Lab Booklet

Science, Secondary 2

Name: _____

Group: _____

Teacher: _____

Table of Contents

Meet An Element Project- Description and Rubric

Due Date: _____

Task: Part A: 3-D Model

You will select an atom from the periodic table and create a 3-D model. The model must contain the following information:

Criteria	Mark
Protons (correct #, clearly identifiable, correct location)	/2
Neutrons (correct #, clearly identifiable, correct location)	/2
Electrons (correct #, clearly identifiable, correct location)	/2
Legend	/2
Presentation	/2
TOTAL:	/10

Part B: Brochure

You are to create a brochure that presents a particular element and promotes its usefulness in our lives. The brochure must contain certain scientific information as well as have enough of a "sales pitch" presentation that people who read your brochure will be excited to purchase products that feature your chosen element.

Marking Grid: Follow this marking grid to make sure your brochure contains all the necessary information

Criteria	Mark
Name of Element (common and scientific, where applicable)	/2
Symbol with Atomic Mass and #	/2
Characteristic Properties	/2
Appearance	/2
History	/2
Uses	/2
Product Info	/3
Images	/5
Presentation/Style	/5
TOTAL:	/25

Title:

Name:

Partner:

Date:

Questions:

Part A: Does the size of the balloon change the power of the pull?

Part B: Will two balloons attract or repel if both are rubbed in hair?

Hypotheses:

Part A:

_____
_____
_____

Part B:

_____
_____
_____

Materials (for both Part A and Part B):

An empty soda cans

2 blown-up balloons of different sizes (one the size of a fist the other the size of two fists)

A head of hair

Ruler

60 cm string

Procedure:

Part A

1. Blow up the balloons to the indicated sizes.

2. Place the can on its side on a flat smooth surface like a table or a smooth floor.

3. Rub the smaller of blown up balloons back and forth through your hair really fast 10 times.

4. Hold the balloon close to the can without actually touching the can.

5. Record the distance at which the soda can starts roll towards balloon.

6. Neutralize the balloon by holding it.

7. Repeat steps 1-5 four times.

8. Replace the small balloon with the large balloon and repeat steps 1-6 for a total of 5 times.

Part B:

1. Tie the two blown up balloons together.

2. Rub each of blown up balloons back and forth through your hair really fast 10 times.

3. Do not allow the balloons to touch anything including each other.

4. Place your finger mid-way along the string.

5. Allow balloons to hang down **without** touching anything.

6. Observe whether balloons are attracted to each other or repel.

7. Neutralize the balloons by holding them.

8. Repeat steps 2 – 7 four more times.

Results:

Part A:

Balloon Size	Trial #1	Trial #2	Trial #3	Trial #4	Trial #5	Average
Small						
Large						

Part B:

Trial number	Observation (attraction or repulsion)
1	
2	
3	
4	
5	

Analysis:

1. Why is the soda can attracted to the balloon?

   _____
   _____
   _____

2. How are the averages for the small balloon and large balloon different?

   _____
   _____
   _____

3. To what can the difference in averages be attributed?

   _____
   _____
   _____

4. Why did the balloons attract/repel each other?

   _____
   _____
   _____

Conclusion

- Summarize your results in a few sentences and use this summary to explain results
- State whether your results support or contradict your hypothesis
- State the scientific principles behind this experiment.
- List sources of error
- Suggest changes in the experimental procedure (or design) and/or possibilities for further study.

Physical and Chemical Changes Demonstration

Demo	Observations Before	Observations After	Physical or Chemical Change? (Give reason for your choice)
Iodine			
NaI & $Pb(NO_3)_2$			
Vinegar and Baking Soda			
Magnesium			
Sugar & Sulphuric Acid			
Chalk			
Nickel Chrome			

Characteristic Properties

TITLE:

NAME:

DATE:

AIM: To determine the identity of an unknown substance using characteristic properties

HYPOTHESIS:

MATERIALS:

Triple Beam Balance

100 ml Graduated Cylinder

Ruler

PROCEDURE:

1) For Mass

2) For Volume

OBSERVATIONS:

Object	**Mass (g)**	**Volume (ml or cm^3)**	**Density (g/ml or g/cm^3)**

CALCULATIONS: Show your calculation for Density

ANALYSIS & CONCLUSIONS:

1) What is the identity of each object and how were you able to identify them?

