result of a spike in blood glucose that would take place after consuming a meal extremely high in glucose. For example eating a huge bowl of pasta or four candy bars.**

HIGH Blood Sugar	Step 1	Step 2	Step 3
Name of Action	Insulin secretion	Cellular uptake	Glucose storage
Brief Description	The pancreas secretes insulin	Insulin travels to tissue and stimulates glucose transporters allowing glucose to enter cells	Insulin stimulates glucose storage. glycogen in muscle and liver cells, triglycerides in adipose tissue

16. **List four health problems that may or may not be associated with a high sugar diet.**
    -Tooth decay
    -Unhealthy blood lipid levels
    -Diabetes and obesity
    -Does not cause hyperactive children*
17. **Explain the difference between type 1 and type 2 diabetes.**
    Type 1 – Little or NO insulin is released from the pancreas. Thus glucose is not taken up by cells.
    Type 2 – Insulin IS released from the pancreas. Cells fail to respond to the insulin and thus glucose remains in blood; i.e. Body cells become resistant to insulin (insulin insensitivity).
18. **Look over figure 4.10 p.122. Fill in the table below to explain the three-step pathway that occurs as a result of a drop in blood glucose that would take place after not eating carbohydrates for a long period.**

LOW Blood Sugar	Step 1	Step 2	Step 3

Name of Action	Glucagon secretion	Glycogenolysis (glycogen splitting)	Gluconeogenesis (glucose making)
Brief Description	The pancreas secretes glucagon	Glucagon stimulates liver to convert glycogen to glucose	Glucagon stimulates liver to breakdown protein into amino acids then glucose.

19. **How many grams of carbohydrates should a "typical" 19 year old consume in 1 day?** 130 g carbohydrates/day
20. **In an "average person" what % of the total energy (calories) should come from carbohydrates?** 45-65%
21. **How many grams of fiber per day does a "typical" female require?** 25 g/day
22. **How many grams of fiber per day does a "typical" male require?** 38 g/day

23. **What makes a grain whole grain? List and in a few words explain each of the three components to whole grains.** Whole grains are kernels that retain all three of their parts.
    1) Bran – outer covering
    2) Endosperm – midsection containing carbohydrates and protein
    3) Germ – base of kernel containing fats
24. **What are artificial sweeteners and, according to research, are artificial sweeteners harmful?**
    These are food additives that provide a sweet taste like that of sugar, while containing significantly less kcal. Not harmful if consumed in moderation. They can be quite harmful if consumed in excess.
25. **Class discussion will be used to answer this question. Consider this statement "artificial sweeteners have zero calories". Draw a flow chart to summarize the leading theory which explains why many people who are on a diet designed to lose weight (that contains lots of artificial sweeteners) often end up gaining weight.**
    Consumption of sweeteners → increased insulin → decreased blood sugar → hunger → increased food consumption → more calories per day → weight gain