Applied Science

Our Technological World

FIFTH GRADE

WORKBOOK

students _____

APPLIED SCIENCE - SCIENCE AND MATH (5A)

PROBLEM: Can you learn how to estimate?

PREDICTION: _____
_____
_____

MATERIALS: 3 containers filled with items given to you by your instructor

PROCEDURE:

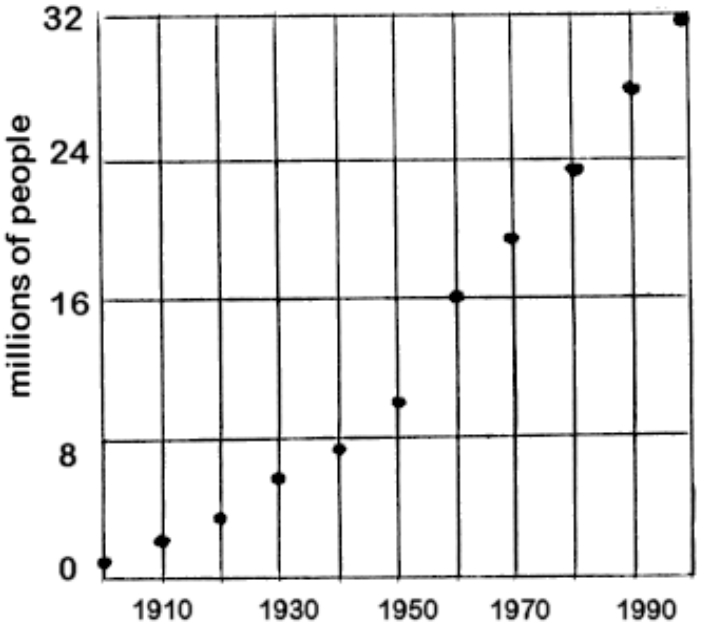
For each container: (1) estimate the number of items that are in the container and record, and (2) count the actual number of items it took to fill the container and record. Complete one container at a time. Record the results below.

ITEM	1	2	3
ESTIMATION			
ACTUAL NUMBER			

Plot the above data as a bar graph on the chart below as accurately as possible. The difference between the actual number and the number estimated is the margin of error (how far off the estimation was). Color the margin of error a separate color. Make the x axis estimation/actual number, and y axis the number of items.

CONCLUSIONS: Summarize your findings. Discuss your margin of error for each container. Were you close? _____
_____
_____

CALIFORNIA'S POPULATION, 1900 - 2000



1. Connect the dots to make a LINE GRAPH.

2. From 1900 to the year 2000, has California's population increased or decreased?

_____

3. During the year 1970, what was California's population?

_____

4. Assuming the extrapolation the data from 1990 to 2000 is accurate, from 1960 to the year 2000, will California's population double or triple?

_____

5. What will be the population in California in the year 2040, if its population growth continues at the rate shown in the graph above? How did you figure out the answer?

