

Science Department

Summer Homework 2014

8th Grade, Living Environment Regents

Dear 8th graders,

The Living Environment Regents curriculum is very challenging. It demands hours of preparation, memorization of multitude of vocabulary words and through understanding of concepts. It is a high school level class and therefore will be tougher than any science class you have ever taken so far. The class is also very rewarding for you get to learn about the living world around you and in particular about the workings of a human body.

This summer packet has been prepared for you in order to introduce you to the living environment and give you a head start. Most of the assignments are very interactive and were designed to pick your curiosity.

I. Cells

Cells are the building blocks of all living things, simply because all living things are made up of cells.

To learn about cells do the assignments below.

1. Play cell craft until you reach the final level. <http://www.carolina.com/teacher-resources/Interactive/online-game-cell-structure-cellcraft-biology/tr11062.tr>
2. Explore the cell at <http://learn.genetics.utah.edu/content/cells/>
 - a. Inside the cell
 - b. Cell size and Scale
 - c. Evolution of the Cell
 - d. Real Cell Videos
3. **Memorize the functions of cellular organelles from the list provided. In September you will be quizzed on labeling of cell parts and knowledge of functions of each cell part listed in this handout. Use the practice form to test your knowledge.**

II. Body System

1. Circulatory system
 - a. The heart animation "Map the Human Heart"
<http://www.pbs.org/wgbh/nova/body/map-human-heart.html>
 - b. Animated heart with a corresponding EKG
http://library.med.utah.edu/kw/pharm/hyper_heart1.html
 - c. Do the blood flow sequence activity.

2. Nervous system
 - a. Do the science of addiction activities. Use the website below to help you do the assignments on “science of addiction” in your packet.
<http://learn.genetics.utah.edu/content/addiction/>
 3. Memorize the functions of each of the body systems listed in the handout. You will be quizzed on functions of the body systems in September.
- III. Genetics
- a. Do all the activities in “Tour the basics of Genetics” to answer the questions in your packet.

<http://learn.genetics.utah.edu/content/basics/>
 - b. Do the activities on the following website to answer questions in “Cloning in Focus.”

<http://learn.genetics.utah.edu/content/cloning/>

I really hope you enjoy doing this assignment and have an amazing adventurous summer.

Sincerely,

Elina Nazarov



Summer Packet

Living Environment Regents Class

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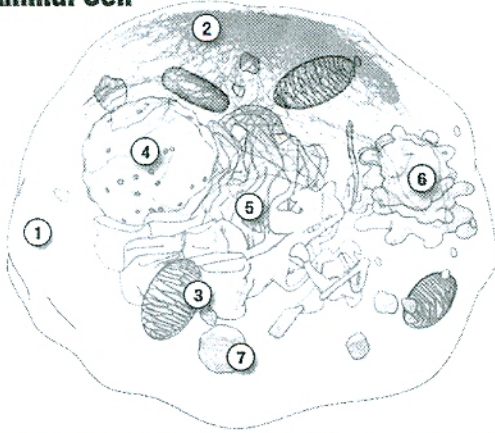
Elina Nazarov

Module
Amazing Cells

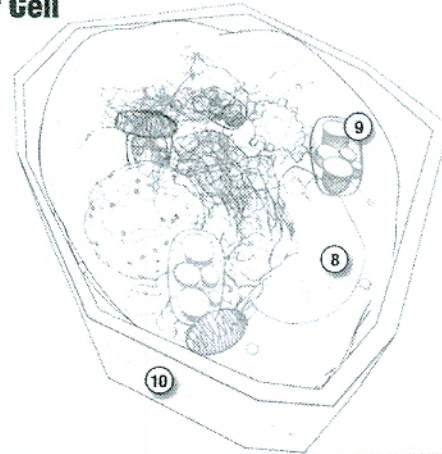
Inside A Cell

Answer Key

Animal Cell



Plant Cell



	Organelle	What does it do?	Other Notes
1	Cell Membrane	<i>Allows molecules to pass in and out of the cell.</i>	<i>Formed by lipid molecules that naturally arrange themselves into spheres.</i>
2	Cytoskeleton	<i>Provides structure, helps organize cell division, functions as a system of roads for motor proteins.</i>	
3	Mitochondrion	<i>Generates a cell's energy.</i>	<i>Has its own genome, and circular DNA similar to bacteria.</i>
4	Nucleus	<i>Stores and protects DNA, DNA is copied to RNA here.</i>	<i>Pores selectively allow molecules in and out.</i>
5	Endoplasmic Reticulum	<i>Provides a place for ribosomes to carry out protein synthesis, stores enzymes, and provides a surface upon which chemical reactions can occur.</i>	<i>1/2 the total amount of membrane in a cell.</i>
6	Golgi Apparatus	<i>Provides an area where macromolecules are tagged with labels.</i>	<i>Transport proteins use these labels to deliver the macromolecules to the proper place in the cell.</i>
7	Lysosome	<i>Contains digestive enzymes that break down discarded proteins.</i>	<i>This is only one example of many types of vesicles.</i>
8	Vacuole	<i>Stores nutrients, breaks down waste, helps cell grow, provides pressure.</i>	<i>Only in plants.</i>
9	Chloroplast	<i>Converts energy from the sun into sugar.</i>	<i>Have their own genome. Only in plants.</i>
10	Cell Wall	<i>Protects cell from injury and provides support.</i>	<i>Only in plants.</i>

