Homework – Chapter 1

The following is a list of biology themes discussed in Chapter 1. Use them to answer the following questions.

I. New properties emerge at each level in the biological hierarchy.
II. Organisms interact with other organisms and the physical environment.
III. Life requires energy transfer and transformation.
IV. Structure and function are correlated at all levels of biological organization.
V. Cells are an organism's basic units of structure and function.
VI. The continuity of life is based on heritable information in the form of DNA.
VII. Feedback mechanisms regulate biological systems.
VIII. Evolution accounts for the unity and diversity of life.

1) Which theme(s) is/are best illustrated by an experiment in which a biologist seeks a medication that will inhibit pain responses in a cancer patient?
   A) II  
   B) VII  
   C) III and V  
   D) V and VIII  
   E) VI and VII

2) Which theme(s) is/are best illustrated by a group of investigators who are trying to classify and explain the ecology of an area known as the Big Thicket?
   A) I only  
   B) II only  
   C) VIII only  
   D) IV and VI  
   E) I and II

3) Which theme(s) is/are illustrated when a group of students is trying to establish which phase of cell division in root tips happens most quickly?
   A) IV only  
   B) V only  
   C) VII only  
   D) IV, V, and VI  
   E) V, VI, and VII

4) Which theme(s) is/are illustrated when a biology class is comparing the rates of photosynthesis between leaves of a flowering plant species (Gerbera jamesonii) and a species of fern (Polypodium polypodioides)?
   A) I only  
   B) II only  
   C) I and III  
   D) I and VII  
   E) I, III, and V
5) All the organisms on your campus make up
A) an ecosystem.
B) a community.
C) a population.
D) an experimental group.
E) a taxonomic domain.

6) Which of the following is a correct sequence of levels in life's hierarchy, proceeding downward from an individual animal?
A) brain, organ system, nerve cell, nervous tissue
B) organ system, nervous tissue, brain
C) organism, organ system, tissue, cell, organ
D) nervous system, brain, nervous tissue, nerve cell
E) organ system, tissue, molecule, cell

7) Which of the following is not an observation or inference on which Darwin's theory of natural selection is based?
A) Poorly adapted individuals never produce offspring.
B) There is heritable variation among individuals.
C) Because of overproduction of offspring, there is competition for limited resources.
D) Individuals whose inherited characteristics best fit them to the environment will generally produce more offspring.
E) A population can become adapted to its environment over time.

8) Systems biology is mainly an attempt to
A) analyze genomes from different species.
B) simplify complex problems by reducing the system into smaller, less complex units.
C) understand the behavior of entire biological systems.
D) build high-throughput machines for the rapid acquisition of biological data.
E) speed up the technological application of scientific knowledge.
Answer: C

9) Protists and bacteria are grouped into different domains because
A) protists eat bacteria.
B) bacteria are not made of cells.
C) protists have a membrane-bounded nucleus, which bacterial cells lack.
D) bacteria decompose protists.
E) protists are photosynthetic.

10) Which of the following is the best description of a control for an experiment?
A) The control group is kept in an unchanging environment.
B) The control is left alone by the experimenters.
C) The control group is matched with the experimental group except for the one experimental
variable.
D) The control group is exposed to only one variable rather than several.
E) Only the experimental group is tested or measured.

10) Which of the following best demonstrates the unity among all organisms?
A) matching DNA nucleotide sequences
B) descent with modification
C) the structure and function of DNA
D) natural selection
E) emergent properties

11) A controlled experiment is one that
A) proceeds slowly enough that a scientist can make careful records of the results.
B) tests experimental and control groups in parallel.
C) is repeated many times to make sure the results are accurate.
D) keeps all variables constant.
E) is supervised by an experienced scientist.

12) Which of the following statements best distinguishes hypotheses from theories in science?
A) Theories are hypotheses that have been proved.
B) Hypotheses are guesses; theories are correct answers.
C) Hypotheses usually are relatively narrow in scope; theories have broad explanatory power.
D) Hypotheses and theories are essentially the same thing.
E) Theories are proved true; hypotheses are often falsified.

13) Which of the following is an example of qualitative data?
A) The temperature decreased from 20°C to 15°C.
B) The plant's height is 25 centimeters (cm).
C) The fish swam in a zigzag motion.
D) The six pairs of robins hatched an average of three chicks.
E) The contents of the stomach are mixed every 20 seconds.