The Cube is _____ because

_____

_____

The Rectangular Prism is _____ because

_____

_____

The Cylinder is _____ because

_____

_____

2) What is a characteristic property?

3) Identify each of the following as characteristic or non-characteristic.

a) _____ Mass
b) _____ Volume
c) _____ Density
d) _____ Color

4) Was your hypothesis correct of incorrect? Why?

5) List any possible errors that could have happened during the experiment.

_____ _____

_____

Aim: To determine the properties of five mineral samples.

Materials:

- 1 mineral sample kit
- 1 magnet
- 1 streak plate
- 1 penny
- 1 triple beam balance
- 1 nail
- 1 graduated cylinder (_____)
- 1 glass plate
- 1 overflow can

Procedure:

1) Select a sample from the mineral kit

2) Determine the colour and lustre by _____

3) Test magnetism by _____

4) Determine the hardness of the sample by using the following guide:

Scratched by (Tool):	**Hardness**
Fingernail	2.5 or less
Penny	2.5 – 3
Nail	3 – 5.5
Glass Plate	Greater than 5.5

5) Gently rub the sample on the streak plate and observe the streak colour

6) _____the triple beam balance and determine the mass of the sample

7) Using_____, determine the volume of the sample

8) Using the calculate mass and volume determine the _____ of each sample

9) Repeat steps 2-8 for all remaining samples (4)

Observations:

Title: _____

Sample Name	Colour	Lustre	Magnetism	Hardness	Streak	Mass (g)	Volume (mL)	Density (_____)

Calculations:

Analysis:

1. Of the five minerals tested, which was the hardest?

_____

_____

2. Of the five minerals tested, which had the lowest density?

_____

_____

3. How could you measure the hardness with a greater precision?

_____

_____

_____

Name: _____

Group: _____

Poster Presentation:

Rocks or Minerals

SCIENCE AND TECHNOLOGY, Cycle 1, Year 2

In teams of two, students will research one (1) rock or mineral that has been selected and provide a poster, which will serve as an information document to educate other students about the chosen rock or mineral by being displayed in either the classroom or hallway.

- Your poster must include:
  - Name of your rock or mineral
  - Description, properties, nature (igneous, metallic etc)
  - Where it is found/mined (country, region), how prevalent, how it is processed (be concise)
  - Interesting fact: something odd, informative, or something to make others think
  - Uses: At least 1 photo + list
  - Description: Characteristic and non-characteristic
  - Research sources list.

Project Assigned:

Project Due:

This is for the Birds
Activity 1 – Feeding Frenzy

Problem

You woke up this morning feeling a little bit strange. You have a look at your feet and you only have 4 long, skinny toes. You look where your hands should be and they are covered in feathers! You are a bird! You hurry to the bathroom mirror to confirm your doubts. You definitely look like a bird, but there is one problem, you do not have a beak. After the initial shock, you realise that you are hungry, so you head for the kitchen. You open the cupboards and your mouth starts watering. In order to eat, you will have to make yourself a beak. Which tool will be most efficient?

Hypothesis

_____
_____
_____

Materials

1 Spoon	1 Tweezers	1 Pair of Chopsticks
30 pennies	30 marbles	30 toothpicks
1 Styrofoam cup	1 paper plate	1 stopwatch

Procedure

-In groups of 3-4 use the materials (1 tool for each student) provided by the teacher to transfer as much of the food from your feeding station (paper plate) to your stomach (Styrofoam cup).
-You may only use one hand to complete this challenge.
-In the table below, record the quantity of food you were able to transfer to your stomach in one minute.
-You may only pick up one food item at a time.
-Complete a total of three trials for each type of tool and food.
-Share your results with your team.
-Calculate the average quantity for each tool and food type.
-Use a bar graph to graph your team's average results.

Observations and Results

Spoon

Type of Food	Quantity of food collected in 1 minute			
	Trial 1	Trial 2	Trial 3	Average
Marbles				
Pennies				
Toothpicks				

Tweezers

Type of Food	Quantity of food collected in 1 minute			
	Trial 1	Trial 2	Trial 3	Average
Marbles				
Pennies				
Toothpicks				