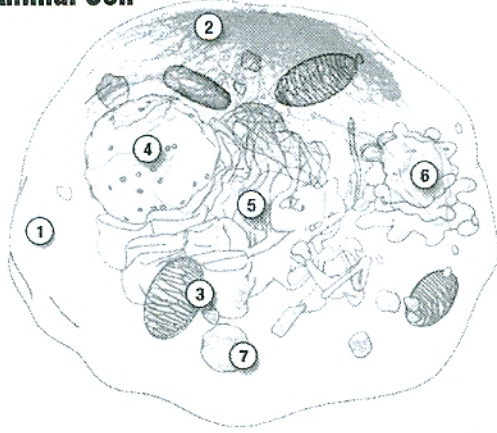
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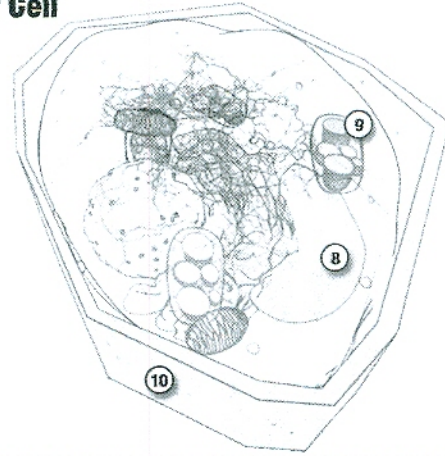
Inside a Cell

Practice Page

Animal Cell



Plant Cell

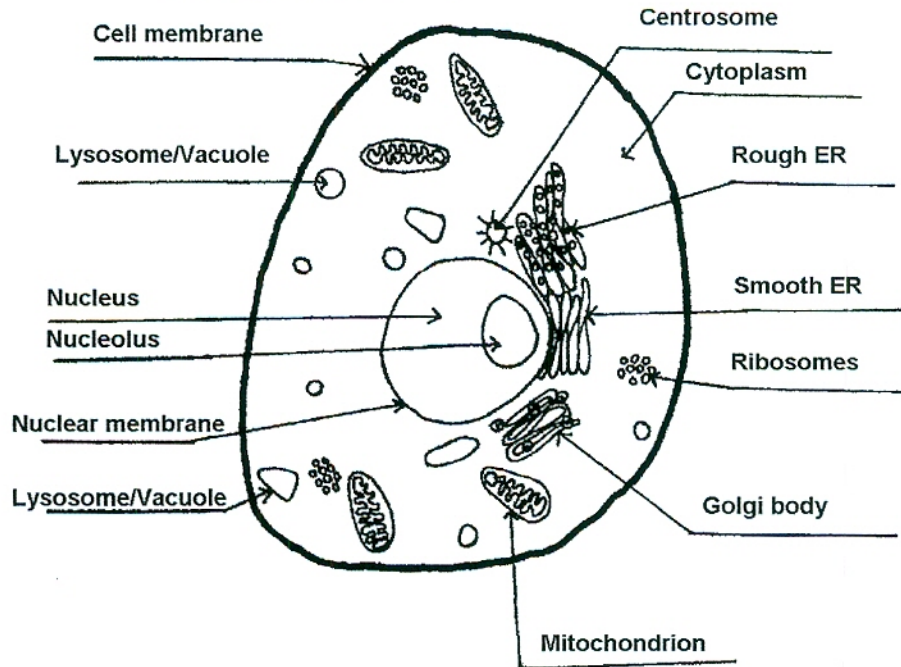


	Organelle	What does it do?	Other Notes
1	Cell Membrane		
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4	Nucleus		
5	Endoplasmic Reticulum		
6	Golgi Apparatus		
7	Lysosome		
8	Vacuole		
9	Chloroplast		
10	Cell Wall		

