MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The heart lies in the ________ ____________ cavity.
   A) dorsal   B) pericardial
   C) abdominal  D) pleural

2) The single most abundant chemical substance of the body, accounting for 60 to 80% of body weight, is _________________.
   A) protein  B) water
   C) hydrogen  D) oxygen

3) A good example of a positive feedback mechanism would be ________.
   A) enhancement of labor contractions
   B) blood calcium level regulation
   C) blood glucose level regulation
   D) body temperature regulation

4) A vertical section through the body, dividing it into anterior and posterior regions, is called _________________.
   A) sagittal  B) median
   C) Frontal/coronal  D) Transverse/horizontal

5) Which of the following would be regarded as an organic molecule?
   A) H2O  B) CH4  C) NaCl  D) NaOH

6) A red blood cell placed in pure water would ________.
   A) neither shrink nor swell
   B) swell and burst
   C) shrink
   D) swell initially, then shrink as equilibrium is reached

8) Which of the following is positive ion found in highest concentration outside our cells?
   A) nitrogen  B) sodium
   C) hydrogen  D) potassium
9) In general, the category of lipids that we refer to as oils (liquid at room temperature) have ________ that prevent/s them from packing together closely compared with lipids like butter that are solid at room temperature.
   A) long fatty acid chains
   B) a high degree of unsaturated bonds
   C) a high degree of saturated bonds
   D) a high water content

10) The four elements that make up about 96% of body matter are ________.
    A) carbon, oxygen, phosphorus, calcium
    B) sodium, potassium, hydrogen, oxygen
    C) carbon, oxygen, hydrogen, nitrogen
    D) nitrogen, hydrogen, calcium, sodium

11) If atom X has an atomic number of 20 it would have ________.
    A) 20 protons and no neutrons
    B) 10 protons and 10 neutrons
    C) 10 electrons
    D) 20 protons and roughly the same number of neutrons

12) If cells are placed in a hypertonic solution containing a solute to which the membrane is impermeable, what could happen?
    A) The cells will lose water and shrink.
    B) The cells will shrink at first, but will later reach equilibrium with the surrounding solution and return to their original condition.
    C) The cells will swell and ultimately burst.
    D) The cells will show no change due to diffusion of both solute and solvent

**Short Answer**
13. The hand is distal to the ____________.

14. The heart is ventral to the _________________.

15. The eyes are superior to the _________________.

16. What are the three different types of structural proteins also called cytoskeletal proteins found inside cells?
   1.
   2.
   3.

17. What body cavity/ies contain/s the following organs (be specific):
   A. heart
   B. stomach
   C. brain
What are the 4 main classes of organic macromolecules found in our body?
1. 
2. 
3. 
4. 

Please identify which building block is used to build each organic macromolecule in the question above.

- a. Glycerol
- b. Fatty acids
- c. Amino acids
- e. Sugars
- f. Nucleotides
- g. cholesterol

Mitochondria are the main producers of ________________ the energy used by all cells in our body (e.g. to transport ions up their concentration gradients – Na,K pump).

Continual protein synthesis is required to maintain healthy functioning cells. Where are the instructions to make each protein in a cell stored?

________________________________ is the process for turning the mRNA sequence into a protein.

Please fill in the blanks with the best choice.

Small non-polar molecules move across cell membranes in a process called ________________. Ions move across the cell membrane through ion channels in a process called ________________. Glucose moves across the cell membrane in two different ways both with the help of a membrane protein. The first means of transport is with the help of membrane proteins in a process called ________________. The second transport method ________________ uses the energy of the Na concentration gradient. When ATP used for transporting a solute across the cell membrane, the process is ________________. When water moves across the cell membrane, the process is called ________________.

- a. Primary active transport
- b. Simple diffusion
- c. Facilitated diffusion
- d. secondary active transport
- e. osmosis

True/False

- Hydrogen bonds are stronger than covalent bonds. True False
- Water has a pH of 7. True False
- An acidic solution has a pH greater than 7 (e.g. pH 9) True False
- Kinetic energy is stored energy. True False
- H₂O, CH₄, H₂ and O₂ are all compounds. True False
Please label the specific part of the body referred to by each of these anatomical terms.

a. axillary  
b. popliteal  
c. sacral  
d. patellar  
e. brachial  
f. carpal  
g. sternal  
h. coxal  
i. femoral  
j. thoracic

Please identify the structures in the figure below with labels.
For the Group I element Na (Sodium) please answer the following:

a. What is the atomic number?

b. What is the atomic mass?

c. How many protons and electrons does Na have?

d. Does Na have any isotopes and how can you tell this from the periodic table?

e. To make a 1 M solution of Na, how many grams of Na do you need to add to 1 Liter of water?
Cell Cycle

Part 1: Please label the stages of the cell cycle below (early prophase, anaphase, telophase/cytokinesis, metaphase, interphase, late prophase)

This plant cell is at what stage of mitosis?

A red blood cell dies after about 3 months while most cells in our bodies live a much longer life. Please explain why RBC’s have such a short life span.
Resting Potential

In the simple case we have talked about in class, all cells in our bodies have a resting potential equal to –60 mV. The only channels that are open and therefore provide a path for ions to move across the membrane are K leak channels. This -60 mV resting potential is an equilibrium where the force due to the concentration gradient is exactly equal to the electrical force (in the opposite direction) and is called the resting potential, a stable state where no energy is required.

You have just discovered that cells from Martians have a resting potential of +120 mV? Like our cells, the Martian’s cells have only 1 type of ion channel in the cell membrane. Could Martian’s have the same K leak channel in their membrane? You do some experiments and find that the concentrations for the important ions in Martians. Please explain what 2 different possibilities might explain the martian cell resting potential of +60 mV.

Here is some information you might need for your explanation.

\[ E_{\text{rest}} = \frac{60}{z} \log_{10} \left( \frac{[\text{ion}]}{[\text{ion}]} \right) \]

where \( z \) = valence of the permeant ion (Ca++ = 2, Na+ = 1, Cl- = -1)

<table>
<thead>
<tr>
<th>Ion</th>
<th>[IN] in mM</th>
<th>[OUT] in mM</th>
<th>Nernst Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Na+</td>
<td>10</td>
<td>1000</td>
<td>+120 mV</td>
</tr>
<tr>
<td>K+</td>
<td>100</td>
<td>10</td>
<td>-60 mV</td>
</tr>
<tr>
<td>Cl-</td>
<td>100</td>
<td>100</td>
<td>0 mV</td>
</tr>
<tr>
<td>Ca++</td>
<td>.001</td>
<td>10</td>
<td>+120 mV</td>
</tr>
</tbody>
</table>

LOG HELP
Log 10 1 = 0
Log 10 10 = 1
Log10 100 = 2
Log10 .1 = -1
Log10 .01 = -2
and so on (therefore Log 10 1000 = 3 and Log 10 .001 = -3)