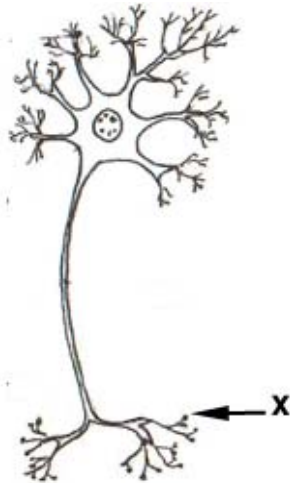


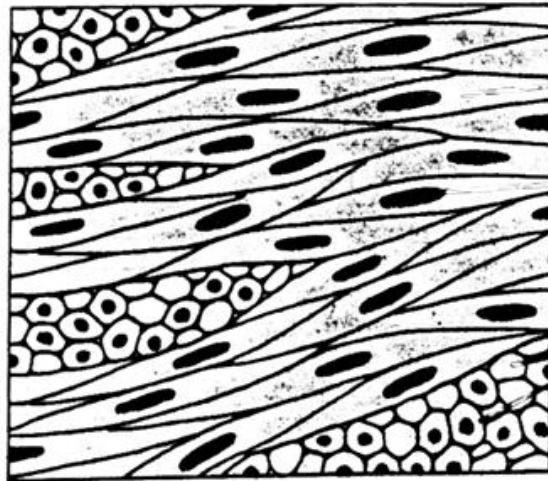
# STATION 1

Figures A and B show two distinct types of cells present in our body. Please answer questions 1 to 5 based on your knowledge of cell structure and function.

**Figure A**



**Figure B**



1. Name ONE organelle that is shown in the drawing of cells in both Figures A and B?
2. What is the main function of this organelle?
3. Identify the type of cell shown in Figure A. Name an organ where this type of cell would be most abundant.
4. Identify the cells shown in Figure B. Name an organ or tissue where you would expect to find this type of cell.
5. What is the function of the structure marked X?

## STATION 2

A student used a control protein called BSA as a standard to calculate the amount of protein present in his unknown sample. He obtained the following absorbance readings after blanking the spectrophotometer at 540 nm wavelength (see table below).

<b>Amount of BSA (<math>\mu\text{g}</math>)</b>	<b>Absorbance at 540 nm</b>
10	0.120
25	0.300
50	0.610
75	0.890
100	1.210
10-fold dilution of unknown replicate 1	0.775
10-fold dilution of unknown replicate 2	0.827

Using the graph paper provided, plot this data and calculate the amount of protein present in the unknown sample.

Assume that the volume of protein used in the assay is identical for all samples. Units are required and graphs should be labeled appropriately.

## STATION 3

A graduate student used a secret code to label his bottles of sucrose and glucose. The scheme backfired when he could not remember his code. He remembered a test he had learned in his high school biology class that would help him distinguish between the two solutions!

1. Name a chemical test that can be used to distinguish between the two solutions.
2. What chemical property of sugars is illustrated by this test?
3. What is the color at the endpoint for sucrose and for glucose?
4. Name the chemical compound that is responsible for the appearance of this color.
5. Would this test be able to differentiate between:
  - a. fructose and sucrose?
  - b. glucose and maltose?Why or why not?

## STATION 4

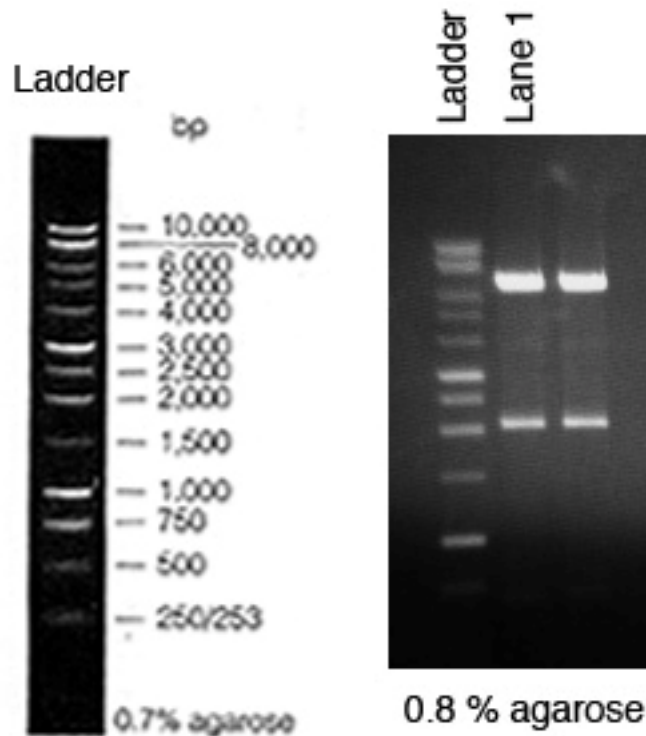
Using your knowledge of Cell Biology, fill in each blank with one word that best describes the information provided:

1. Peptide bonds link amino acids to form polymers called \_\_\_\_\_.
2. Animals store energy in their muscles in the form of this carbohydrate: \_\_\_\_\_.
3. Name the pathway where glucose is metabolized to pyruvic acid.  
\_\_\_\_\_
4. The two major components of cell membranes are:
  - a) \_\_\_\_\_
  - b) \_\_\_\_\_
5. DNA is present in these three organelles of a plant cell:
  - a) \_\_\_\_\_
  - b) \_\_\_\_\_
  - c) \_\_\_\_\_
6. Yeast cells produce alcohol and carbon dioxide by this form of respiration: \_\_\_\_\_.
7. The dark cycle takes place in this part of a chloroplast:  
\_\_\_\_\_.
8. This organic base is present in RNA but not in DNA: \_\_\_\_\_.
9. This food molecule provides the most calories per gram:  
\_\_\_\_\_.
10. This transport is involved in the influx of sodium inside the cell:  
\_\_\_\_\_.

## STATION 5

Cloning involves restriction of plasmid DNA with enzymes. The DNA is then run on an agarose gel to determine the sizes of the fragments obtained. The figure below is representative of one such run.

Using the image of the DNA standards (Ladder) shown on the left, determine the approximate sizes of the two bands in Lane 1 of the agarose gel (right panel).



# Response Sheet

## Station 1:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

## Station 2:

1. \_\_\_\_\_

## Station 3:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

## Station 4:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. a) \_\_\_\_\_  
b) \_\_\_\_\_
5. a) \_\_\_\_\_  
b) \_\_\_\_\_  
c) \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

## Station 5:

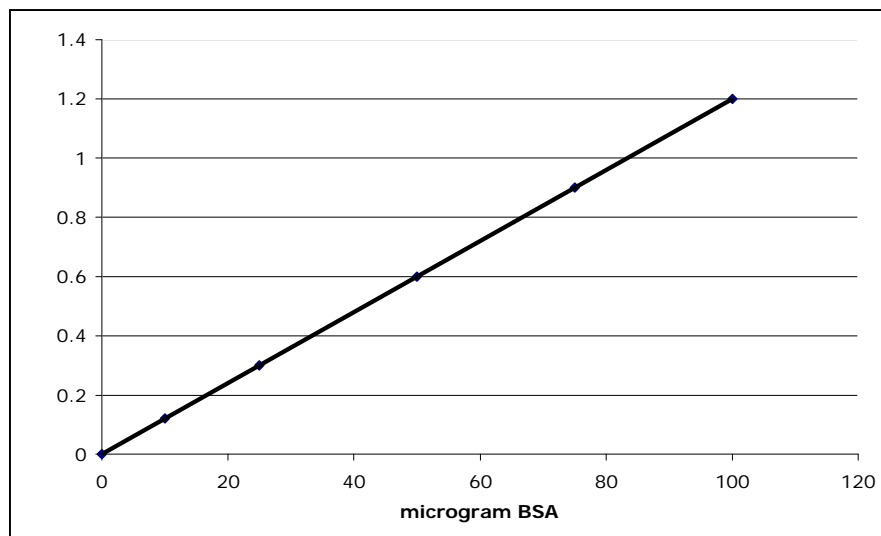
- Top band: \_\_\_\_\_  
Bottom band: \_\_\_\_\_

# Answers

## Station 1:

1. Nucleus
2. Carries genetic material
3. Neuron (nerve cell); Brain or spinal cord
4. Muscle cell (bonus point for smooth muscle but not needed for answer to be correct); any muscular part of the body
5. Release of neurotransmitters

## Station 2:



1. Graph should have:
  - a) Dependent and independent variables present on the correct axes.
  - b) X and Y axis labeled appropriately.
  - c) Line passes through origin.
2. 667.5  $\mu$ g (margin of error for this number will be based on the size of graph paper provided)

## Station 3:

1. Fehling's or Benedict's
2. Reducing characteristic of sugars
3. Sucrose: blue; Glucose: brick-red
4. Copper (I) oxide
5. a) Yes; fructose is a reducing sugar while sucrose is not. b) No; both are reducing sugars.

#### Station 4:

1. Proteins
2. Glycogen
3. Glycolysis
4. a) Phospholipids  
b) Proteins
5. a) Nucleus  
b) Mitochondria  
c) Chloroplast
6. Anaerobic
7. Stroma
8. Uracil
9. Fat
10. Active

#### Station 5:

Top band: 7,200 bp (any number between 6,000 and 8,000 bp will be correct)

Bottom band: 2,100 bp (any number between 2,000 and 2,500 bp will be correct)