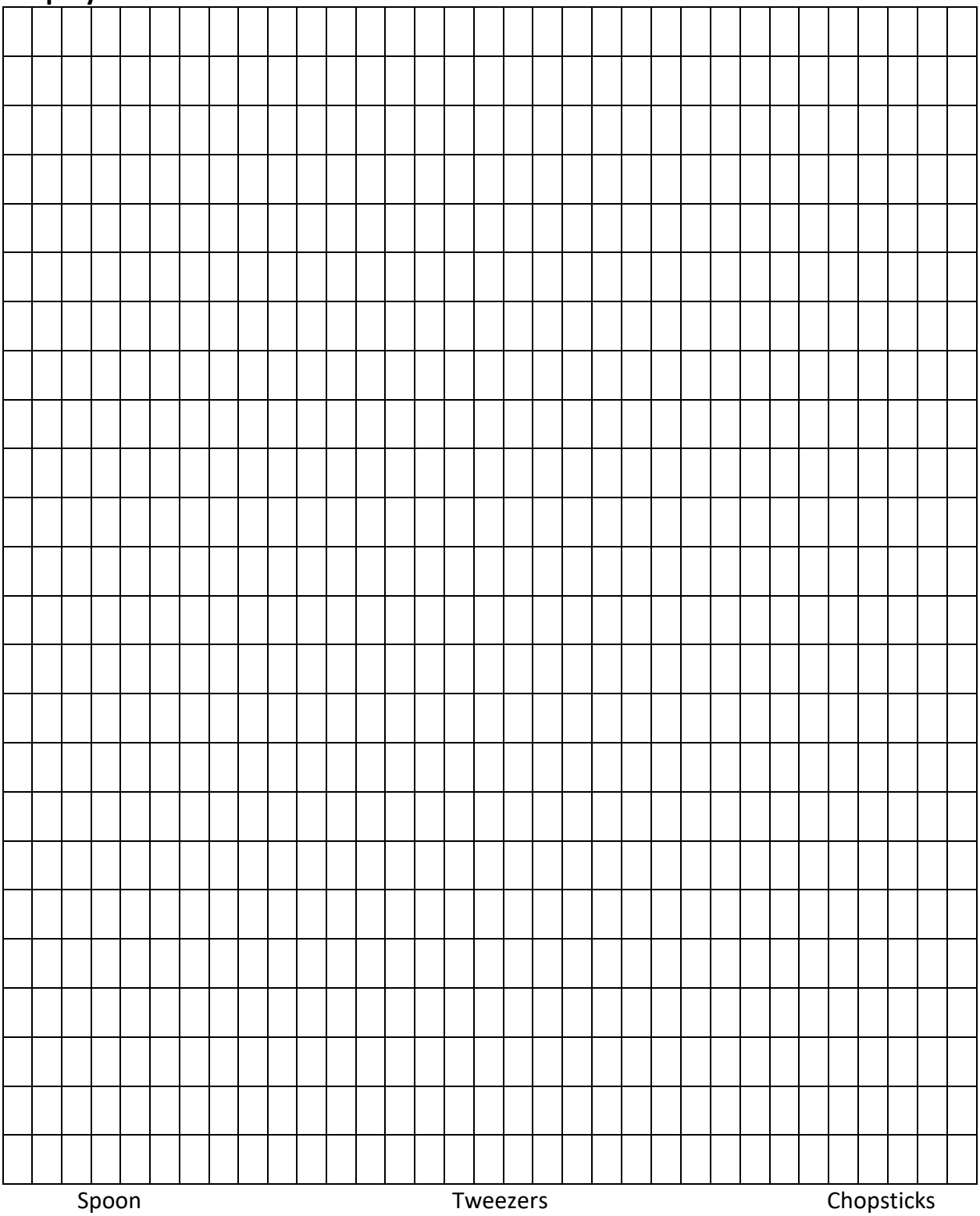
Chopsticks

Type of Food	Quantity of food collected in 1 minute			
	Trial 1	Trial 2	Trial 3	Average
Marbles				
Pennies				
Toothpicks				

Sample Calculation

Trial 1 + Trial 2 + Trial 3 = _____ Divide by 3 = Average _____

Graph your results.



Legend

Marbles ☐ Toothpicks ☐

Pennies ☐

Analysis and Discussion

State which beak is most efficient for each type of food?

_____

_____

_____

_____

Why were the other beaks not as efficient?

_____

_____

_____

_____

Suggest other tools that would be more efficient than the ones supplied by the teacher.

_____

_____

_____

_____

Conclusion

Explain how this proves or disproves your hypothesis.

_____

_____

_____

_____

_____

_____

_____

Activity 2 – Penny Teeter-Totter

Problem

How does a lever work? What happens when we move the fulcrum further away from the load?