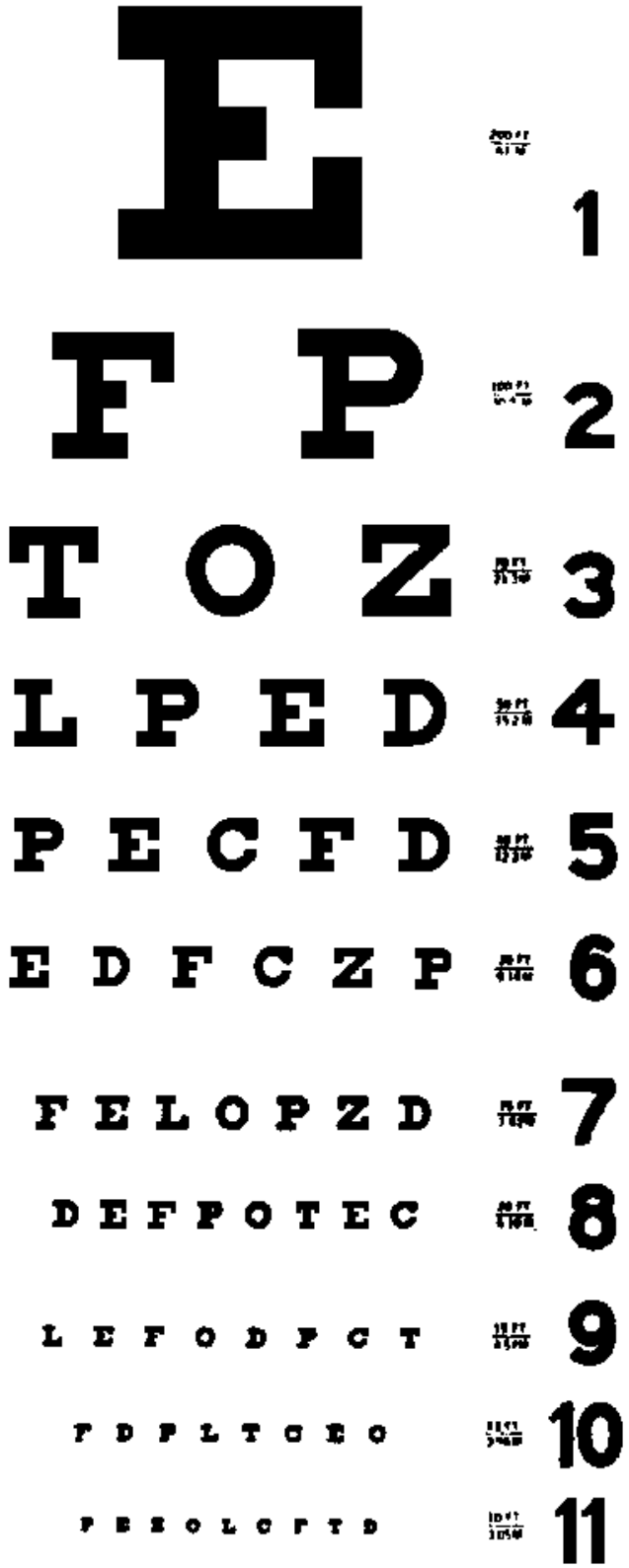
_____
_____

MEASUREMENT OF YOUR BODY

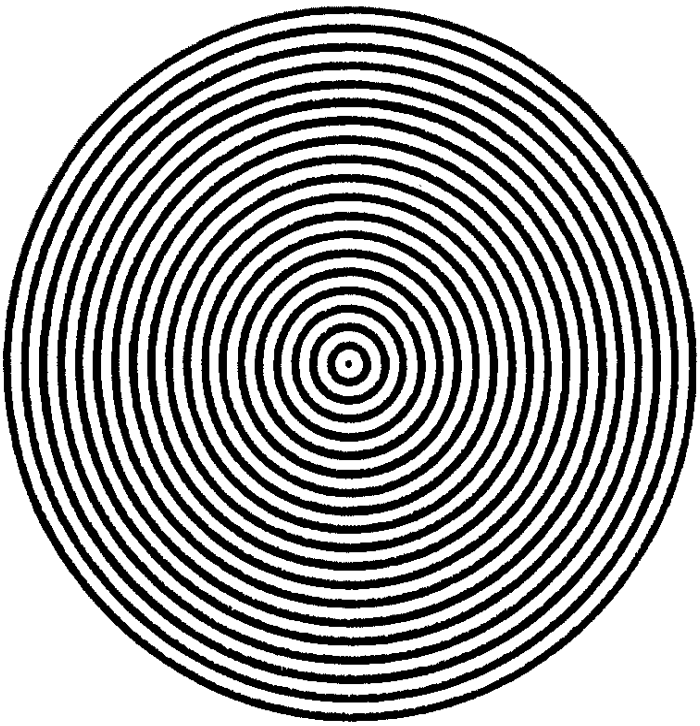
Use a ruler or tape measure and record your measurement in centimeters.

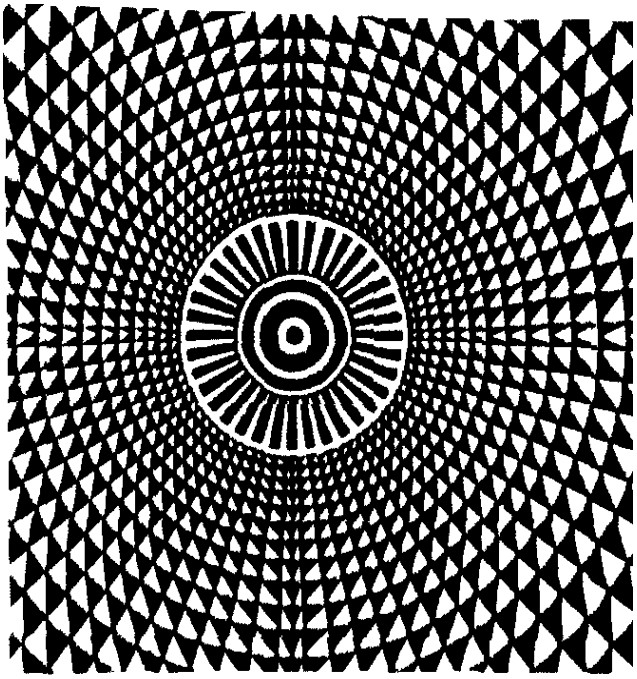
	cm
hand span	
right foot	
left foot	
right ear	
smile width	
between eyes	
right arm	
left arm	
arm span	
head size (girth)	
height	
wrist	

Measure other parts you might want to know.