Name _____

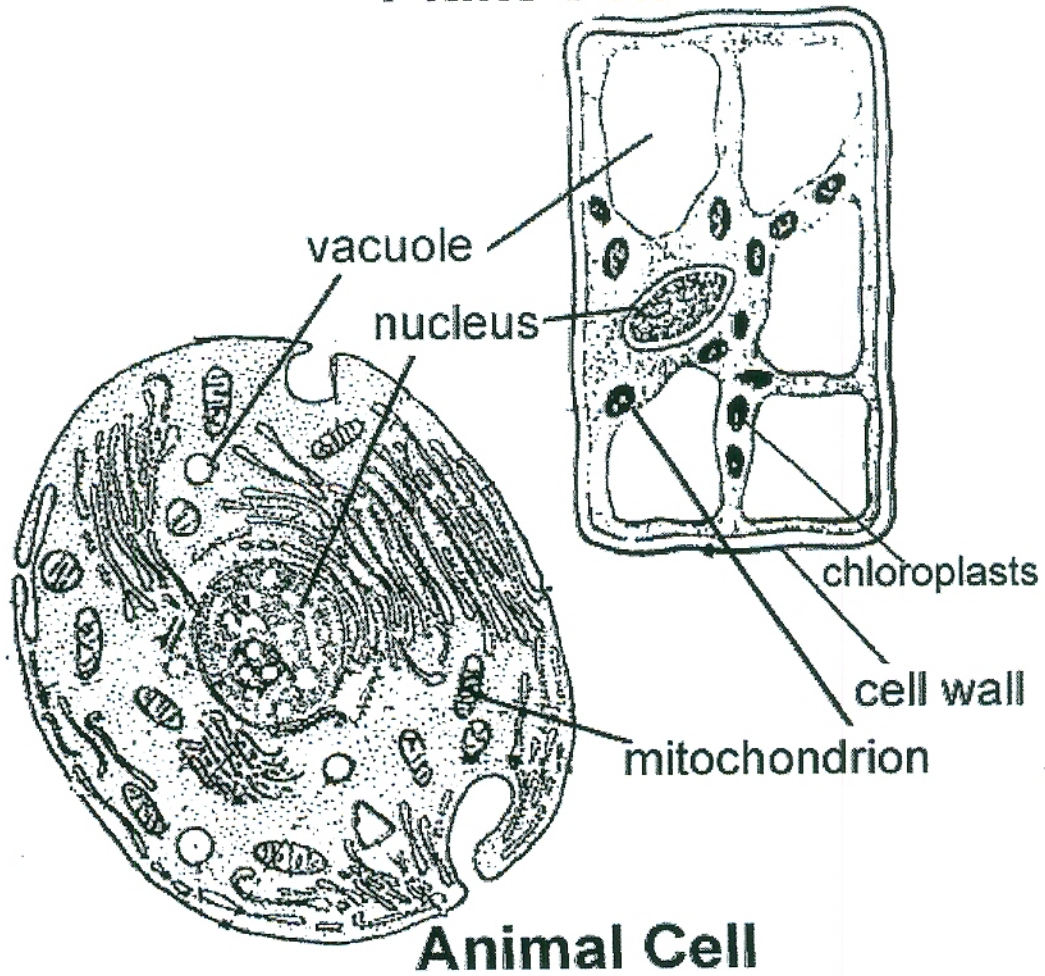
ANIMAL CELL

Directions: Use your book or any other resource to correctly label the following animal cell structures.



cell membrane, centrosome, cytoplasm, Golgi body, lysosome, mitochondrion, nuclear membrane, nucleolus, nucleus, ribosome, rough endoplasmic reticulum (rough ER), smooth endoplasmic reticulum (smooth ER), vacuole

Plant Cell



Name _____ Date _____ Class Period _____

Blood Flow Sequence

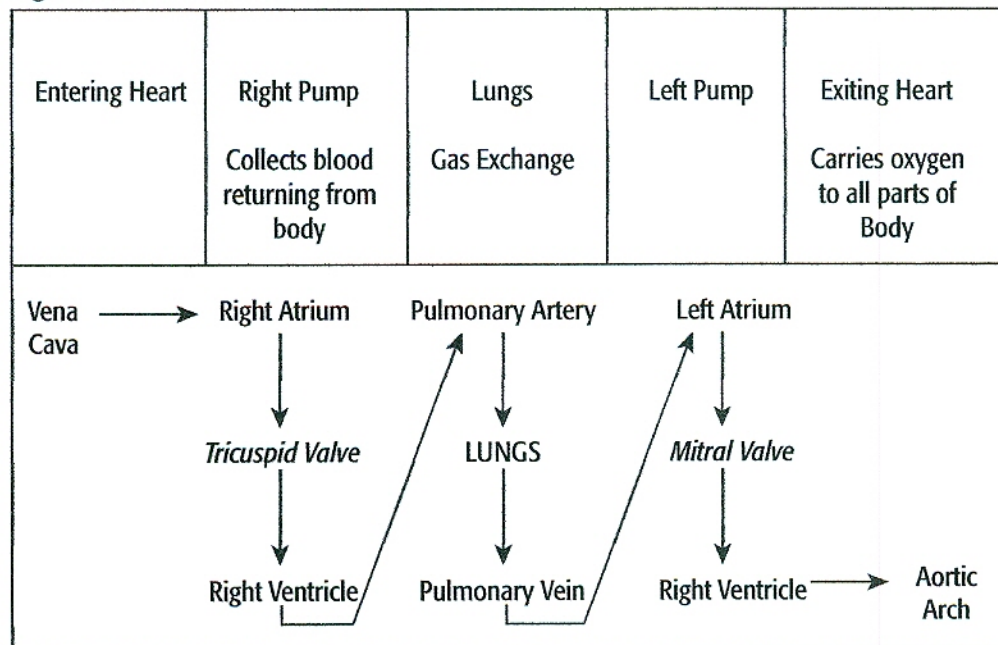
Trace the blood flow through the heart, and learn the names of important parts of the sequence. Try to follow the pathway of blood shown in Figure 1.4.

The Pathway of Blood to and from the Heart

1. Blood that has circulated through the body, which has lost its oxygen and collected carbon dioxide, enters through the vena cava into the right atrium of the heart.
2. The right atrium contracts and pumps the blood through the tricuspid valve and into the right ventricle.
3. The right ventricle then pumps blood through the pulmonary artery into the lungs.
4. In the lungs, tiny blood vessels called capillaries absorb carbon dioxide from the blood and replace it with oxygen.
5. Oxygenated blood then flows through the pulmonary vein and into the left atrium.
6. Oxygenated blood then pumps through the mitral valve and into the left ventricle.
7. The left side of the heart contracts the strongest to send blood out the left ventricle and through the aortic arch on its way to all parts of the body. At this point, there are a few options for the blood flow: blood can be pumped
 - through the carotid artery and into the brain.
 - through the auxiliary arteries and into the arms.
 - through the aorta and into the torso and legs.
8. Blood will then move through the arteries, then through capillaries, and then return through the veins.
9. Deoxygenated blood (blood without oxygen) will then return to the heart.
10. The cycle repeats.

Name _____ Date _____ Class Period _____

Figure 1.4



Hint: to help you remember arteries and veins
A (arteries) – Away Blood is moving away from the heart.
V (veins) – Toward Blood is moving toward the heart.
 Capillaries are small blood vessels that connect the arteries and veins.

Blood Flow Sequence Activity

The purpose of this activity is to understand the sequence of blood flow through the heart, lungs, and body. **Figure 1.5** illustrates different parts of the heart involved in the blood flow sequence.