Hypothesis

_____

_____

Materials

1 rigid ruler 30 cm long
2 pencils
1 eraser
10-15 pennies
Tape
Triple Beam Balance
Paper

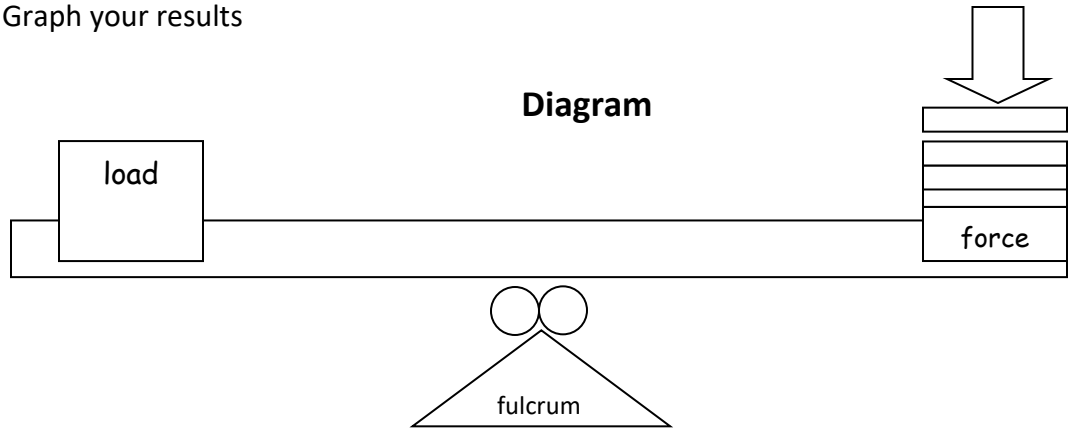
Procedure – Part 1

1. Tape the pencils side by side on the table so that they don't roll.
2. Place the ruler perpendicularly across the pencils so that the 15 cm mark is between the two pencils. This is the location of the fulcrum. Once it is balanced try not to move it for the rest of the experiment.
3. Find the mass of the eraser (load). Record this in the table.
4. Find the mass of one penny (force). Record this in the table.
5. Place the load on one end of the ruler, 1 cm from the edge.
6. Stack the pennies gently on the free end of the ruler until the ruler is balanced again.
7. Count the number of pennies and record in the table.
8. Calculate the total mass of the pennies. Record this in the table.

Procedure – Part 2

1. Remove the pennies from the lever from Part 1
2. Repeat the procedure from Part 1 so that the fulcrum is placed at the 17 cm mark on the ruler.
3. Record your results in the table.

4. Repeat for each of the following:
   - fulcrum at 19 cm
   - fulcrum at 21 cm
   - fulcrum at 23 cm
   - fulcrum at 25 cm.
5. Graph your results



