completed

Day1: Scientific Method & Experimentation ___/33pts

#9 Scientific Investigation & Experimentation: Scientific progress is made by asking meaningful questions & conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions & perform investigations. Students will:

a. Plan & conduct a scientific investigation to test a hypothesis.

b. Evaluate the accuracy & reproducibility of data.

c. Distinguish between Variable & controlled parameters in a test.

d. Recognize the slope of the linear graph as the constant in the relationship y=kx & apply this principle in interpreting graphs constructed from data.

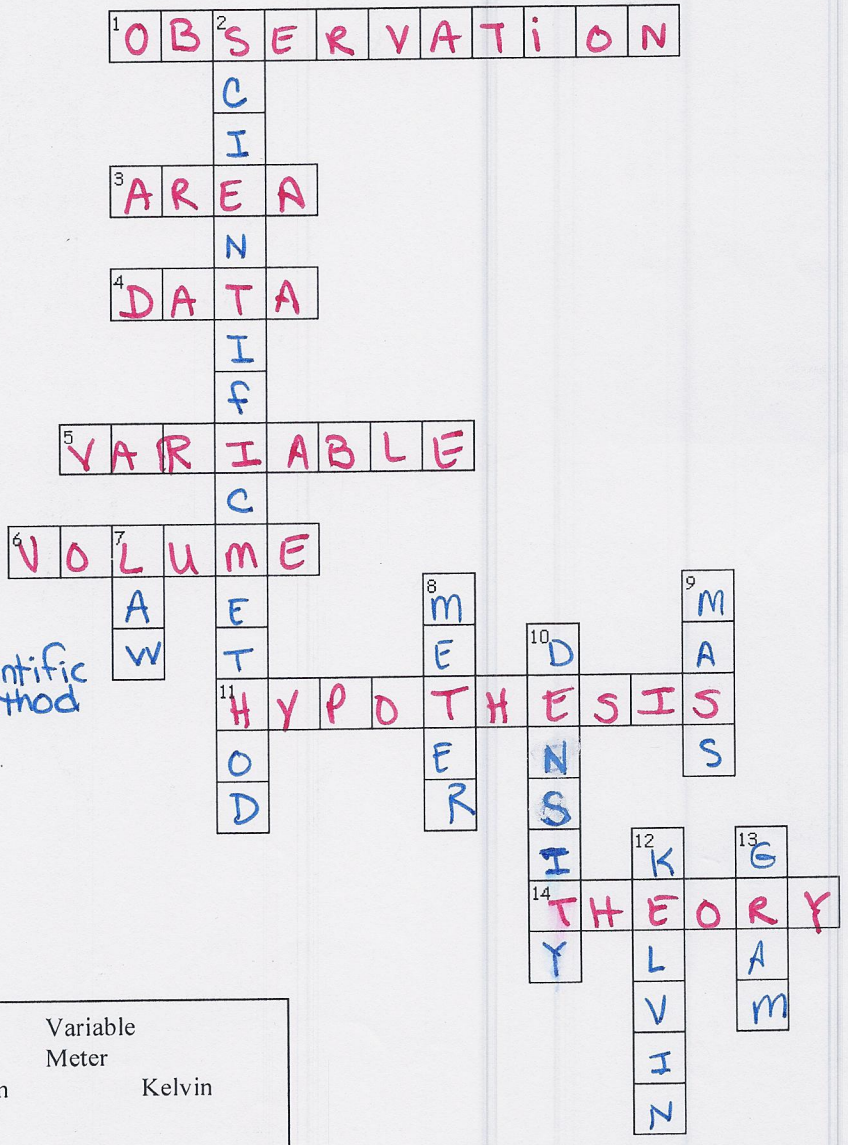
e. Construct appropriate graphs from data & develop quantitative statements about the relationships between variables.

f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure × area, volume = area × height).

g. Distinguish between linear & nonlinear relationships on a graph of data.

