During the exam you may:
- use one front only of an 8 1/2 X 11 sheet of notes
- type or hand-write the notes (any font you want)
- NOT use any magnifying lenses, iPods, or other electronic devices. You may use a calculator, but if it contains any notes for the exam, that will be considered cheating.
- apply diagrams (hand-drawn, internet generated), but no flip-out pages
- NOT photocopy any other person’s review notes
- YOU MUST write your name on the upper right corner of the review sheet.

CHAPTER ONE – Biology of Life
1. Be able to tell the difference between an observation and an inference.
2. How do qualitative and quantitative data differ?
3. Be able to identify the parts of the scientific method.
4. What is the difference between a constant and a control?
5. How many independent variables should be tested in an experiment at a time?
6. Be able to convert metric to metric units (EX: 40 cm = _____µm)
7. What is the difference between a hypothesis and a theory? Which is used to guide one experiment? Which is broader and was devised after several experiments?
8. How are asexual and sexual reproduction different (number of parents, how alike are the offspring from the parents)
9. Identify the characteristics of life: EX: order, reproduction, energy processing…
10. Contrast eukaryotic and prokaryotic cells: which are larger, which have membrane-bound organelles, which include a nucleus/ a nucleoid?
11. How are homeostasis and metabolism different?
13. How are producers, consumers, and decomposers related in a food pyramid?
14. Lab Safety Rules
15. What are characteristics and examples of the 3 domains of life?
16. What are characteristics and examples of the 6 kingdoms of life? (how cell wall composition (if any) differs, prokaryotic or eukaryotic, multicellular or unicellular)
17. What are emergent properties? (EX: How is a community an emergent property of the organisms that make it?)
18. Which is technology and which is science? (study of cell structure, test tube babies, chemical make-up of crude oil, using gasoline in cars, ability to clone embryonic stem cells, should we use embryonic stem cells?)
CHAPTER 35 – Animal Behavior

Be able to match and identify examples of the following animal behaviors:

A. innate  G. social learning  M. polygamous mating  S. kinesis
B. taxis  H. problem-solving  N. territorial behavior  T. FAP’s
C. habituation  I. foraging  O. agnostic behavior
D. imprinting  J. communication  P. Dominance hierarchy
E. spatial learning  K. promiscuous mating  Q. inclusive fitness
F. trial-and-error  L. monogamous mating  R. altruism

1. _____no strong bond-pairing between the males and females
2. _____Siamese fighting fish, rams butting horns, or snakes “wrestling” rituals in which the victor gets the rights over the food or mate.
3. _____squirrels wagging a tail in the direction of the food, birds chirping signals to show danger, whales singing to locate each other are all signals transmitted by one animal to another, and honeybee waggle dance to show direction of food
4. _____birds learn not to respond to a scarecrow after repeated visits cause no harm
5. _____behavior under strong genetic control and is the same in all of the species
6. _____newly hatching geese follow the farmer when the mother was killed
7. _____a wasp uses landmarks to find her nest each day
8. _____a chimp learns to break open a jar when it learned previously that a rock falling on a coconut opened it.
9. _____a dog learns to not mess with a porcupine when it threw quills on his face once before.
10. _____A graylag goose will always retrieve an egg exactly the same way, even if the egg is temporarily removed.
11. _____sow bugs start and stop in random movement to a response to moisture
12. _____one male and one female share parental care
13. _____salmon move upstream (in one direction) in response to a scent of the water
14. _____kin selection, just passing on genes to close relatives
15. _____an individual of one sex mating with several of the others
16. _____pecking order is an example such as when one hen gets to the food first
17. _____a non-reproductive naked rat mole gives its life so the queen rat mole lives
18. _____a male sea lion defends his area and females, gannet birds peck at any other bird that comes near its nest, or cheetah mark its defended area with urine
19. _____food-getting behavior, such as crows eat anything, koala eat only eucalyptus
20. _____learning by observing the behavior of others, such as a baby chimp from its mother how to climb a tree
CHAPTER TWO-Chemistry