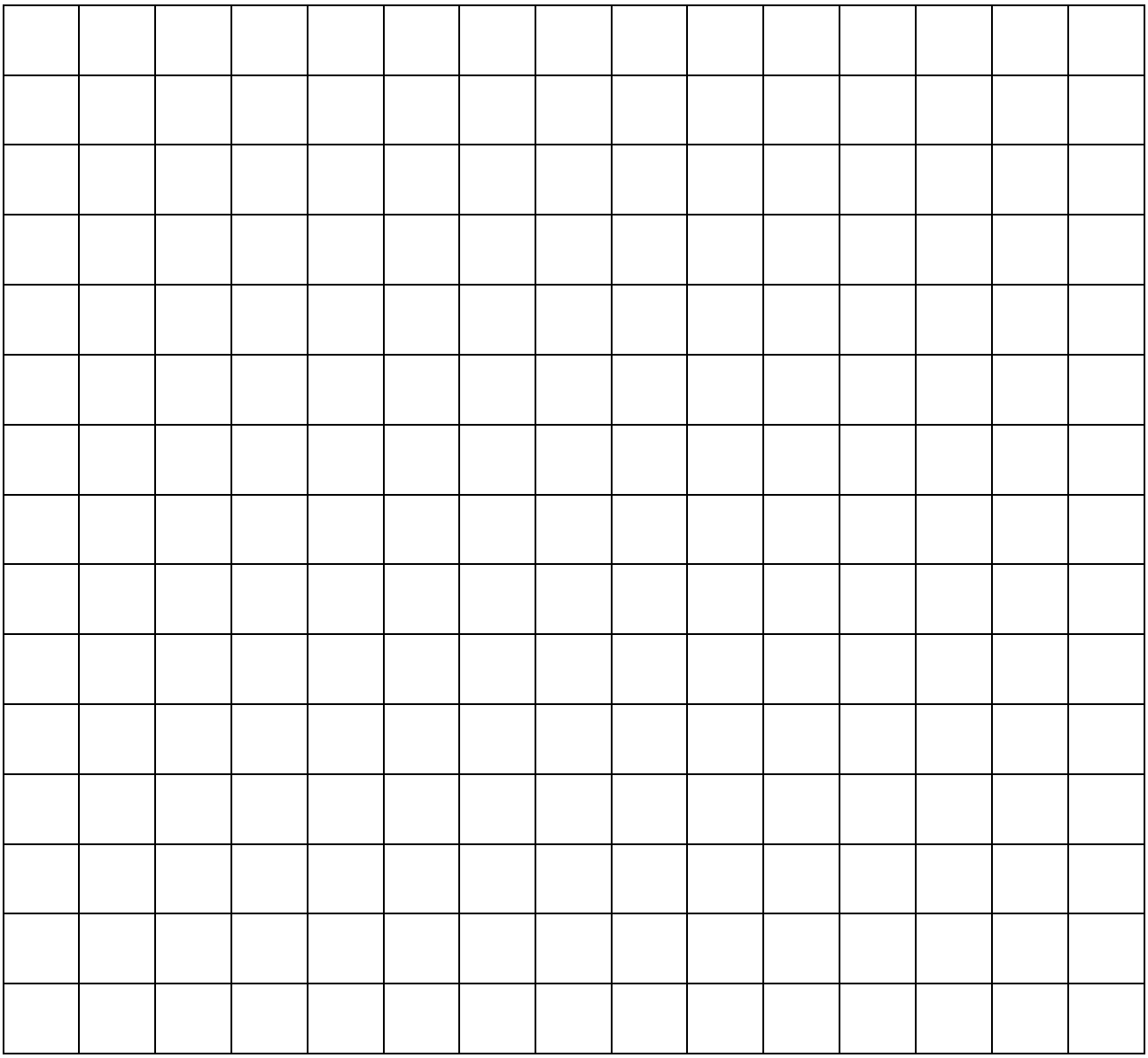
Observations and Results

Mass of Load = _____ grams

Mass of one penny = _____ grams

Distance of load in relation to Position of Fulcrum	Number of pennies	Total mass of pennies (grams)
15 cm from load		
17 cm from load		
19 cm from load		
21 cm from load		
23 cm from load		

Graph your results



Analysis

1. What type of lever is this? _____
2. What type of bird beak would have a fulcrum close to the load?
   _____
3. What type of bird beak would have a fulcrum further away from the load?
   _____

Conclusion (reread your problem and hypothesis)

What happened to the force when the fulcrum was moved further away from the load?

_____

_____

_____

_____

_____

_____

Activity 3 – Technical Diagram

Problem

Using what you have learned about levers, build a tool to replicate a bird beak. Which bird will be most effective at collecting each type of food?

Hypothesis

_____

_____

Materials (suggested)

Popsicle sticks	Chopsticks
Tongue depressors	Elastic bands
Screws	Marbles
Pennies	Toothpicks
Water	Balloons filled with different substances
Plastic objects	Container (aquarium, beaker, etc)

Procedure

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Diagram

Provide a technical diagram of the bird beak that you have built. You need to show the top and front view of your beak. Include the dimensions with the proper units. The drawing must be neat and in pencil.

Top view

Front view

Legend

Provide another diagram of the beak and label the fulcrum, force and load using the appropriate symbols. (Front view)

Sketch a side view of your feeding station. Include the depth of the area, the type of food and indicate at which level each type of food is found.

Sketch of the feeding station

Complete the following table:

Table 1: Amount and type of food collected at each level

Analysis and Conclusion

Which length of beak was best for picking up food at the bottom of the station? The middle? And the top?