E
1
F P
2
T O Z
3
L P E D
4
P E C F D
5
E D F C Z P
6
F E L O P Z D
7
D E F P O T E C
8
L E F O D P C T
9
F D P L T C E O
10
P E Z O L C F T D
11

ASTIGMATISM





APPLIED SCIENCE - SCIENCE AND MATH (5B)

PROBLEM: How many students in the class have better than 20/20 (6/6) eyesight?

PREDICTION: _____

_____

MATERIALS: Snellen eye chart, astigmatism chart

Measure 20 feet (6 meters) away from the eye chart. Have your partner stand on that line. Point to several of the lines on the chart and record which lines they can see and which ones they cannot. Tabulate what eyesight you think the student has. Have your instructor check your conclusion. Use your partner's lab sheet to record the information.

Partner who is recording _____

EYE	LINES THAT CAN BE READ	LINES THAT CANNOT BE READ
left		
right		
both		

Figure out your eyesight for "both" eyes. _____

Look at the astigmatism chart. Describe what you see. Do you have astigmatism?

_____

_____

After the class is finished with testing, the teacher should find out the following by a hand count. Record the class results.

	GIRLS	BOYS
less than 20/20		
20/20		
more than 20/20		

CONCLUSION:_____

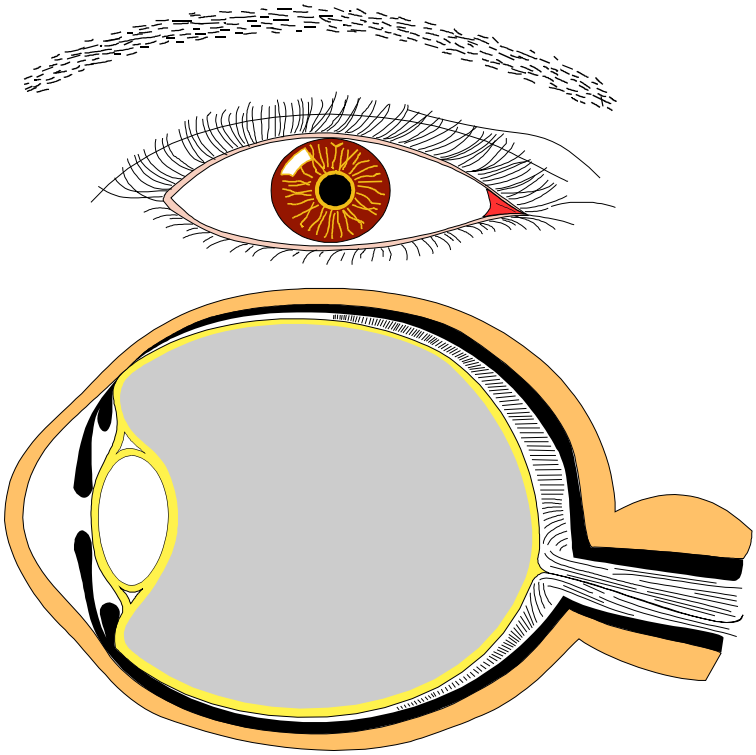
_____

_____

_____

APPLIED SCIENCE - SCIENCE AND MATH (5B)

1. Below are pictures of the eye. Label each part of the eye from information derived from your research.



Write down the websites or books that helped you discover more about diseases of the eye.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

SOMETHING INTERESTING ABOUT SOUND

Sound is everywhere. We know when someone opens the door or when you are on the beach. The sounds are different. Can you explain sound. Use any book, encyclopedia or ask a knowledgeable person.

APPLIED SCIENCE - SCIENCE AND MATH (5C)

PROBLEM: How can you determine if sound is a physical wave?

PREDICTION:_____

PROCEDURE:

MATERIALS: 6 jars (same size); water, stick, tuning forks

EXERCISE I. Stretch a rubber band to different lengths and describe what happens to the pitch of the sound _____

EXERCISE II. Hit the tines of the tuning fork on a hard surface and touch the tines to the items listed below. Record what happens and see if you can hear the tuning fork.