1. Subatomic particles: charge and where found. In what order do the electrons fill in the first three shells? Identify a correctly drawn Bohr model of an atom.
3. Difference between symbol and formula.
4. What part of atoms form bonds? What is electronegativity?
5. What do electrons do in each of these bond types? Ionic, covalent, polar covalent bonds and nonpolar covalent bonds.
6. List the following bonds in order of strength: hydrogen, van der Waals, ionic, covalent. How are each of these bonds formed?
7. What are ions? What are isotopes? What are cations? What are anions? What use are radioisotopes in medicine?
8. What is this element? What is its number of protons? Neutrons? What is its number of electrons?
9. What makes up the nucleus of an atom? What charge would it have?
10. What is the reason why atoms join with other atoms to form compounds?
11. How would you be able to tell single, double, or triple covalent bonds?
12. Be able to determine trends on the periodic table (valence electrons, ions charges, which elements would form ionic bonds, which elements would behave more alike chemically)
13. Describe water’s chemical characteristics: (polar or nonpolar, ionic or covalent, high surface tension or weak, capillarity up small or wide tubes, expand or contract when freezing) Which of these two characteristics determine most of water’s unusual properties?
14. What is the difference between cohesion and adhesion? Which is water to glass? Which is shown in a drop of water?
15. What are the parts of a solution?
16. How is a mixture different from a compound?
17. What two ions does water dissociate into?
18. What does a pH scale indicate? What number ranges are for acids? For bases?
   How is the concentration of H+ and OH- ions different in acids/bases? What pH is neutral? How do you determine the –log [H+] or the [OH–] if given the pH of a solution?
19. How does a buffer behave in solutions?
20. If given the two ions (with their charges), predict the ionic formula: such as Mg\(^2\) and Cl\(^–\)
21. In a chemical reaction, how do you identify the reactants or the products?
1. What are the four most abundant elements of living organisms?
2. What three elements are found in carbohydrates and lipids? What four elements are found in proteins? What five elements are found in nucleic acids?
3. What are the smaller units of macromolecules (polymers) called?
4. What are the monomers of each macromolecule called: carbohydrates, proteins, lipids, nucleic acids?
5. Contrast dehydration synthesis and hydrolysis (add/remove water, split/join)
6. How can you tell the difference between a saturated and an unsaturated fat?
7. How could you tell the difference between a carbohydrate and a lipid structural formula since both only contain C-H-O?
8. Glucose and fructose are isomers? What does this mean?
9. Sucrose, glycogen, starch and cellulose all contain glucose? How are they different?
10. In a triglyceride, where is the hydrophobic end and where is the hydrophilic end?
11. Phospholipids different than a triglyceride in what way?
12. How many levels of folding are proteins capable of? What causes each level to form? Between what functional groups do disulfide bonds form?
13. Be able to identify the functional groups: carbonyl, carboxyl, hydroxyl, phosphate, methyl, amino
14. What are two examples of nucleic acids? What four letters are used for the nitrogenous bases? What three parts make up a nucleotide? How many amino acids are there? What kind of bond joins them?
15. What are the basic parts of a protein that are alike? What letter is used to show how the amino acids are different?
16. Why does denaturation of an enzyme make it not work properly?
17. To remember the functions of proteins: SSSCDETR (look on p. 43 to see what they mean)
18. In a chemical reaction, where are the reactants and where are the products?
19. How does a substrate relate to an enzyme? Where is the active site? What is meant by “induced fit” or “Lock-and-Key” when referring to enzymes? What suffix do most enzymes end in? What type of macromolecule are enzymes?
20. What do hydrophilic and hydrophobic mean? Which functional group would be hydrophobic?
21. How would you be able to recognize the ring structure of a monosaccharide and a disaccharide? Give examples of each. What suffix do most sugars end in?
22. What is the general structure for a steroid?
23. Be able to match the positive test for the macromolecule lab of the substance tested (glucose, protein, lipid, starch)
24. Polypeptide and amino acid chain refer to which macromolecule?
CHAPTER FOUR - Cells