1. How are these bird beaks the same as the one built by your team? Explain why.

_____

_____

_____

_____

_____

2. How these bird beaks different from the one built by your team? Explain why.

_____

_____

_____

_____

_____

3. Explain what is the most valuable thing you have learned throughout this project.

_____

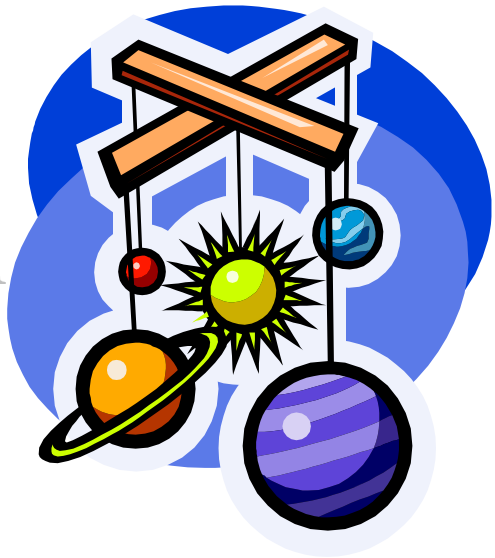
_____

_____

_____

_____

Building the Solar System



You have been listening to your teacher and working so hard on the Solar System that you are officially an expert! Your younger brother is well aware of this and has asked you to help him build a model of it for his science class…

It must be a scale 3-D model of the Solar System that is not more than 50 cm wide. Since there may be no time to go to the store, all materials can be in your house or maybe in the recycling bin?!?

You have also decided to use the design process that you learned in science class to ensure the success of your model.

Your brother has also informed you that you are not allowed to use perishable food items.

In exchange, your brother has promised to do your chores for 2 weeks!

Note: The ***diameter*** of the planets must be to scale. Refer to Table 14 on page 361 of your textbook to obtain the diameter of each planet. Divide each diameter by a factor of 10,000 and you will obtain the size of each planet in centimeters (cm).

PROBLEM: Identify the problem to be solved.

_____

_____

_____

_____

HYPOTHESIS: Predict which materials will work the best to build your model.

_____

_____

_____

BRAINSTORM: Draw and label all your ideas about how you plan to build your model.

MATERIALS: List the materials used to build your model (remember to include quantities and sizes).

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

PROCEDURE: Write out the steps to building your model.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

OBSERVATIONS: State 3 modifications that you made as you were building your model to improve your design.

_____

_____

_____

_____

_____

ANALYSIS: Explain why your model will “wow” and instruct the audience.

_____

_____

_____

_____

_____

_____

_____

_____

CONCLUSION: Confirm or refute your hypothesis and why. Which other groups model were you impressed with and why?

_____

_____

_____

_____

_____ _____

Diffusion Lab

Diffusion Experiment:

Dialysis tubing acts like an artificial cell membrane. Some molecules can pass freely through tiny pores in the tubing, others cannot. Water can pass freely, but some larger molecules cannot. You will carry out an experiment to find out what molecules can cross through the membrane.

Materials:

dialysis tubing	15% glucose/1% starch solution
funnel	glucose indicator strips
beaker	iodine
distilled water	

Procedure:

1. Obtain a section of dialysis tubing which has been soaking in water. Knot one end to make a "bag".

2. Open the other end of the tubing and insert a funnel. Pour glucose/starch solution into the tubing until it is about half to three-quarters full.

3. Tie off the top end of the tubing to form a closed "bag".

4. Fill a plastic beaker ¾ full with water and add iodine until the water is a light amber color (the exact amount isn't important).

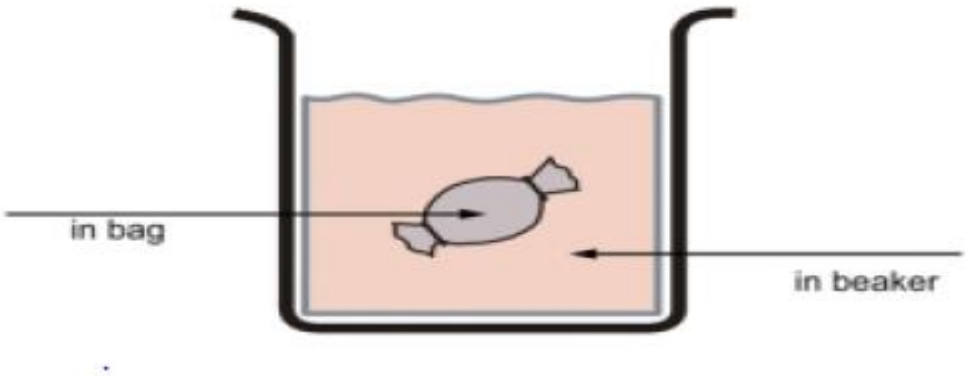
5. Record initial observations in Data Table 1.

