

**EVPP 110 Lecture
Exam #1 Study Questions
Fall 2003
Dr. Largen**

These study questions are meant to focus your study of the material for the first exam. The absence here of a topic or point covered in lecture means that it won't be on the exam. The presence here of a topic or point covered in lecture does not guarantee that there will be a question about it on the exam. There are many more "study questions" here than there will be questions on the exam. Frequently, a single multiple choice question on the exam will require an understanding of many "study questions" from this list.

An "answer sheet" to go with these questions is not provided. **The answers to these questions have been presented in the class lectures, class activities and the lecture notes posted on the website.** You should work through these questions and attempt to answer them as you go. If you encounter a question that you cannot answer, you should search for the answer in your notes. You will notice that, often, several of these questions are asking basically the same thing but from a slightly different angle. This is done to ensure that your understanding of the material goes beyond the simple level of being able to restate a definition. Simply memorizing definitions will not be sufficient to do well on the exam. The exam will include questions that ask you to apply concepts, such as determining the electron placement in an atom when you are given the atom's atomic number.

Administrative Introduction & Chapter 1: Environmental Interrelationships - Introduction

- What are some examples of disciplines into environmental science?
- What is meant by the term "environment"?

Introduction to Environmental Science and the Scientific Method?

- What is the definition of "environmental science"?
- What is "environmental sustainability"?
- What is science?
- What is the "scientific method"?
- What are the steps of the scientific method?
- What is a "hypothesis"?
- Must a hypothesis be "testable"?
- What is a scientific "theory"?
- What is a scientific "law"?
- Can the process of science prove a hypothesis to be true?

Matter & Energy: Structure of Matter and Chemical Bonds

- What is matter?
- What is mass?
- What is the relationship between mass and weight?
- What are the three states (phases) in which matter exists on earth?
- What is the difference between a liquid, a solid and a gas?
- What is an element?
- Which four elements make up ~96% of the human body?

- What is a molecule (or compound)?
- What is the chemical (or molecular) formula of a compound?
- What is the structural formula of a compound?
- What is an atom?
- What is the relationship between an atom and an element?
- What are the three main subatomic particles of which atoms are made?
- What is the nucleus of an atom composed of and where is it located?
- What is a proton, what is its charge, what is its mass, where in the atom is it located?
- What is a neutron, what is its charge, what is its mass, where in the atom is it located?
- What is an electron, what is its charge, what is its mass, where in the atom is it located?
- What are electron orbitals (or energy shells)?
- What is the atomic number of an element?
- What is the atomic mass of an element?
- Given the atomic number of element, how would you determine the number of protons and electrons it has?
- Given the atomic number and atomic mass of an element, how would you determine the number of neutrons it has?
- What is an isotope?
- What is the normal net charge of an atom and why?
- What is an ion and how/why does it form?
- What is an anion?
- What is a cation?
- Why is the arrangement of electrons in their orbitals key to the chemical behavior of atoms?
- How does the energy associated with electrons closer to the nucleus compare to that of electrons further from the nucleus?
- How many electrons can be accommodated in the first, innermost electron shell?
- How many electrons can be accommodated in the 2nd, 3rd, and 4th electron shells?
- Given the atomic number of an element, how would you determine the number of electron shells and the arrangement of the electrons in them?
- What is a general characteristic of a "reactive" element relative to the arrangement of its electrons?
- What is a general characteristic of a "un-reactive" element relative to the arrangement of its electrons?
- What are the three categories of chemical bonds discussed?
- Which two categories of bonds are considered "strong"?
- Which category of bond is considered "weak"?
- What is a covalent bond?
- What is the difference between a polar and nonpolar covalent bond?
- What is an ionic bond?
- What is a hydrogen bond?
- What is a single covalent bond, double covalent bond, triple covalent bond?
- Does the formation of a bond require an input of energy or result in a release of energy?
- Does the breaking of a bond require an input of energy or result in a release of energy?
- What is electronegativity?
- What causes the formation of partial charges in compounds with an electronegative atom?
- What causes the formation of "poles" in polar molecules?

- What role do polar molecules play in the formation of hydrogen bonds and why?
- What do all chemical reactions involve?

Matter & Energy: Properties of Water, pH, Chemical Reactions

- What are the main reasons water is considered so important to life?
- What is the chemical structure of water?
- Why is water a stable molecule?
- Why is water considered a polar molecule?
- Which atom in the water molecule is the most electronegative?
- What are the unusual properties of water that contribute to the special roles it plays in life?
- Why do water molecules form hydrogen bonds with other water molecules?
- What is cohesion?
- What is adhesion?
- What is surface tension?
- What is capillary action?
- What are some examples of how cohesion, adhesion, surface tension and capillary action help with processes in living systems?
- What is heat?
- What is temperature?
- Why does water have a great ability to resist temperature change?
- What role does water's hydrogen bonds play in its ability to resist temperature change?
- What role does water's hydrogen bonds play in evaporative cooling?
- What is density?
- How does the density of water change as temperature decreases?
- Is water more or less dense as a solid than as a liquid and why?
- Why does solid water float on liquid water?
- If ice did not float, what would be the consequence to life on earth?
- What is a solution?
- What is a solvent?
- What is a solute?
- What ions are produced when water molecules dissociate?
- Why does a crystal of salt dissolve in water? In this scenario, which substance is the solute, which is the solvent?
- What is the relationship between the terms acid, base and pH scale to the concept of the dissociation of water molecules?
- What is an acid?
- What is a base?
- What is a neutral substance?
- Which numbers on the pH scale correspond to acid, base and neutral?
- What is a buffer?
- Which is more acidic, a pH of 1 or a pH of 5?
- Which is more basic (or alkaline), a pH of 12 or a pH of 8?
- What is acid precipitation?
- What are chemical reactions?
- What are the reactants in a chemical reaction and where are they located in a chemical equation?