ITEM	WHAT HAPPENS	CAN YOU HEAR
nose		
hand		
nail		
paper		
pencil		
pen		
surface of water		
other:		

EXERCISE III. Using 6 jars, fill each with the appropriate amount of fluid in the chart below. Record the type of sound produced when you tap it with a drumming stick. Describe the quality of the pitch.

JAR CONTENTS	DESCRIPTION OF SOUND
A. empty	
B. 1/4 full	
C. 1/3 full	
D. 1/2 full	
E. 2/3 full	
F. 3/4 full	

CONCLUSIONS: Do the above experiments illustrate that sound is a physical wave? What else did you learn?

_____

APPLIED SCIENCE - PHYSICS (5A)

PROBLEM: How can you distinguish between diffraction, reflection, and refraction of waves?

PREDICTION:_____

PROCEDURE: Go to the different stations and determine if the wave is physical or electromagnetic. Perform the activity and determine whether you are showing diffraction, reflection or refraction. Remember LASER SAFETY.

	PHYSICAL OR ELECTROMAGNETIC	DESCRIBE MOTION
STATION 1. Pencil in glass of water		
STATION 2. Use laser-slits in aluminum foil 0, 2 and 5 mm apart		
STATION 3. Tuning fork in pie tin half full of water		
STATION 4. Spoon hitting surface of water		
STATION 5. Slinky motion (push pull)		
STATION 6. Rope oscillating		
STATION 7. Flashlight through prism		
STATION 8. Mirror		
STATION 9. Flashlight through convex lens		
STATION 10. Turbo yo-yo		

CONCLUSIONS: How did you detect the different type of wave motion?

_____

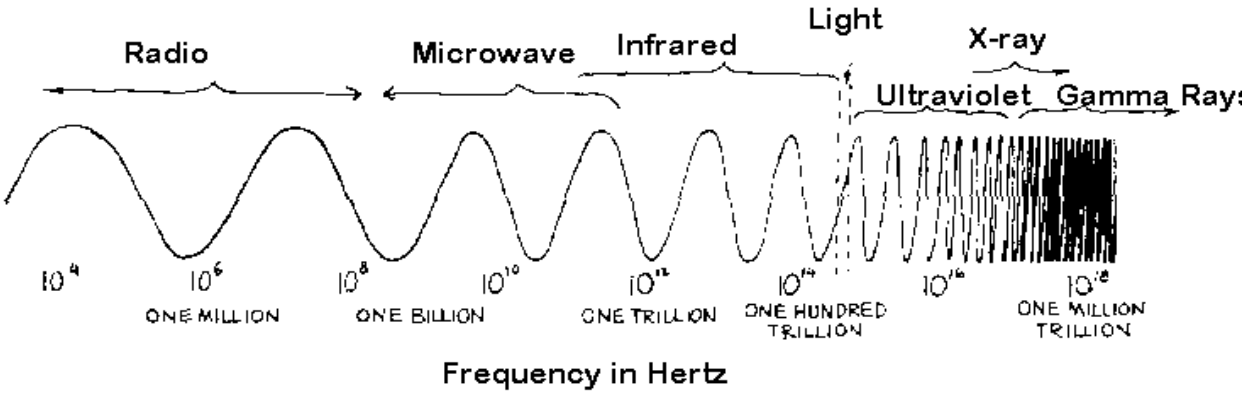
_____

_____

APPLIED SCIENCE - PHYSICS (5A)

ELECTROMAGNETIC WAVES

The illustrations below demonstrate most electromagnetic waves that we know. Frequency of a wave is the number of vibrations in a given time (measured in Hertz). The higher the frequency the smaller the wavelength, the lower the frequency the larger the wavelength.



1. Which wave has the highest frequency?
_____

2. Which wave has the lowest frequency?
_____

3. Which wave can we see? Circle and label this light on the diagram.
_____

4. Which wave can we hear? Why isn't this wave on the chart?
_____

5. Which wave can take a picture of your bones?
_____

6. What uses microwaves? _____

7. Where do television waves come from?
_____

8. Where do radio waves come from?
_____

APPLIED SCIENCE - PHYSICS (5B)

PROBLEM: How does a kaleidoscope work?

