STUDY GUIDE - *Ch. 41.1 - An Animal's Diet Must Supply Chemical Energy, Organic Molecules, and Essential Nutrients*

NAME: _____

- **PHYSICALLY PRINT OUT this PDF and HANDWRITE (with a black or blue pen) your answers directly on this PDF.** *Typed or digitally-written work is **not** accepted. Do **not** answer questions on separate paper.*
- **Importantly, study guides are NOT GROUP PROJECTS!!!** *You, and you alone, are to answer the questions as you **read** your assigned textbook. You are **not** to share answers with other students. You are **not** to copy any answers from any other source, including the internet.*
- **Get in the habit of writing LEGIBLY, neatly, and in a medium-sized font.** *AP essay readers and I will skip grading anything that cannot be easily read so start perfecting your handwriting, and don't write so large you can't add all the relevant details and key elaborations in the space provided.*
- **SCAN physical documents in color and with good resolution. Then, upload your final work as PDFs to Archie.** *Avoid uploading dark, shaded, washed-out, sideways, or upside-down scans of homework. Keep completed physical study guides organized in your biology binder to use as future study and review tools.*
- **READ FOR UNDERSTANDING and not merely to complete an assignment.** ***First**, read a section quickly to get an overview of the topic covered. Then, read it a **second** time slowly, paraphrasing each paragraph **out loud** and analyzing every figure. Finally, read it a **third** time as you answer the study guide questions if assigned and start building your memory. Try to write answers out in your own words, when possible, and try to purposefully and accurately use all new terminology introduced.*

1. All animals eat other organisms or parts of organisms. When asked "Why do animals eat?" you might answer "in order to live." However, this would not be a college-level response. At the college-level, specifics are needed. So, what are the **three nutritional needs** all organisms' diets must meet?

    1.

    2.

    3.

2. What is the **chemical energy in high energy organic food molecules** (like lipids, carbohydrates, and proteins) **used for** before it is used to do the mechanical, chemical, and transport work the cell carries out with that chemical energy.

3. In order to engage in biosynthesis, what are the **two main categories of organic molecules that animals must obtain from their diets** so they have the raw material needed to construct other necessary organic (carbon-based) molecules in the body and what necessary resource do these molecules provide the organism with?

    1. **Category of Organic Molecule** = _____

       Provides the Organism with necessary _____

    2. **Category of Organic Molecule** = _____

       Provides the Organism with necessary _____

4. a. What are **essential nutrients**?

    b. For animals, what are the **four categories of essential nutrients**?

    1.

    2.

    3.

    4.

    c. Besides using essential amino acids to make proteins, how else may a cell **uses various essential nutrients**?

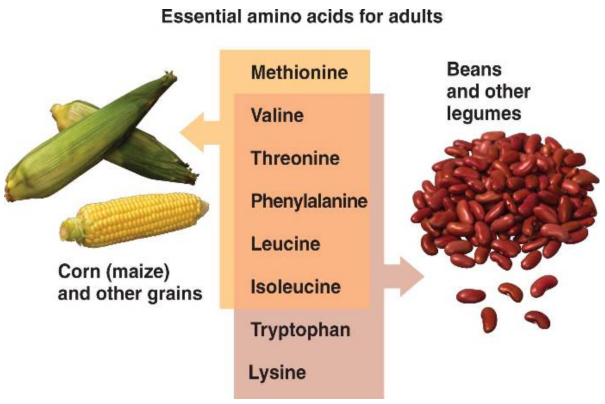
5. a. **How many amino acids are used by all types of organisms to make proteins**?

   b. **Plants and microorganisms (like bacteria) can usually synthesize all 20 amino acids needed from other precursor molecules.** Animals though, cannot synthesize all necessary amino acids. How many of these amino acids are considered **essential amino acids** in the human diet, for example? *(These are amino acids that **must be obtained from the animal's diet** since they cannot be synthesized from other precursor molecules).*

   c. When it comes to humans, why are **proteins obtained from the consumption of animal products "complete?"**

   d. Why could a **vegetarian** face a possible problem with regard to protein synthesis?

   e. What must **vegetarians** do in order to ensure they obtain all the essential amino acids needed for protein synthesis?



6. a. What are **three** examples of necessary molecules built out of **fatty acids** in cells?

   1. _____ 2. _____ 3. _____

   b. Why are some necessary fatty acids in animals also referred to as **essential fatty acids**?

   c. Review Figure 41.2. **Linolineic acid is considered an essential fatty acid** in animals obtains from seeds, grains, and vegetables. What are **two cell products made in cells from linolineic acid**?

   1.

   2.

7. What are **vitamins**?

8. **Review Table 41.1,** which presents a comprehensive list of 13 vitamins required by humans, their dietary sources and functions, and the symptoms of deficiency. Deficiencies in vitamins result in various conditions and diseases.

   a. What **vitamin deficiency leads to beriberi**?