Words to use:
Distance/time
Data
Mass/volume
Variable
Hypothesis

1. Vocabulary Crossword 6pts



Across

1. using the senses to gather information OBSERVATION
3. a measure of how much surface an object has; length x width AREA
4. pieces of information acquired through experimentation DATA
5. the one factor that is changed during an experiment VARIABLE
6. the amount of space something occupies Volume
11. a possible explanation or answer to a question hypothesis
14. a unifying explanation for a broad range of hypothesis & observations that have been supported by testing Theory

Down

2. a series of steps that scientists use to answer questions & solve problems Scientific method
7. a summary of many experimental results & observations LAW
8. the SI unit for length METER
9. the amount of matter something is made of MASS
10. equal to mass/volume Density
12. the SI unit for temperature KELVIN
13. the SI unit for mass Gram

Scientific Method	Observation	Hypothesis	Variable	
Theory	Data	Law	Meter	
Volume	Mass	Gram	Kelvin	
Area	Density			

_____/5PTS

Scientific Method

Column A	Column B
F 3. I told my classmates that Kaboing! shoes do not help you jump higher and that regular sneakers work better.	a. Ask a question.
A 4. I wanted to know, "Will wearing Kaboing! shoes help me jump higher?"	b. Form a hypothesis.
C 5. I jumped five times in a pair of Kaboing! shoes and recorded the height each time. After resting for 5 minutes, I repeated the test wearing my sneakers.	c. Test the hypothesis.
B 6. I thought I'd jump higher in Kaboing! shoes than in my sneakers.	d. Analyze the results.
E 7. I jumped higher in my sneakers than I did in Kaboing! shoes. Kaboing! shoes do not help me jump higher.	e. Draw conclusions.
D 8. The average height for the five jumps in Kaboing! shoes was 35.5 cm. The average height for the five jumps in my sneakers was 36 cm. On average, I jumped half a centimeter higher in my sneakers than I did in Kaboing! shoes.	f. Communicate the results.

Math in Science

1. a cereal box has a mass of 340g. its dimensions are 27cm x 19cm x 6 cm. what is the volume of the box?

27cm x 19cm x 6cm = 3,078 cm^3

2. Each of two cement building blocks has a volume of 2.5L. The mass of block A is 5kg, and the mass of block B is 7kg. find the difference in the densities of the two blocks (density = mass / volume)

BlK A: D = 5kg / 2.5L = 2.0kg/L

BlK B: D = 7kg / 2.5L = 2.8kg/L

BlK B is more dense than A

The difference is 0.8kg/L

Variables & Controls:

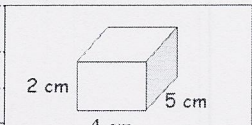
3. Imagine that you are conducting an experiment in which you are testing the effects of the height of a ramp on the speed at which a toy car goes down the ramp. 1. What is the variable in this experiment? 2. What factors must be controlled?

1. Variable is the height of the ramp

2. Controls: type of car, Ramp material, point which car is released.

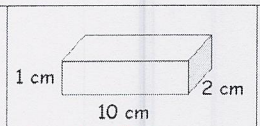
Finding Volume: Volume (V) is the amount of space something occupies. It is expressed in cubic units such as cubic meters (m^3) and cubic centimeters (cm^3). Use the equations below for volume of cubes & prisms.

Object	Solid Rectangular Prism
Examples	Block, cube, box, crate
Equation	Volume = length x width x height = ____ cm^3
SI Unit	cubic meter (m^3)
Other Units	m^3 mm^3 etc.



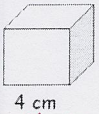
2 x 4 x 5 =

1. Volume = 40 cm^3



1 x 10 x 2 =

2. Volume = 20 cm^3

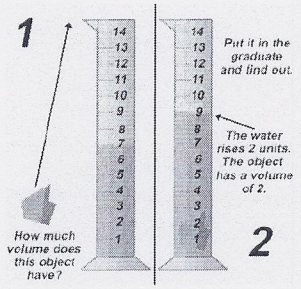


4 x 4 x 4 =

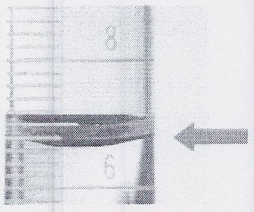
3. Volume = 64 cm^3

When choosing which cylinder to use, always choose the _____ one.
The smaller the cylinder, the more _____ it is.

Object	Solid Irregular Objects
Examples	Key, lump of clay, paperclip, metal rod…
Measure By:	Displacement Method
Units	Milliliters (ml), Liter (l)



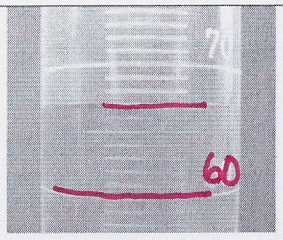
Note the level at the lowest point of the curve, or the meniscus.