- What are the products in a chemical reaction and where are they located in a chemical equation?
- In a chemical reaction, must the number and type of atoms on the right side of the equation be the same as on the left side of the equation?
- Can chemical reactions proceed in both directions?
- What does it mean to say that a chemical reaction is at equilibrium?

Matter & Energy: Thermodynamics, Enzymes, Membranes, Diffusion

- What is energy?
- What is kinetic energy?
- What is potential energy?
- What are examples of the many forms in which energy exists?
- What is chemical energy?
- What is heat?
- Why is heat one of the most convenient ways to measure energy?
- What is thermodynamics?
- What is the First Law of Thermodynamics?
- What is the Second Law of Thermodynamics?
- What is entropy?
- What is an endergonic reaction?
- What is an exergonic reaction?
- What is energy coupling?
- What molecule powers nearly all forms of cellular work?
- What is the ATP cycle and what role does it play in fueling the work of cells?
- What is the energy of activation?
- What is an enzyme?
- How does an enzyme help a reaction proceed?
- In an enzyme catalyzed reaction, what is the substrate?
- In an enzyme catalyzed reaction, what is the active site?
- Does an enzyme contribute raw materials to a reaction it catalyzes?
- Does an enzyme contribute energy to a reaction it catalyzes?
- How is an enzyme affected by its physical environment?
- What are the three major categories of factors that affect enzyme activity?
- How does a competitive inhibitor interfere with enzyme activity?
- How does a noncompetitive inhibitor interfere with enzyme activity?
- What is a plasma membrane?
- Do all types of cells have a plasma membrane?
- What is meant by the term "selectively permeable"?
- What is the main type of molecule that makes up the plasma membrane?
- Why does the structure of phospholipids make them well-suited to their role in membranes?
- What is diffusion?
- Does diffusion require an input of work?
- What is passive transport?
- What is osmosis?
- What role do concentration gradients play in diffusion, passive transport, osmosis?
- What is the definition of hypertonic (or hyperosmotic)?

- What is the definition of hypotonic (or hypoosmotic)?
- What is the definition of isotonic (or isoosmotic)?
- What is active transport?
- Does active transport require an input of energy?

Matter & Energy: Chemistry of Life

- What is an organic molecule?
- How prevalent is carbon in the molecules of living organisms?
- How many covalent bonds can a carbon atom form with other atoms and why (in terms of its electron arrangement)?
- Can carbon atoms form covalent bonds with other carbon atoms?
- What shapes can carbon chains form?
- What is a hydrocarbon?
- Why is there a great deal of energy associated with hydrocarbons?
- What is an isomer?
- What is a structural isomer?
- What is a stereoisomer (geometric isomer)?
- What is meant by a carbon "skeleton" or carbon "core"?
- What is meant by a functional group?
- Why are biological macromolecules called "macromolecules"?
- What are the four main categories of biological macromolecules?
- How are biological macromolecules synthesized?
- How are biological macromolecules broken down?
- What is a dehydration synthesis reaction and what occurs during it?
- What is a hydrolysis reaction and what occurs during it?
- What characteristics are shared by all biological macromolecules in terms of their general construction?
- What is a monomer?
- What is a polymer?
- What is the monomer for carbohydrates?
- What is a monosaccharide?
- What is a disaccharide?
- What is a polysaccharide?
- What are some examples of the functions of carbohydrates?
- What is starch?
- What is glycogen?
- What is cellulose?
- What is chitin?
- What is the monomer for lipids?
- Are lipids soluble in water?
- What is the main type of lipid?
- What is a fat (or triglyceride)?
- What are the components of a fat?
- What is a fatty acid?
- What is a glycerol?

- What are some examples of the functions of lipids?
- What is a saturated fat and its characteristics?
- What is an unsaturated fat and its characteristics?
- What is a polyunsaturated fat?
- What is a phospholipid?
- What is the monomer for proteins?
- What two types of "groups" are characteristic of an amino acid?
- What is the relationship between an amino acid and a peptide?
- What is a dipeptide?
- What is a polypeptide?
- What is the name of the bond that joins two amino acids?
- Is a peptide bond a covalent bond?
- What is the relationship between a polypeptide and a protein?
- What role does the three-dimensional structure (shape) of a protein play in the activity of the protein?
- What are the four levels of structure of proteins?
- What is the primary structure of a protein?
- What is the secondary level of structure of a protein?
- What is the tertiary level of structure of a protein?
- What is the quaternary level of structure of a protein?
- What is denaturation?
- What factors can cause the denaturation of a protein?
- What are some examples of the functions of proteins?
- What is the monomer for nucleic acids?
- What are the two types of nucleic acid?
- What is RNA?
- What is DNA?
- What is a nucleotide?
- What are the three components of a nucleotide?
- What are the two types of organic bases occur in nucleotides?
- What are pyrimidines, what are their characteristics and are they found in DNA, RNA or both?
- What are purines, what are their characteristics and are they found in DNA, RNA or both?
- What is the name of the bond that links two nucleotides?
- Is a phosphodiester bond a covalent bond?
- What is meant by a "sugar-phosphate backbone"?
- When two strands of DNA join together, which portions of the nucleotides join and by what type of bond?
- What is meant by a "double helix"?
- Which nitrogenous bases join together in DNA?
- What are some examples of the functions of nucleic acids?