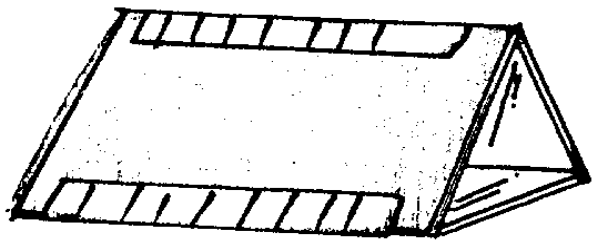
PREDICTION:_____

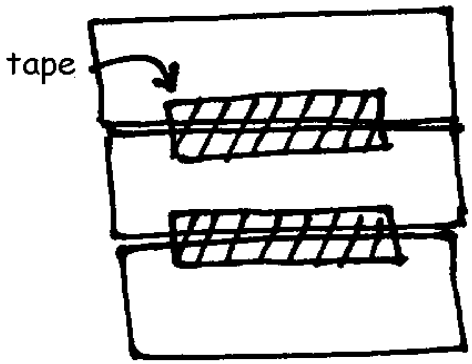
_____

PROCEDURE: Materials: ruler, tape, silver mylar sheets, 3/4 oz plastic cup, toilet paper tube, paper towels

1. Measure 3 pieces of 2.5 cm by 10 cm piece of silver mylar that your teacher will provide. If you have a different size tube consult your teacher. Join the 3 pieces of silver mylar into a triangular prism. MAKE SURE YOU PUT THE SHINY SURFACE INSIDE. Tape the triangular prism together. (see picture below)
2. Put a small number of colored beads or any other materials in the plastic cup. Record what you put in your kaleidoscope. Position the cup in one end of the toilet paper tube. Put the lid on the cup.
3. Wrap the triangular prism in paper towel (you may need 2 or 3 sheets depending on the thickness of the towel) so it fits snugly in the tube.

Point the tube toward a light source and rotate the plastic cup as you look through the open end of the tube. You have just made a kaleidoscope. List what and how many items you put in your kaleidoscope.





LOOK AT YOUR KALEIDOSCOPE. Draw what you see in the tube without turning it. How many sections is it divided into?

_____

Look through your partners kaleidoscope. Is it different from yours? How?

_____

_____

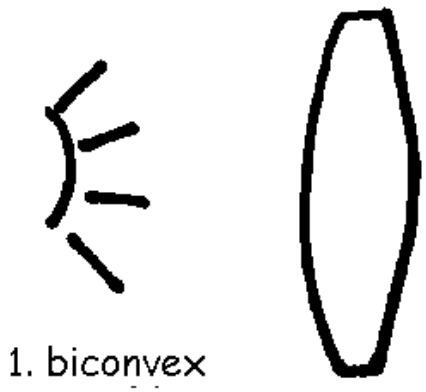
CONCLUSION: Why do you think a kaleidoscope works. Explain?

_____

APPLIED SCIENCE - PHYSICS (5B) POST

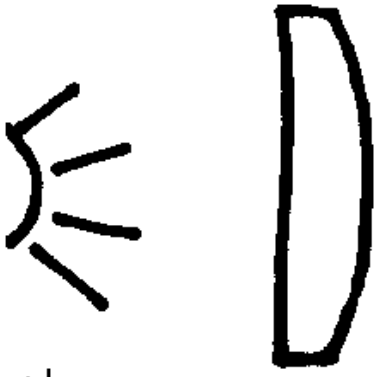
REFLECT OR REFRACT?

Trace the path of light from the different lenses. Note where the light source is and if there is mylar. Remember mylar will reflect light.

