

Day One:

Today, your child should complete their reading and practice problems for the week.

Below are the supplies for this week's lab:

One 3 X 5 inch (8 x 13 cm) card or other stiff paper
Black and red markers
Pen
Meterstick

National Science Education Standards covered this week:

12CLS5.6 As matter and energy flows through different levels of organization of living systems — cells, organs, organisms, communities — and between living systems and the physical environment, chemical elements are recombined in different ways.

Definitions

Alzheimer's disease	a disease in which changes within neurons cause the death of a large number of cells within the brain
amnesia	the loss of memory that may be caused by a blow to the head
autoimmune disease	a condition where the body attacks its own healthy cells
color blindness	the inability to perceive one or more colors
concave lenses	lens which bends light outwards; its structure is thinnest in the center
concussion	a general name given to any minor injury to the brain that is caused by a blow to the head
conduction deafness	a form of deafness; caused by damage within the middle ear which prevents a nerve impulse from being created
convex lenses	lens which bends light inwards; its structure is thickest in its center
diabetes	a medical condition which is caused by the inability of the pancreas to produce or utilize the hormone insulin
epilepsy	disorder of the brain; characterized by nerve impulses within the brain traveling much faster than normal
gigantism	condition caused by an abnormally large amount of growth hormone being produced during and beyond adolescence
goiter	condition in which the thyroid has grown very large; can be caused by hyper- or hypothyroidism
hyperopia (farsightedness)	the ability to see objects far away, but not near to you
hyperthyroidism	condition caused by the overproduction of the hormones thyroxine (T_3) and triiodothyronine (T_4)
hypothyroidism	condition caused by the underproduction of the hormones thyroxine (T_3) and triiodothyronine (T_4)
lidocaine	local anesthetic used to numb the surface of the skin

local anesthetics	numbing agents which block the sensation of pain by keeping sodium ions from entering and leaving the cell membranes of neurons
motion sickness	minor condition caused when the body undergoes rapid changes in speed and/or direction
mucus	a thick, slippery solution that is produced in several areas of the body; its functions are varied and plays an important role in several body systems
multiple sclerosis (MS)	disease in which a neuron's myelin is destroyed or lost; causes serious problems within the muscular system by slowing down or completely blocking the ability of muscles to function
myopia (nearsightedness)	the ability to see objects near you, but not far away
novocain	local anesthetic used for tooth pain
sensorineural deafness	a form of deafness in which an injury occurs within or beyond the inner ear; a nerve impulse may be generated, but the damage prevents the signal from reaching the central nervous system
stroke	a condition in which a vessel that supplies blood to the brain becomes blocked, inducing a series of potentially life-threatening symptoms

Sample questions to ask your child after completing the weekly reading.

How do local anesthetics prevent the sensation of pain?

Local anesthetics block the sensation of pain by keeping sodium ions from entering and leaving the cell membranes of neurons. A nerve impulse cannot be created without the movement of sodium ions.

What induces the condition known as multiple sclerosis and how do researchers believe it occurs?

The destruction or removal of myelin surrounding a nerve cell can cause serious problems within the muscular system by slowing down or completely blocking the ability of muscles to function. This debilitating disease is thought to be caused by the body's own immune system mistakenly identifying myelin as a foreign pathogen.

What are some of the symptoms of a concussion and when can they be observed?

The symptoms of a concussion include headaches, neck pain, confusion, difficulty remembering things, exhaustion, mood changes, loss of sleep, blurred vision, ringing in the ears, or amnesia. These symptoms may occur immediately or after a period of several days.

What are the symptoms from having an overproductive thyroid gland?

Sudden weight loss, rapid heartbeats, nervousness, irritability, and increased sweating.

Day Two:

Your child should check their work on the practice worksheets today with the answer key on the next page.

In addition, your child should read the lab activity and start collecting all of the necessary materials!

Answer Key for Practice Problems

Vocabulary Review

- | | |
|---------------------------|--------------------------------|
| 1) stroke | 13) multiple sclerosis (MS) |
| 2) autoimmune disease | 14) epilepsy |
| 3) Alzheimer's disease | 15) convex lenses |
| 4) sensorineural deafness | 16) concave lenses |
| 5) conduction deafness | 17) novocain |
| 6) concussion | 18) lidocaine |
| 7) diabetes | 19) motion sickness |
| 8) mucus | 20) local anesthetics |
| 9) gigantism | 21) hyperopia (farsightedness) |
| 10) hyperthyroidism | 22) myopia (nearsightedness) |
| 11) hypothyroidism | 23) color blindness |
| 12) goiter | 24) amnesia |

Multiple Choice

- 1) Concave
- 2) C
- 3) B
- 4) A

Application Questions

As a person ages, a decrease in the amount of myelin surrounding axons would decrease the speed of an action potential. In a similar vein, a reduced release of neurotransmitters by the presynaptic terminal of an older individual would result in fewer postsynaptic neurons receiving a nerve impulse. Furthermore, reduced numbers of pre/postsynaptic neurons would also decrease the speed of nerve impulses.

Day Three: Lab Activity

Your child should have already read through this lab and has been reviewing all of this week's vocabulary words.

Collect your supplies for the lab:

One 3 X 5 inch (8 x 13 cm) card or other stiff paper

Black and red markers

Pen

Meterstick

Measuring your blind spot or...

So that explains why I can never find my keys!

A simple series of experiments will be used to identify a person's blind spot.