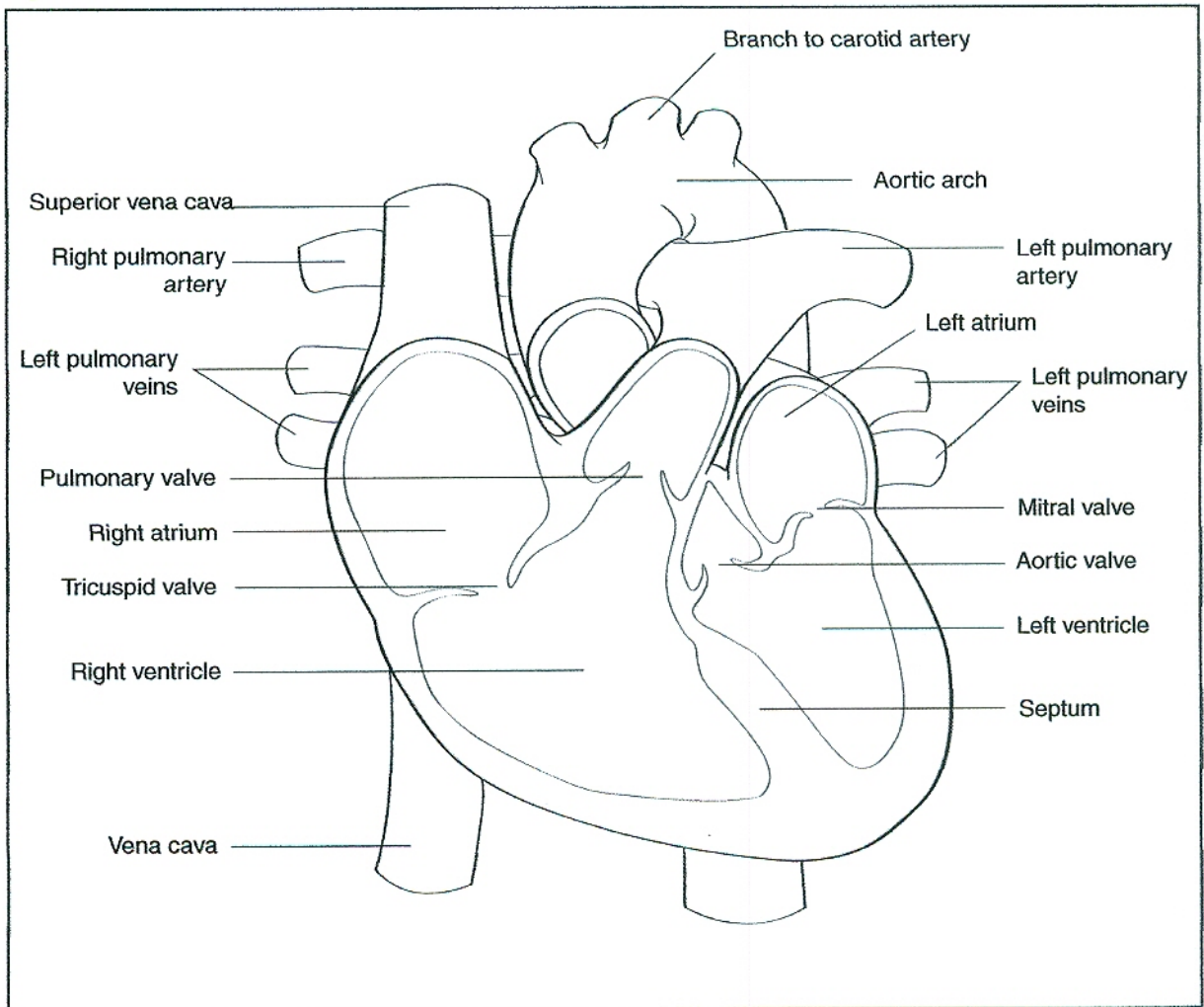
Students will develop their own challenge or obstacle course to indicate the blood flow sequence. Partners or small groups may construct a part of the sequence. Make a drawing of the challenge course. For the actual activity, use jump ropes, hurdles, cones, and other objects to indicate the different parts of the system. Also, decide the sequence for using these objects. See if you can complete the challenge course three times while saying the name and function of each part of your sequence.

Name _____ Date _____ Class Period _____

Evaluation

Look at the parts of the heart in **Figure 1.5**, and describe the importance of that part of the heart on the next page.

Figure 1.5



The Heart—Activity

Name _____ Date _____ Class Period _____

1. vena cava _____

2. right atrium _____

3. tricuspid valve _____

4. right ventricle _____

5. pulmonary artery _____

6. lungs _____

7. pulmonary vein _____

8. left atrium _____

9. mitral valve _____

10. left ventricle _____

11. aortic arch _____

12. arteries _____

13. capillaries _____

14. veins _____

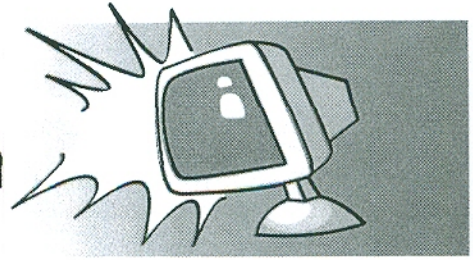
15. Why must the heart contract very strongly to pump blood from the left ventricle into the aorta?