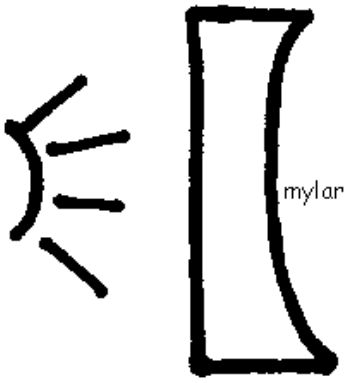


1. biconvex

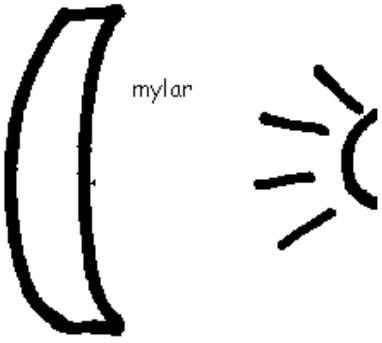
2. biconcave



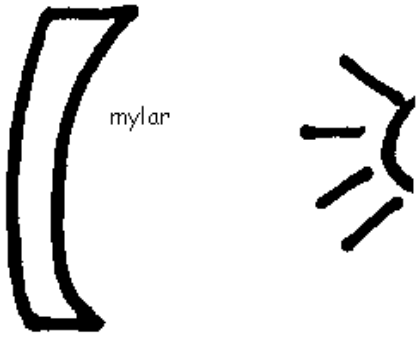
3. planar convex



4. planar concave



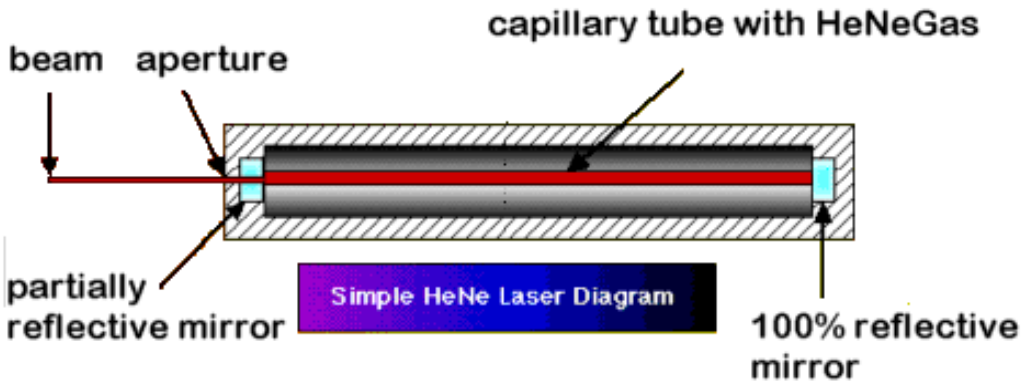
5. meniscus convex



5. meniscus concave

APPLIED SCIENCE - TECHNOLOGY (5A)

Lasers are neat! It almost seems like the photons of light have joined together to make a powerful and beautiful tool. The term "laser" really is a condensed word meaning: **L**ight **A**mplification by **S**timulated **E**mission of R*adiation.*



The above picture shows how light from helium and neon can become a laser light. Can you explain?

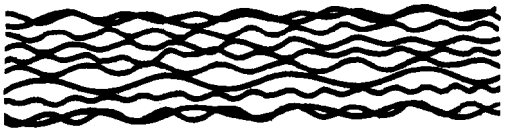
_____
_____
_____

List some places or items where you may have hear the word laser and write them down.

_____
_____
_____
_____

Which one of the following is the type of pattern generated by laser? Which one is produced by sunlight? _____
_____

Coherent light wave pattern



Incoherent light wave pattern

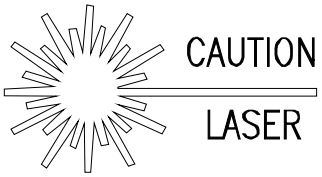
APPLIED SCIENCE - TECHNOLOGY (5A)

PROBLEM: Is there a difference between light from a laser and a flashlight?

PREDICTION: _____

MATERIALS: lens, prism, cube magnifier, ulexite, quartz, mirror, laser, flashlight

PROCEDURE: IF YOU ARE USING THE LASER, LISTEN TO YOUR TEACHER'S INSTRUCTIONS. LASERS ARE NOT TOYS AND MUST BE HANDLED WITH CARE. DO NOT STARE AT LASER LIGHT!



Shine the light of the flashlight through your items. If the room is not dark, use a black piece of paper as the backing so your images will show up. Record what you see. If you are using a laser, shoot one of the beams through the same material and draw what you see in the appropriate space below.

ITEM	FLASHLIGHT	LASER
PRISM		
QUARTZ		
ULEXITE		
CUBE MAGNIFIER		
MIRROR		
BICONVEX LENS		
CALCITE		

CONCLUSION:_____

_____

APPLIED SCIENCE - TECHNOLOGY (5A)

FIND DIFFERENT TECHNOLOGIES THAT USE LASERS?

Use the Internet to search “lasers” and list the different products that you can find.

_____
_____
_____
_____
_____
_____
_____

Many of you have seen holograms. Many stickers that “flicker” are actually holographic images. There are artists that specialize in holograms. Holograms are made by lasers. But how are they made. Search the web for “holograms” and see if you can understand what and how holograms are made. The picture and information below were found searching the web. After your search, see if you can explain how a hologram is made with your own words. Write them down in the space provided.

HOW IS A HOLOGRAM MADE?