6. Place the dialysis bag with the glucose/starch mixture into the beaker and record the start time

HERE: _____

While you are waiting (20 minutes), complete the following exercise:

(a) List the initial locations (inside or outside the bag) of all of the molecules that are available for diffusion (or osmosis) through the dialysis membrane, and then LABEL them in the picture below:



(b) For each molecule you listed in a), PREDICT their direction of net (overall) diffusion: into the bag, out of the bag, both into and out of the bag equally, or none (will not diffuse across the dialysis membrane). State your reason for each prediction.

_____

_____

_____

_____

_____

7. After 20 minutes, remove the tubing.

8. Record the final colors of the bag and the beaker contents in the data table. Test both the beaker and bag contents for presence of glucose with test strips (a green to brown color usually indicates a positive test result). Record this in Data Table 1.

Table 1

	Initial contents	Initial color	Final color	Initial glucose test	Final glucose test
Dialysis BAG	15%glucose/1% starch solution			+	
BEAKER	Water and iodine			-	

Analysis of Results:

1. Which substance(s) are entering the bag and which are leaving the bag? What experimental evidence supports your answer?

_____

_____

_____

2. Explain the results obtained. Include the concentration differences and membrane pore size in your discussion.

_____

_____

_____

_____

_____

_____

3. Quantitative data uses numbers to measure observed changes. How could this experiment be modified so that quantitative data could be collected to show that water diffused into the dialysis bag?

_____

_____

_____

4. Based on your observations, rank the following by relative size, beginning with the smallest: glucose molecules, water molecules, IKI molecules, membrane pores, starch molecules

_____

5. What results would you expect if the experiment started with glucose and IKI solution inside the bag and only starch and water outside? Why?

_____

_____

_____

_____

_____

_____ _____

Flower Dissection

Aim: To identify the male and female reproductive organs of the flower

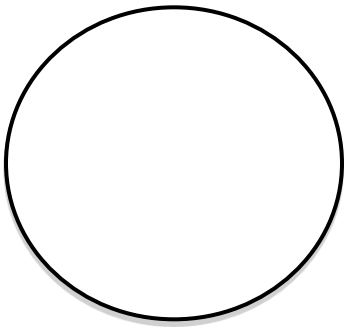
1) Draw your observations of each reproductive organ, from under the microscope.

2) Tape a sample of each organ to the left of your drawing

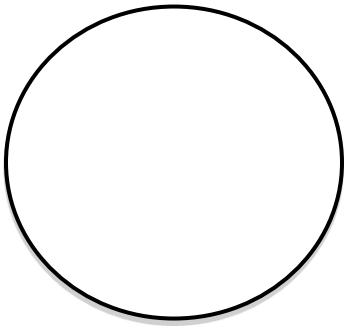
Observations: Circle **Male** or **Female**

(Male/Female)

_____



Stigma



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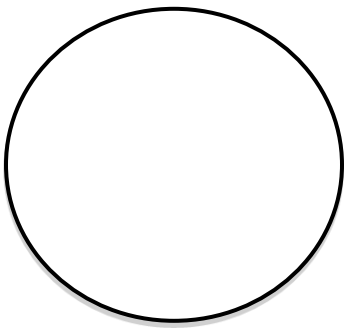
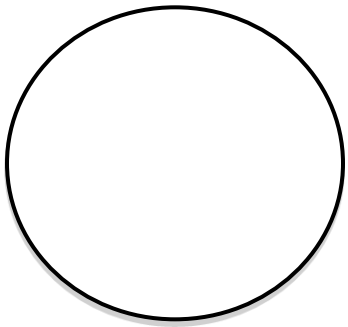


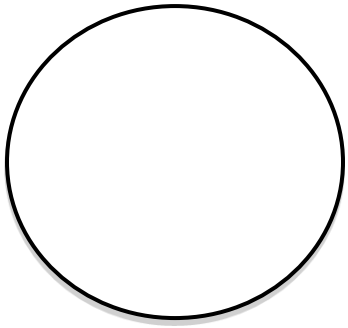
Ovary & Ovules

(Male/Female)

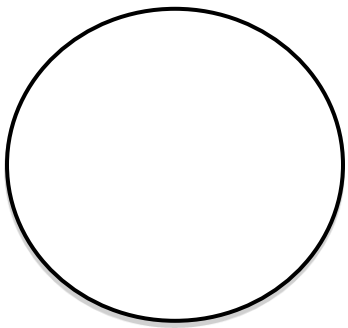
_____



Anther



Pollen



Filament

Analysis:

1) Name the 5 female reproductive organs visible during the dissection.