Name _____

Date _____



Exploring The New Science of Addiction

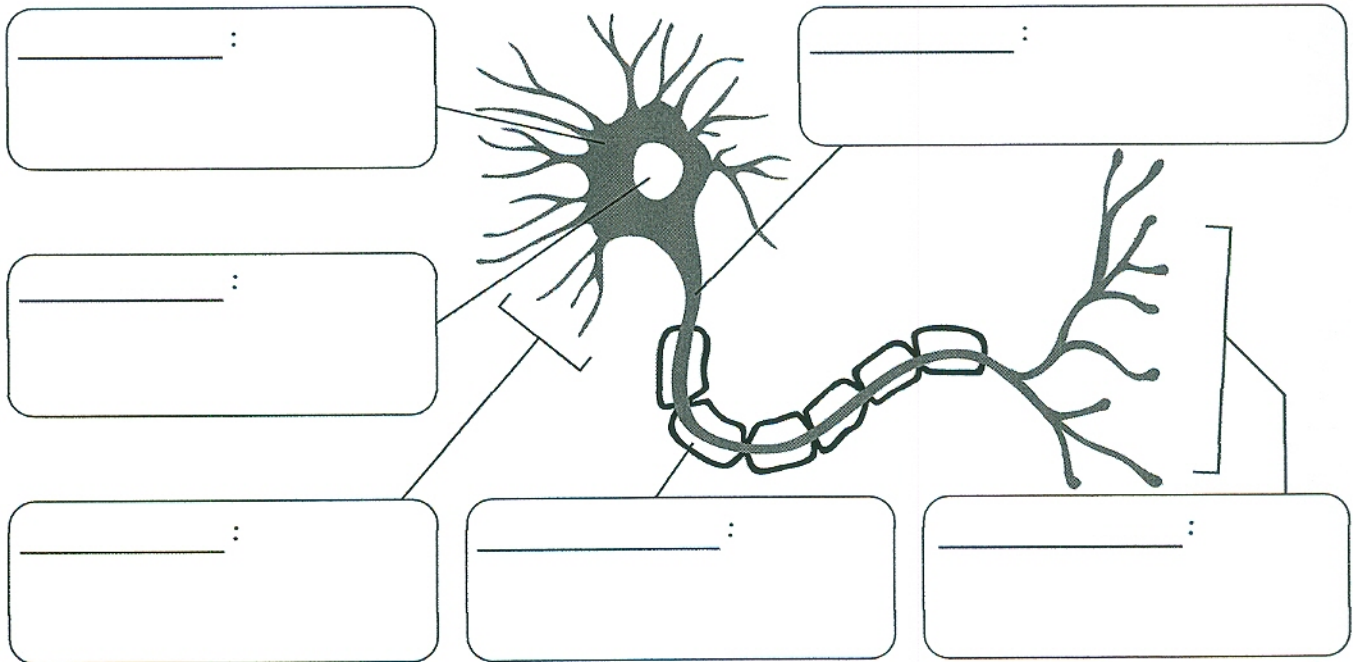


Log on to: <http://gslc.genetics.utah.edu/units/addiction> and explore this module to find the answers to the questions below.

Hint: the Search feature on this website may or may not help you find what you are looking for; it is best to go through the module to find the answers.

Natural Reward Pathways Exist in the Brain

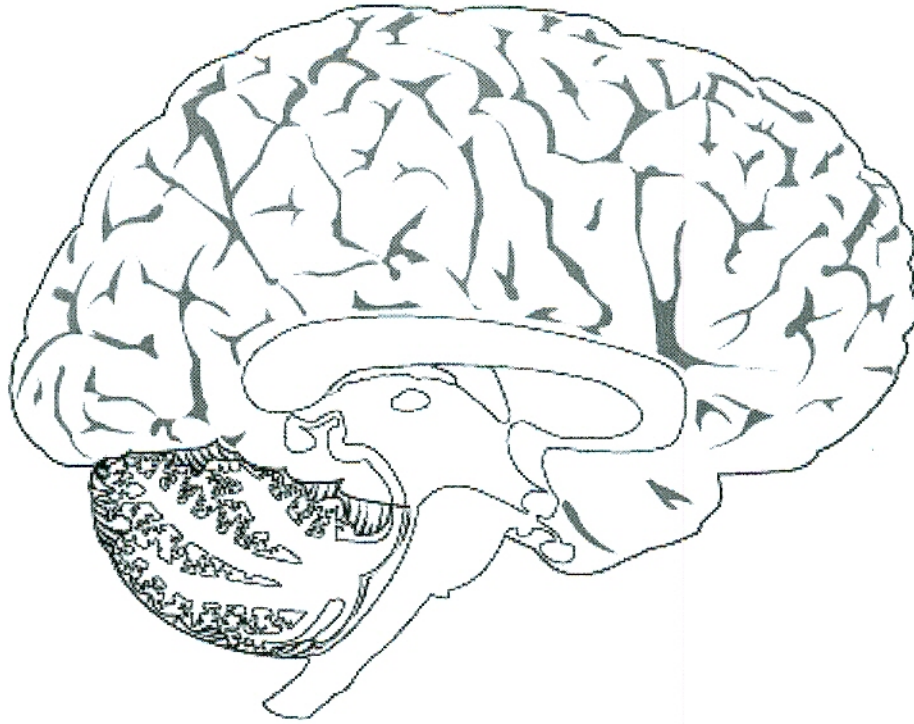
1. *Make a Mad, Mad, Mad Neuron*, label each part on the neuron below and give a brief description of each part's function.



Name _____

Date _____

2. On the brain below, roughly sketch in and label: A) the Reward Pathway, B) the area of the brain responsible for behavior and C) the area of the brain responsible for memory.



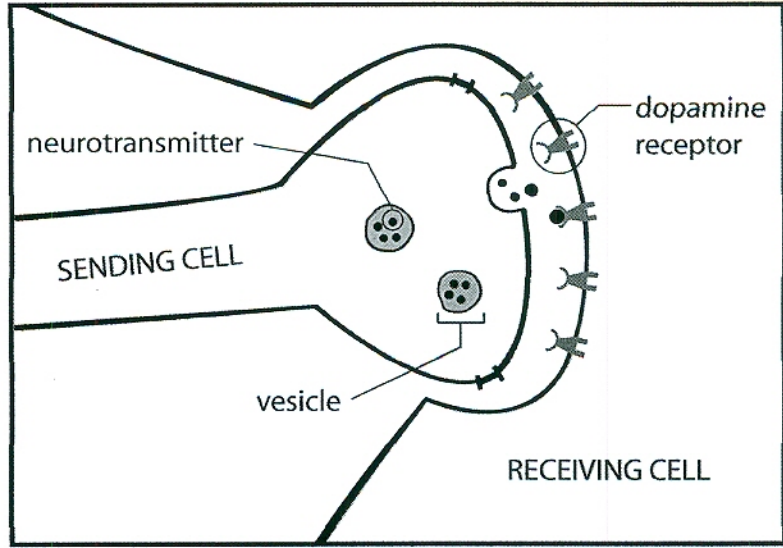
The components of the Reward Pathway are:

The Reward Pathway is responsible for:

Name _____

Date _____

3. *Crossing the Divide: How Neurons Talk to Each Other* (view the movie to answer the questions below).