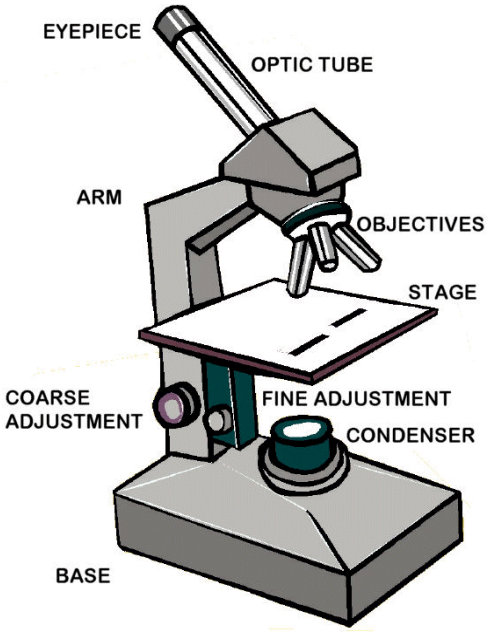
The custom artwork is then sent to our holography laboratory where the holographer creates and combines the necessary photographic and holographic elements to produce a "master" hologram on special photosensitive emulsions.

As with all holograms, the multidimensional image is recorded as a unique "interference pattern" which is created using laser light and precision optical techniques.

_____
_____
_____
_____

COMPARING HOW LIGHT IS USED IN A MICROSCOPE

1. Draw the **Swift GH** in the space below and label the appropriate parts.



2. Define the function of the following parts.

ARM	
CONDENSER	
EYEPIECE	
OBJECTIVE	
STAGE	

3. Trace how light goes through an object and through the optic tube of the transmitting light figure and the **Swift GH** figure you drew.

APPLIED SCIENCE - TECHNOLOGY (5B)

PROBLEM: Do people focus differently using the same objective on the microscope?

PREDICTION:_____

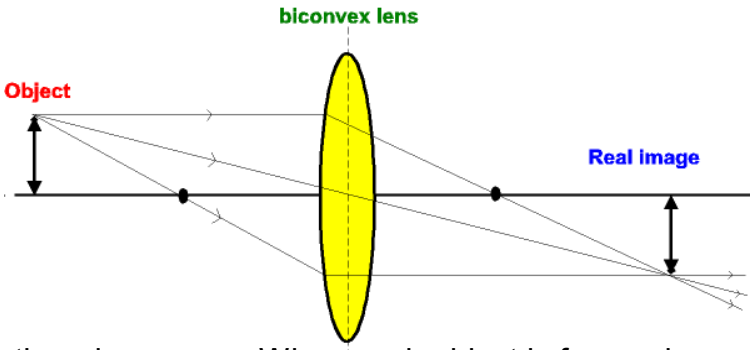
_____

MATERIALS: reflecting microscope, ruler, 5 objects, lens, index card

PROCEDURE:

EXERCISE I. Find the optical element-image distance. Using a convex lens and a source of light (near a window), create an inverted image. Look at diagram below. Measure the distance from the inverted image (or index card) to the lens. Record your answer and compare it with the image your partner found.