1. Who is given credit for the first microscope (looked at “animacules”)?
2. Who first coined the term “cells?”
3. How do SEM and TEM microscopes compare to a compound light microscope (how much they can magnify, how they operate, and advantages and disadvantages)
4. Be able to identify the parts of the microscope. Be able to find an organism with a microscope (first objective to use, position of stage, adjustment knobs).
5. How do you find the total magnification if given the magnification of the eye piece and the objective lens.
6. Be able to estimate the size of an organism if given the field diameter.
7. Be able to calculate the high field diameter if given the low magnification and low field diameter.
8. Be able to describe how to make a wet mount slide.
9. What happens to the surface-area-to-volume ratio when a cell gets larger?
10. How do prokaryotes and eukaryotes compare in where their DNA is kept? How do prokaryotes and eukaryotes differ in the general size of their cells? What structures are common to both prokaryotes and eukaryotes?
11. Place these in relative order from largest to smallest in an animal cell: Vacuole – nucleus – mitochondrion – ribosome – lysosome
12. What is the difference between unicellular and multicellular organisms?
13. How is chromatin related to DNA?
14. Where is the nucleolus found and what does it make? Does it have a membrane around it?
15. Where are ribosomes found, their relative size, and their job?
16. What are the two kinds of ER? How are their functions different?
17. What does the Golgi apparatus receive from the RER? How does this material get to the Golgi? What does the Golgi do to this material?
18. Lysosomes contain what material to do what job? What do peroxisomes contain and what is their job?
19. Water vacuoles will have what function? What purpose do they have in plants for being so large? What is the contents of the water vacuole called?
20. What two structures would not be found in animal cells but would be in plant cells? What two structures would not be found in plant cells but would be in animal cells?
21. Would you find these in prokaryotic, plant or animal cells? mitochondria? chloroplasts? Which is the site of photosynthesis? Which is the site of cellular respiration? How could you tell them apart in a cell drawing?
22. How is the construction of microfilaments and microtubules different? What are their jobs? What is the job of centrioles? What is the purpose of intermediate microfilaments? What is the difference between a centrosome and a centriole?
23. How do these coverings of a prokaryotic cells differ in location, structure, and function (cell wall, capsule, plasma membrane)?
24. What two organelles make up the endosymbiont theory?
25. Trace the path of a protein from the template of the DNA to mRNA through the nuclear envelope, ribosomes to RER, vesicles through the cell, the modifications at the Golgi, and secreted out of the cell as an enzyme.

26. What connection do these words have? ECM, integrins, glycoprotein, collagen, and microfilaments (see Fig. 4.19)

27. How are each of these cell junctions used between cells: tight junctions, anchoring junctions, gap junctions?

28. How are each of these used in cell walls? cellulose, lignin, pectin, plasmodesmata

CHAPTER FIVE-The Working Cell
1. Why would the cell membrane be also known as a “Fluid Mosaic Model” or a “Phospholipid Bilayer”?
2. How are peripheral and integral proteins different? How are pumps different from other transport proteins? Under what types of circumstances would active transport be needed?
3. How do a glycoprotein and glycolipid appear differently on a plasma membrane?
4. What does it mean for a membrane to have “selective permeability”? What types of materials are usually permeable to a plasma membrane? What types of materials are usually not permeable to a plasma membrane?
5. How is osmosis different from diffusion? Describe this in concentration of free and bound water movement.
6. How is aquaporin a type of facilitated diffusion?
7. How is the concentration of solute different in and out of the cell in each of these types of solution? Isotonic, hypotonic, hypertonic
8. How would the red blood cell and plant cells be affected if put into each of these solutions? Isotonic, hypertonic, hypotonic
9. Is facilitated diffusion passive or active transport? How is it different from just diffusion?
10. How is active transport different from passive?
11. What happens in: endocytosis, phagocytosis, pinocytosis, exocytosis?
12. What does ATP stand for? How is it used as cell “batteries”?
13. Where is the energy stored in molecules? What part of ATP is usually lost or gained to release or store energy? What is phosphorylation?
14. Contrast kinetic and potential energy. How can a molecule show both?
15. Contrast the First and Second Laws of Thermodynamics.
16. Contrast endergonic and exergonic reactions. How would these be used in energy coupling?
17. How is metabolism different from cellular respiration?
18. How can activation energy be shown in a graph? How would enzymes affect this line?
19. How might temperature, pH or acids or bases affect the work of enzymes?
20. How do these inhibitors affect the work of an enzyme? Competitive and noncompetitive and feedback.
21. Give examples of coenzymes and cofactors.