Describe what is happening in the diagram above.

Assuming the sending cell started at rest, list the events that had to happen in order to get it to this stage.

What events will transpire next in order to complete the message?

Name _____

Date _____

Learn More: *The Other Brain Cells*

Glial Cell Type	Diagram	Function
Oligodendrocytes		
Microglia		
Astrocytes		

Drugs Alter the Brain's Reward Pathway

4. Categorize the *Drugs of Abuse*

Stimulant

Depressant

Other

5. Observe the mice at the *Mouse Party*.

Where is the action of each drug taking place?

All of the drugs affect the natural balance of neurotransmitters in the brain. T F

Learn More: *Drug Delivery Methods*

Name two reasons why the method of drug delivery is an important factor in addiction.

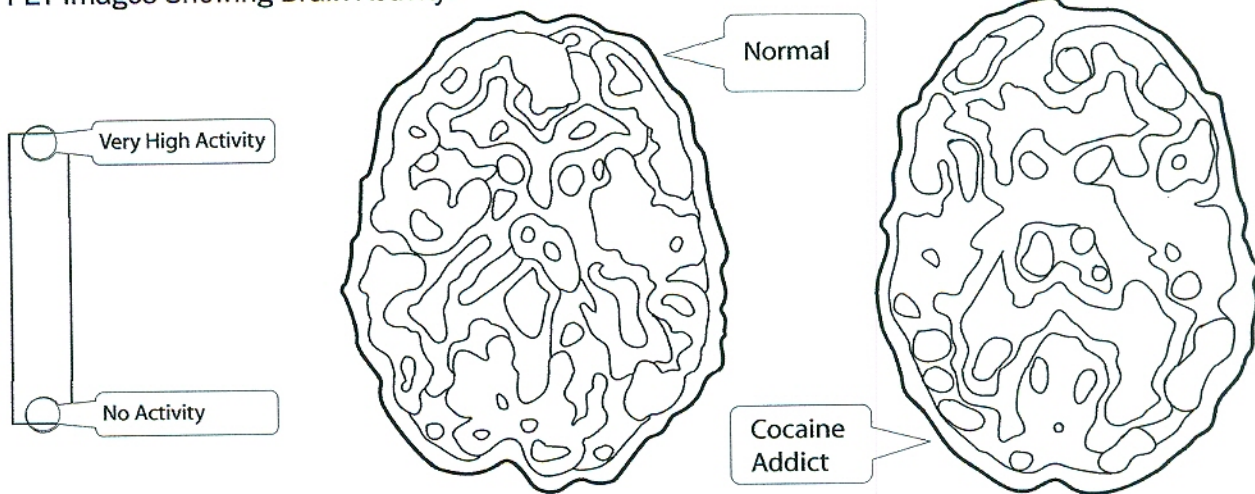
Name _____

Date _____

6. Play *Cerebral Commando* until you win. What was the most effective strategy?

7. Color in the PET scan images of the normal-functioning brain and the brain of a cocaine addict below:

PET Images Showing Brain Activity:



Learn More: *Brain Imaging Technologies*

A PET scan involves the following steps:

Step one:

Step two:

Step three:

Name _____

Date _____

Learn More: *Brain Imaging Technologies (cont'd.)*

Compare:	PET	MRI
Measures		
Electromagnetic Wave Detected		

Learn More: *Beyond the Reward Pathway*

Aside from memory, motivation and reward, what other functions controlled by the brain would you expect drugs that interfere with dopamine to affect?

List the main role(s) for each neurotransmitter below:

Dopamine:

Serotonin:

GABA:

Glutamate:

Name _____

Date _____

Learn More: *How Drugs Can Kill*

Complete the table below:

Class of Drug:	How it Kills
Polydrug Cocktails (ex. Alcohol and Heroin)	
Heroin and other Opiates	
Alcohol	
Nicotine	
Stimulants: Cocaine	
Methamphetamine	

Name _____

Date _____

Genetics is an Important Factor in Addiction

8. There is one addiction gene that has been identified by researchers. T F
9. Become the *Pedigree Investigator* and complete the pedigree for the Marshall family. Does the pedigree indicate a possible genetic component to nicotine addiction?
10. List the risk factors for nicotine addiction present in the Marshall family.

Learn More: *Discovering Addiction Genes Using the Candidate Gene Approach*

Briefly explain why the CHRNA4 gene might be a likely candidate gene for nicotine addiction.

Learn More: *Mice Are Good Model Organisms for Addiction Research*

Reasons why mice are a good model organism for addiction research:

1.

2.

3.