_____

_____

_____

_____

_____

2) Name the 4 male reproductive organs visible during the dissection

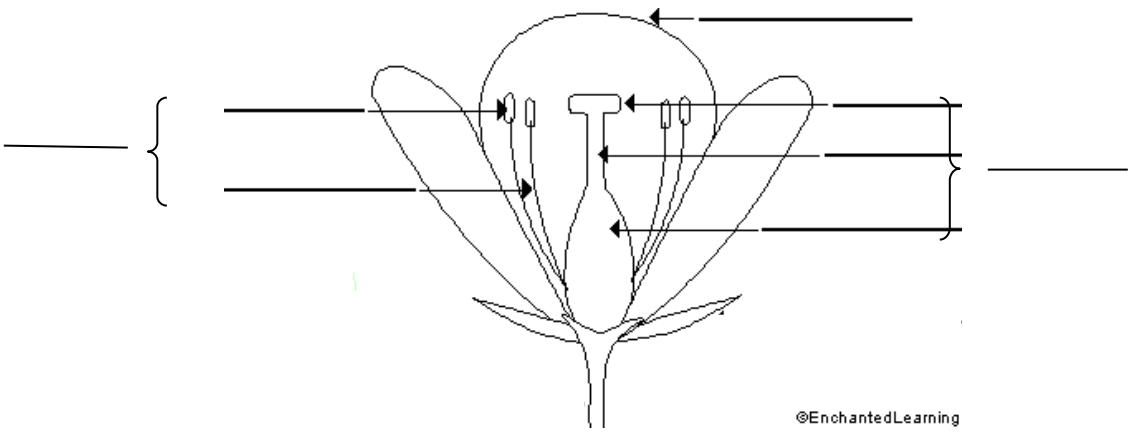
_____

_____

_____

_____

3) Label the reproductive organs of the flower below.



_____ _____

At the Speed of Light: STI Transmission

Background:

Many STI's have little or no outward signs or may not present symptoms for a long time; sometimes even years. This means that it can be difficult to determine whether a person is infected with an STI. Even if a person is your partner, you may not know whether or not they have previously come in contact with an STI.

Aim:

To determine how fast an STI can spread.

Materials:

1 pipette of simulated bodily fluid per student

1 specimen cup per student

1 bottle of indicator

Procedure:

1- Select one of the pipettes and record it's number in the data table (Original (yours))

2- Empty the contents of the pipette into a specimen cup.

3- Follow the teacher's instructions regarding the number of sexual partners to exchange fluids with.

4- For each simulated sexual partner:
   a. Collect a few drops of your simulated bodily fluid from your specimen cup with the pipette
   b. Empty the pipette into the specimen cup of your sexual partner
   c. Record the number of your sexual partner in your data table

5- Once you have exchanged fluids with the required number of individuals, get 2 drops of indicator from the teacher and record the results

6- At the end of the lab dispose of the liquids in the waste beaker at the front and place the pipette and specimen cup in the garbage.

Results:

Record of Sexual Partners **Addition of Indicator**

Sexual Partners	Specimen Number:		
Original (yours)			
First sample			
Second Sample			
Third Sample			

Analysis:

The teacher will now say which pipette(s) contained the simulated bodily fluids infected by an STI. Following your teachers instructions, complete the following chart to analyze the rate of infection:

Selected infected pipette (yes/no)	**Tested Positive for as STI (Yes/No)**	**Exchanged fluids DIRECTLY with infected pipette(s) (yes/no)**	**Exchanged fluids with somebody from Group 1 (yes/no)**	**Exchanged fluids with somebody from Group 2 (yes/no)**	**Total Infected**
(If "yes", go to the last box, if "no" continue)	(If "no", go to the last box)	(Group 1)	If Yes, record the number(s) (Group 2)	If Yes, record the number(s) (Group 3)	No. of students: % of class:

Using the data collected by the teacher on the board, answer the following questions:

1) How many students got infected directly from the contaminated pipette(s)?

2) How many students got infected by exchanging fluids with those who had gotten DIRECTLY infected (total number of students in Group 1)?

3) How does the number of pipettes containing infected fluid in this activity imitate the spread of an STI?