   What are the **symptoms of the disorder known as beriberi**, seen in regions of the world where the diet includes mainly unenriched, processed white rice or where people are consuming or absorbing too little of the particular vitamin in question from their diets?

   What are **good dietary sources of this vitamin**?

b. What **vitamin deficiency leads to scurvy**?

What are the **symptoms of the disorder known as scurvy**, which killed more than millions of sailors between the time of Columbus's transatlantic voyage and the rise of steam engines in the mid-19th century and which still diagnosed occasionally today?

What are **good dietary sources of this vitamin**?

c. What **vitamin deficiency leads to rickets**?

What are the **symptoms of the disorder known as rickets**, uncommon in the U.S. but seen mostly in children who are between 6 and 36 months old who are not exposed to enough sunlight or are not consuming enough of a certain vitamin in their diet?

What are **good dietary sources of this vitamin**?

9. Though vitamins are needed for normal function, vitamin excess can also cause problems. Vitamin **overdoses** are possible!
   a. Which **four vitamins are considered fat soluble**?

   b. Some vitamins are hydrophilic and some are hydrophobic. Which category of vitamin, **water-soluble** or **fat-soluble**, is most likely to result in overdose compared to the other, and *why*?

10. *Think:* Considering what you learned in Ch.8.4 about how enzymes function, why are vitamins only required in very small amounts? *(Check your answer by going to **Ch.41.1 Concept Check Question #2** in Appendix A)*

11. What are **dietary minerals**?

12. **Review Table 41.2.** All minerals are important for good health. Let's look at a few of these more carefully.
   a. Among other functions, **which macromolecule(s) could not get built in your cells if you lacked phosphorus**? *(Take this moment to review Ch.5 and the composition of the monomers needed to construct proteins, carbohydrates, nucleic acids, and various lipids)*

   What are **good dietary sources of this mineral**?

   b. Among other functions, **which macromolecule(s) could not get built in your cells if you lacked sulfur**?

   What are **good dietary sources of this mineral**?

c. What do humans **use calcium for**?

What are **good dietary sources of this mineral**?

d. What do humans **use iron for**?

What are **good dietary sources of this mineral**?

e. What do humans **use iodine for**?

What are **good dietary sources of this mineral**?

13. Excess minerals, like excess vitamins, can be harmful too despite them being necessary. Sodium is **essential** for proper osmoregulation of cells and interstitial fluid and for proper nervous system function. *(F.Y.I., **osmoregulation** refers to an organism's ability to control water levels and solute concentrations in its body fluids. The concentration of the aqueous solutions in the body - blood, interstitial fluid, etc - is controlled so as to keep the solute concentrations the same inside and outside the cells, protecting the cells by preventing too much water from entering or leaving them by osmosis).*

Though sodium is absolutely necessary in the human diet, too much is bad. That's why it is important to read your food labels, which indicate how much sodium you are consuming in that food source and what percentage of your daily suggested intake that comprises. What is a possible **consequence of consuming excess table salt**?

*(Remember what you know about **osmosis**. If the ion concentration in your blood remains too high, your blood becomes slightly hypertonic and water will slowly diffuse from your interstitial fluid into your blood vessels while less water will diffuse out of your blood into urine in your kidneys, increasing the volume of blood in your blood vessels, which means there is more pressure on your blood vessel walls than there ought to be = You suffer from hypertension)*

14. Organisms diets vary by species. What does it mean that an organism is an…

Herbivore:

Carnivore:

Omnivore:

15. a. What can result from a diet that leads to **too little absorption of essential nutrients or too little acquisition of necessary chemical energy**?

b. What is the **most common essential nutrient deficiency seen in the human population**?

16. a. **Malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.** A **lack** of nutrients is called undernutrition or undernourishment while a **surplus** of nutrients causes overnutrition or overnourishment. What **events start to occur in the body of an animal when it fails to take in enough chemical energy for doing work**?

b. What are **four common causes of undernourishment in human populations**?

17. In the U.S. certain foods are supplemented (enriched) with certain vitamins or minerals to prevent certain disorders that would be more prevalent otherwise. **Table salt is often enriched with iodine,** for example, since iodine is necessary for making hormones that **control metabolism** (such as cellular respiration rates). What **vitamin is added to enriched grain products like breads, cereals,** and other foods in the U.S., which in too low dietary quantities could cause **neural tube deficiencies in fetuses** and, thus, babies?

18. *Think:* If a zoo animal is eating ample food, but still shows signs of malnutrition, how can a researcher determine which nutrient is lacking in its diet? *(Check your answer by going to **Ch.41.1 Concept Check Question #3** in Appendix A)*