Name _____

Date _____

Timing and Circumstances Influence Addiction

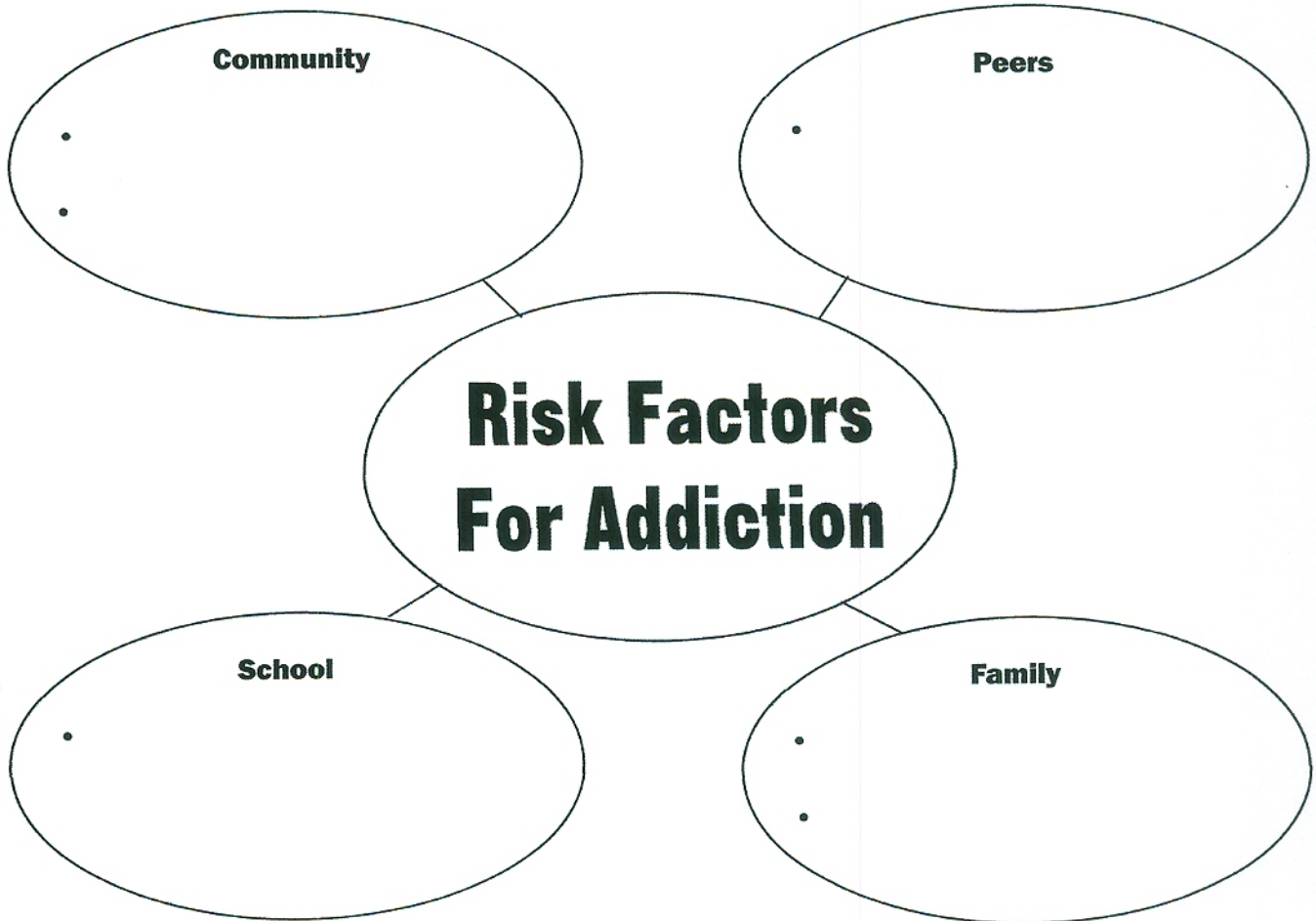
11. Name two reasons why the adolescent brain is particularly susceptible to developing a lifetime drug addiction.

1.

2.

Learn More: *Environmental Risk Factors for Addiction*

Fill in the circles below with the appropriate risk factors



Name _____

Date _____

Challenges and Issues in Addiction

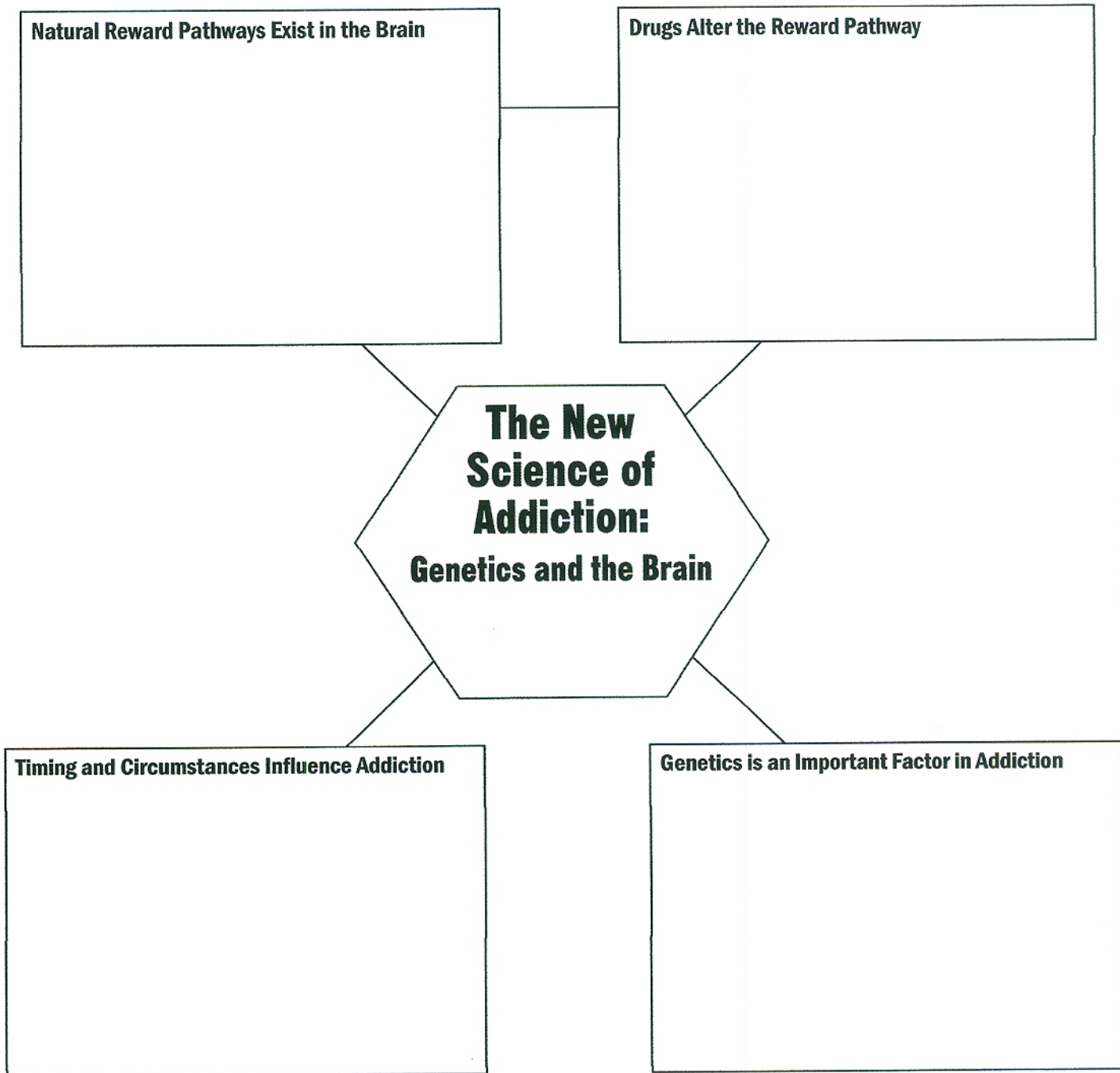
12. Which challenge/issue discussed on this page do you find most compelling? Why?