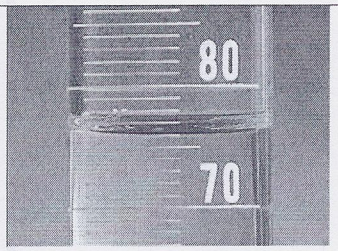
10 pts for these sections

____/10

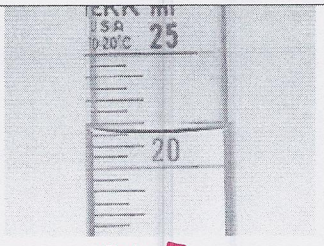
Volume of Liquids



7. 67 ml



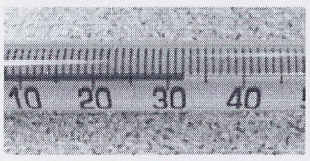
8. 76 ml



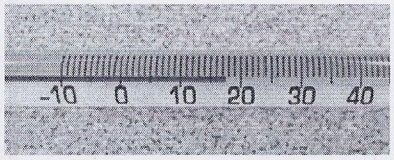
9. 21.5 ml

(2) Day!

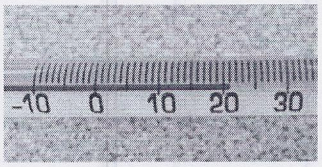
Measuring Temperature: You Try It!



1. 32°



2. 17°



3. 21°

Sample Test Questions **THESE WILL BE GRADED AND WILL COUNT TOWARD YOUR NOTEBOOK SCORE**

1. A student wanted to find out if changing the volume of water changes its density. Which statement is a prediction that the student could test in his investigations?

A Water is not very dense
B The density of water increases as its temperature increases
C The density of water remains the same no matter how the volume of the sample is changed
D Density equals mass divided by volume

2. A student conducting an experiment wants to make sure his results are reliable. What should he do?

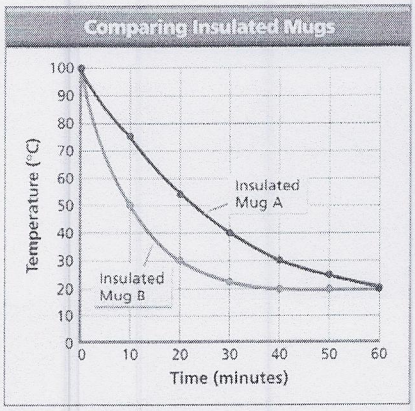
A Repeat the experiment several times and average the results
B Repeat the experiment several times and use the fastest results
C Repeat the experiment using a different responding variable
D Repeat the experiment using a different manipulated variable

3. The actual length of a rectangular room is 6.60 meters. A student measures the length of the room three times and gets measurements of 7.49 m, 7.50 m, and 7.48 m. The student's measurements can be described as

A both accurate and reproducible
B reproducible but not accurate
C accurate but not reproducible
D neither accurate nor reproducible

4. Which parameter in this experiment was the responding variable (dependent variable)?

a. The temperature of the water
b. The location of the insulated mug
c. The brand of insulated mug
d. The length of time the water was allowed to cool



5. An experiment involves measuring the time it takes for heat to be conducted along the lengths of several bars made of different substances. The bars have the same length and the same cross-sectional area. What is the manipulated (independent) variable in this experiment?

A. The length of each bar
B. the time during which heat is conducted
C. The substance of which each bar is made
D. The cross-sectional area of each bar

6. A student designs a controlled experiment to test how the shape of an object affects how fast it falls when dropped. Which of the following is **NOT** a controlled parameter in the student's experiment?

A. The shape of the object
B. The height from which the object is dropped
C. The mass of the object
D. The initial velocity of the object

7. What information does the slope of a line on a graph provide?

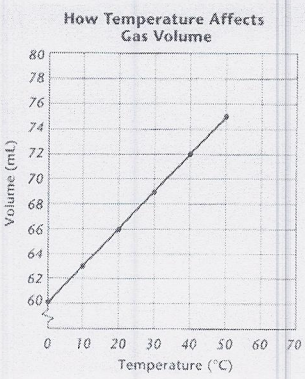
A how much **y** changes for every change in **x**
B how much **x** changes for every change in **y**
C how much the manipulated variable changes with the responding variable
D how much the independent variable changes with the dependent variable

(3) Day1

8. A scientist heated a balloon. As the balloon was heated, the gas inside expanded. The scientist measured the balloon's size at every temperature increase of 10 degrees and then graphed the data as shown.