Materials:

One 3 X 5 inch (8 x 13 cm) card or other stiff paper

Black and red markers

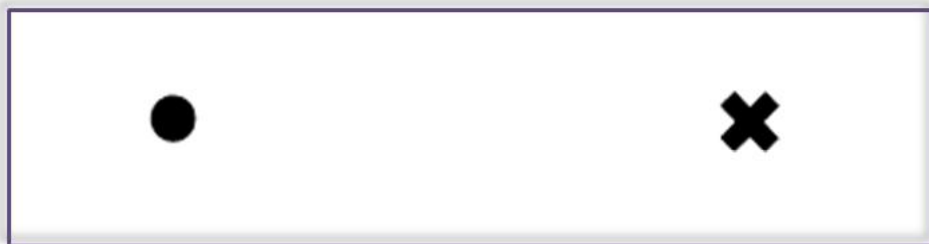
Pen

Meterstick

Procedure:

Activity One:

- 1) Using the black marker, place a dot and cross on the paper similar to the following image:



- 2) Hold the card at eye level approximately one arm's length away making certain the X is on the right side. You may use the meterstick to rest the card.
- 3) Close your right eye and focus on the X with your left eye.
- 4) Slowly slide the card on top of the meterstick towards your face. Pay close attention to the fact that at some time, the dot will disappear and then reappear as you pull the card even closer.
- 5) Repeat this activity by closing your left eye and focusing your right eye on the dot. The same result will occur with the X.

Activity Two:

- 1) Use the pen to draw a straight line across the card as shown in the image below:



- 2) Repeat the procedure from above. Take special note that when the dot or the X disappear, the line appears to be continuous, without a gap where the objects used to be.

Activity Three: You will likely need an assistant for this activity.

- 1) Mark an X on the left side of another note card similar to the image below:



- 2) Project the meterstick once again from your face as with the previous activities.
- 3) Rest the card exactly 9.75 inches (25cm) from your eyes.
- 4) Close your left eye and stare at the X with your right eye.
- 5) Have your assistance move the tip of red marker across the card slowly from the X.
- 6) When the tip of the marker disappears from your vision, have the assistant mark the spot on the paper.
- 7) Place another mark when the tip reappears.
- 8) Measure the distance between the two marks on the card. This number will be known as d .

9) Using the following formula, you will be able to determine the approximate size of your blind spot:

$$\frac{s}{2} = \frac{d}{D}$$

s is the diameter of your blind spot on your retina

d is the diameter of the blind spot on the card

D is the distance of the card from your eyes (9.75 inches or 25cm)

Solving for the diameter of your actual blind spot (s) should give you an answer that is close to 0.4 cm

Explanation:

The blind spot of an eye is a part of the retina that does not contain any photoreceptors. Without these receptors, nerve impulses cannot be transmitted and your brain is unable to provide any visual information for these specific areas. This is what happens when the various objects within these activities "disappear" from your vision. As photons of light bounce off these objects and enter the eye, they fall upon areas on the retina where it is impossible to generate a nerve impulse.

You might be wondering why this blind spot doesn't appear constantly in our everyday life. The reason this is not true can be found in the results of Activity Two. The extension of the line through the dot and X in Activity Two is accomplished by your brain "filling in" the blind spot with the surrounding images of the blind spot itself. This, in effect, fills in the area by extending the line across the card. This is a continual process by your brain and is the reason why objects don't mysteriously "disappear" from sight throughout the day.

Unit Quiz (Weeks 12-14)

Choose the correct answer in the following questions:

1) The pineal gland produces:

- a) insulin
- b) cortisol
- c) melatonin
- d) thymosin
- e) estrogen

2) Which of these hormones regulate calcium levels in the body:

- a) T_3 and T_4
- b) calcitonin and parathyroid hormone
- c) melatonin and glucocorticoids
- d) oxytocin and prolactin

3) The hormone responsible for the maturation of immune cells known as T cells is:

- a) aldosterone
- b) progesterone
- c) thymosin
- d) melatonin
- e) thyroxine

4) Which one of the following is NOT produced by the adrenal cortex:

- a) mineralocorticoids
- b) glucocorticoids
- c) aldosterone
- d) epinephrine

5) The element necessary in the diet for proper thyroid function is:

- a) sodium
- b) potassium
- c) iodine
- d) bromine
- e) calcium

6) Which one of the following is NOT an anterior pituitary hormone:

- a) prolactin
- b) antidiuretic hormone
- c) follicle-stimulating hormone
- d) adrenocorticotrophic hormone
- e) luteinizing hormone

7) The transport of glucose into and out of most cells, such as muscle and fat cells, occurs by facilitated diffusion. Once glucose enters a cell, it is rapidly converted to other molecules, such as glycogen. What effect does this conversion have on the ability of the cell to acquire glucose? Explain.

8) Brian is in a 50-mile bike race on a hot summer day. He's breathing dust at the end of the line, sweating profusely, and he just dropped his water bottle. How will his hormones produced by the pituitary and adrenal glands respond to decreased intake of water and the stress of the situation?

Unit Quiz Answer Key

- 1) c
- 2) b
- 3) c
- 4) d
- 5) c
- 6) b

7) A high concentration of glucose outside of the cell will be transported inside by facilitated diffusion. If glucose molecules are quickly converted to some other molecule within the cell, the amount of glucose transported into the cell will continue to occur. This is because the concentration of glucose molecules will continue to be lower within the cell as compared to its external environment.

8) Dehydration will stimulate the release of ADH from the posterior pituitary. ADH will increase water retention by the kidneys and will decrease sweating. Epinephrine and norepinephrine will be released in response to stress.