Name _____

Date _____

13. Summary

Fill in the boxes below to explain how each contributes to our new understanding of addiction:



Nervous System – regulates your body with electrochemical impulses

Endocrine system – produces hormones to regulate the body.

Adrenal gland makes adrenalin to regulate the body under stress.

Pancreas makes insulin and glucagon to regulate blood sugar levels.

Transport/Circulatory system – moves materials such as water, nutrients, hormones, and wastes through the body to the cells that need them.

Respiratory system- provides oxygen needed for cellular respiration. Cellular respiration is a process that releases energy from sugars.

Immune system – protects the body from pathogens. Pathogens are bacteria, viruses and parasites.

Excretory system – removes metabolic cellular waste from your body.

Lungs excrete carbon dioxide and water.

Skin excretes sweat.

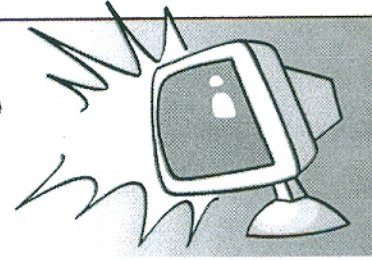
Kidneys filter wastes from blood for excretion and reabsorb nutrients.

The liver filters toxins and red blood cells from the blood.

Digestive system – breaks down food so that it is small enough to enter cells.



Tour of the Basics Web Quest



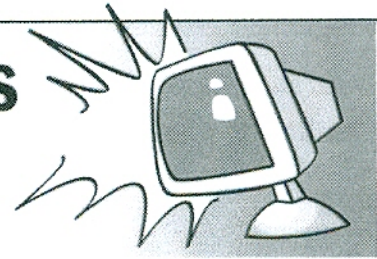
Log on to: <http://gslc.genetics.utah.edu/units/basics/tour/>. Explore this activity to find the answers to the questions below.

1. What is DNA?
2. What does "DNA" stand for?
3. What is the four-letter DNA alphabet and what are the special rules by which the alphabet pieces bond together?
4. What is a gene?
5. What are genes made of?
6. How many genes do humans have?
7. For what molecule do genes contain the instructions for building?
8. What is a chromosome?
9. How many chromosomes does a human cell hold?
10. How are the human sex chromosomes labeled?
11. How many different kinds of proteins does one cell contain?

12. *Why do scientists use computer programs to model protein structure and function?*
13. *What provides the "blueprint" for making a protein?*
14. *What is heredity?*
15. *Why aren't children identical to either one of their parents?*
16. *In humans, how many chromosomes does each parent pass on to their offspring?*
17. *Does the second baby in the What is Heredity? animation inherit the exact same chromosomes as the first? Do both babies have a complete set?*
18. *What is a trait?*
19. *List the types of traits that exist.*
20. *Give an example of how an environmental factor can influence a trait.*
21. *Briefly explain how the Hitchhiker's Thumb trait is determined using the following words: allele, dominant, recessive, homozygous, heterozygous. You may draw pictures if you wish.*



Cloning in Focus Web Quest



Log on to: <http://gslc.genetics.utah.edu/units/cloning> and explore this module to find the answers to the questions below.

1. Compare and contrast the following methods of Cloning:

	Embryo Twinning	Somatic Cell Nuclear Transfer
Similarities		
Differences		

2. How does Somatic Cell Nuclear Transfer (SCNT) differ from the natural way of making an embryo?

3. "Click and Clone" to create a mouse clone.

Write the steps involved in cloning your mouse below(continue on back if necessary):

What color coat will your mouse clone have?

4. Briefly explain the medical reasons for cloning.

5. List reasons, other than medical, for cloning.

6. What was the first organism cloned? How was it done? In what year did this take place?

7. What was the first organism to be cloned using nuclear transfer?

8. How were the first cows cloned?

9. What organism helped prove that cloning could be done using cells from males (up to this point all cloning experiments had been carried out using cells from females)? What was the organism's name?

10. In what year was the first human clone created and what stage of development did it reach before it stopped growing?

11. Give at least two reasons why a clone might not necessarily be a carbon copy of the donor organism.

Name the two animals (they are the same species) that serve as an example.

12. Test your knowledge in "Is it Cloning or Not?". What was your score and prize?

13. List and briefly explain the risks of cloning.

14. Choose one of the questions raised in "What Are Some Issues In Cloning?". Write the question and your response to it below.