What would be the size of the balloon if the temperature were 60°C?

A 72 mL B 75 mL C 78 mL D 80 mL



9. What is the slope of the line?

A 0.3°C/mL B 0.3 mL/°C C 3°C/mL D 3 mL/°C

10. On a line graph, the x-axis is labeled with the name of the

A. Manipulated variable B. Responding variable C. Controlled variable D. Categories being compared

11. A bar graph would be **best** used to graph which of the following?

A showing how the mass of an object affects how fast it falls
B showing how far a train travels in a certain amount of time
C showing the percentage of Earth's crust made up of iron
D comparing the boiling points of different elements

12. A student collected these data while testing how the pressure of a gas changed at different temperatures.

What kind of graph should the student use?

A circle graph
B line graph
C bar graph
D pie graph

Temperature (K)	Pressure (kPa)
273	8
278	11
283	14
288	17
293	20

Additional notes: 9c. Distinguish between variable and controlled parameters in a test. Parameter is a factor that can be measured in an experiment. Variable parameters change during the experiment

Manipulated variable - the parameter that is changed

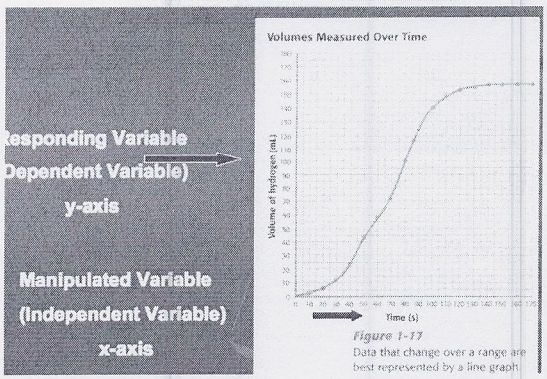
Responding variable - the parameter that changes in response to the manipulated variable

Controlled parameter - not changed during experiment

Controlled experiment - only one parameter is manipulated at a time

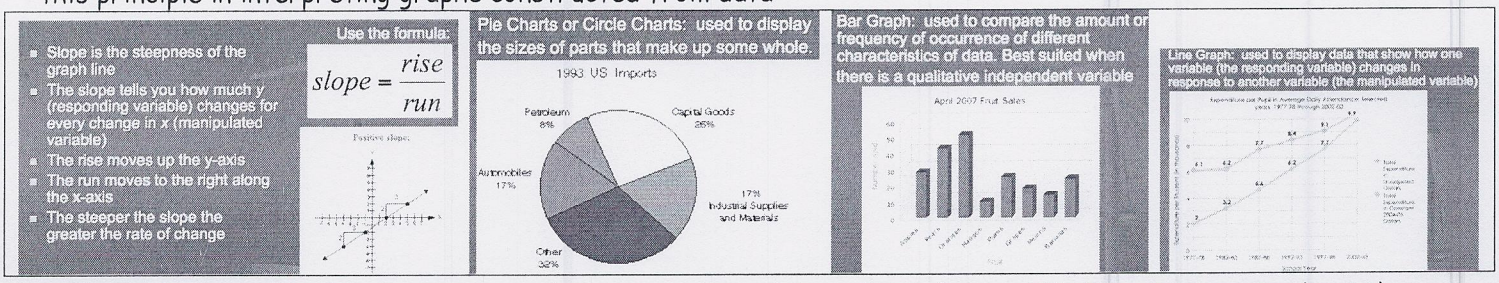
Manipulated variable: slope of ramp. You change the angle of the ramp to see how it changes the speed

Responding variable: speed. What we want to find out. The results that we measure



Controlled Parameter: same ball used for each trial

Additional notes: 9d: Recognize the slope of the linear graph as the constant in the relationship **y = kx** and apply this principle in interpreting graphs constructed from data



Additional notes: 9e: Construct appropriate graphs from data and develop quantitative statements about the relationships between variables

4 Day1