YOUR DISTANCE: _____
PARTNER'S DISTANCE: _____



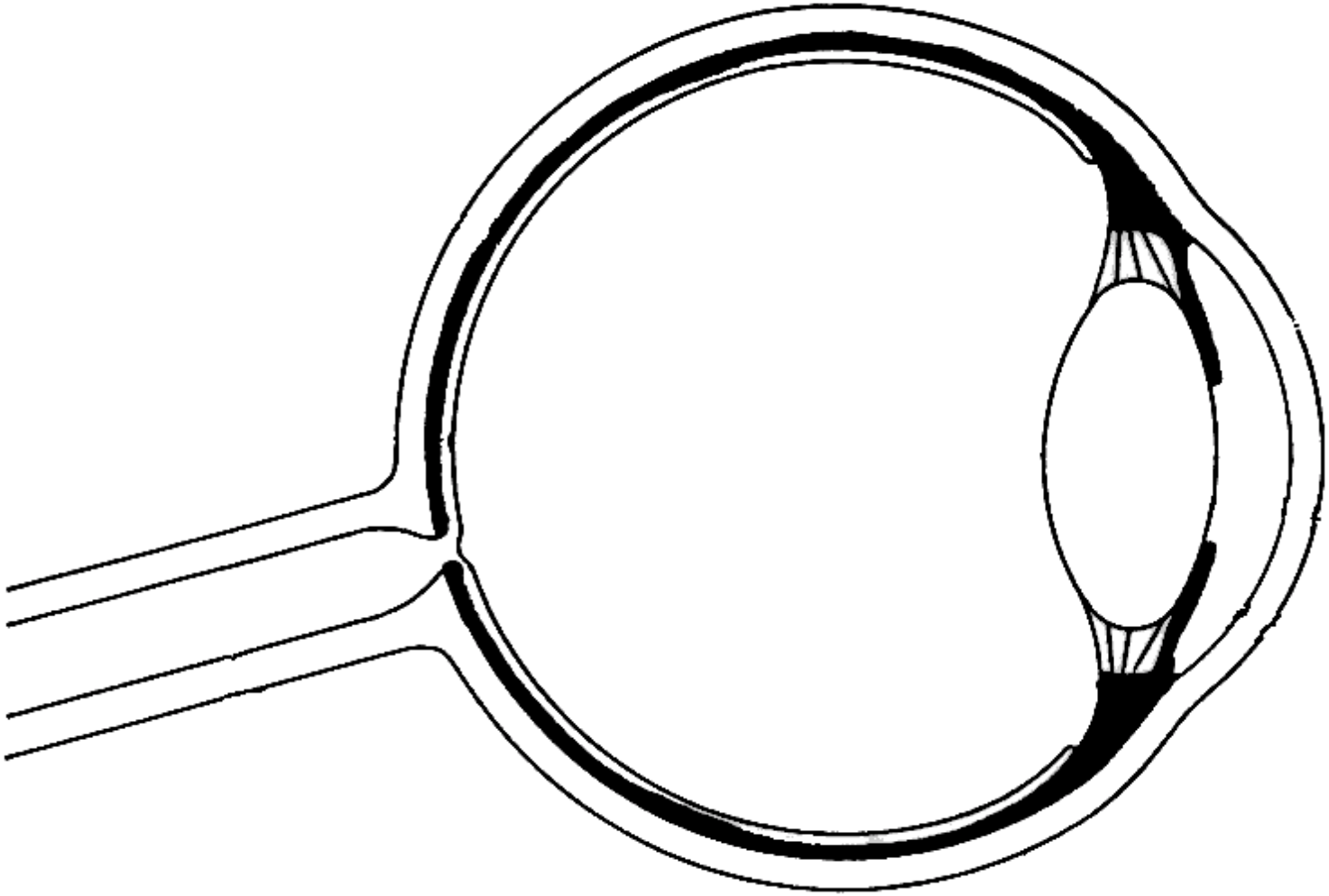
EXERCISE II. Look at 5 objects under the microscope. When each object is focused, measure the distance from the object to the objective. Record the focal distance in the graph below. Compare with 2 other groups and see if the focal distance is the same or not. Write your observations under the conclusions.

Specimen Used	Your Data	Group 1	Group 2

CONCLUSIONS: Is the focal distance the same for all objects? How did you prove this?_____

APPLIED SCIENCE - TECHNOLOGY (5B) POST LAB

HOW THE EYE SEES IMAGES



APPLIED SCIENCE - BUILT ENVIRONMENT (5)

In the first 2 columns on this chart, write down the types of sounds you hear in 24 hours and the sources of those sounds. For each sound on your list, decide the decibels of that noise. Then decide how necessary each noise is (somewhat, or not at all). Finally, make suggestions for reducing the noises on your list in the proper columns.

jet airplane, 100 feet away	140 db
air raid siren, nearby	125 db
rock music, amplified	120 db
riveter	95 db
busy street traffic	70 db
conversation in home	65 db
quiet radio in home	40 db
whisper	20 db
rustle of leaves	10 db
threshold of hearing	0 db

SOUND	SOURCE	DECIBEL	HOW NECESSARY	HOW REDUCED

APPLIED SCIENCE - BUILT ENVIRONMENT (5)

PROBLEM: Are all light bulbs the same inside? Why or why not?

PREDICTION:_____

MATERIALS: 4 different light bulbs, microscope
PROCEDURE: Look at light bulbs at your station and draw the inside of the bulb. You may use a microscope. Make sure that the filament is 5.5 cm away from the objective. Remember the bulbs are glass. HANDLE WITH CARE. Label the following: glass, filament. Trace the flow of the electrons through the light bulb in each of the pictures.

Your teacher has a light bulb that is producing light. Look and see if you can determine what produces the light. Use the following space to make notes.

_____

_____

CONCLUSIONS: Why do light bulbs have different filaments?

_____
_____