

ACC Integrated Physical Science Biology

Summer Assignment 2019

Welcome to 9th grade ACC Integrated Physical Science and Biology. This is a year-long set of blocked courses that sequence Physical Science and Biology to maximize the learning concepts within both courses. Physical Science is examined in detail in the Fall and Biology in the Spring, with strategic overlap between the two sciences as we progress through the year. Strong mathematics and science skills will be needed as this is for the students that plan to pursue science at the uppermost levels and want to take biology in their freshman year.

Many of the competencies and topics we will be covering revolve around your ability and skills in the areas of graphing, measuring, scientific method, and the language of science.

Each piece of your assigned summer work addresses each of these processes.

- Part one: Graphing and Analyzing Data
- Part two: Identifying Parts of the Scientific Method
- Part three: Scientific Instruments and Measurements
- Part four: Application of Mathematics
- Part five: The language of Science

- Please Print the assignment and complete during the summer months.
- Be ready to turn your summer work in by **Thursday, September 5th and Friday, September 6th**, for potential full credit.
- Accepted until September 12th will deduct 10% in your grade per day.
- Not accepted after September 12th.
- This is a graded assignment worth 3% of your Quarter One grade.
- This will be graded according to the point value assigned for each section for a total point value of up to 106 possible points.



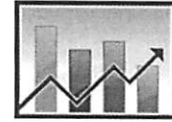
Graphing and Analyzing Scientific Data

Graphing is an important procedure used by scientist to display the data that is collected during a controlled experiment. There are three main types of graphs:

Pie/circle graphs: Used to show parts of a whole.

Bar graphs: Used to compare amounts.

Line graphs: Use to show the change of one piece of information as it relates to another change.



Both bar and line graphs have an “X” axis (horizontal) and a “Y” axis (vertical).

Parts of a Graph:

Title: Summarizes information being represented in ANY graph.

Independent Variable: The variable that is controlled by the experimenter, such as, time, dates, depth, and temperature. This is placed on the X axis.

Dependent Variable: The variable that is directly affected by the I.V. It is the result of what happens as time, dates, depth and temperature are changed. This is placed on the Y axis.

Scales for each Variable: In constructing a graph, one needs to know where to plot the points representing the data. In order to do this a scale must be employed to include all the data points. This must also take up a conservative amount of space. It is not suggested to have a run on scale making the graph too hard to manage. The scales should start with 0 and climb in intervals such as, multiples of 2, 5, 10, 20, 25, etc...the scale of numbers will be determined by your data values.

Legend: A short descriptive narrative concerning the graph's data. It should be short and concise and placed under the graph.

For any set of data, you will need to determine the following:

Mean: This is determined by adding all the numbers in a set of data and then dividing by the number of values.

Median*: This is the middle number in a set of data. If there is an even set of numbers in the data, then take the average of the two middle numbers.

Ex: 2, 3, 4, 8, 12, 16, 20 median = 8

Ex: 3, 5, 8, 11, 17, 19, 27, 30 median is $11 + 17 = 28 / 2 = 14$

Mode*: This is the number that occurs most often in a set of data.

Ex: 3, 4, 6, 6, 7, 9, 9, 9, 12, 12, 15 mode = 9

* To determine median and mode, the numbers in the set of data must be put in numerical order.

Extrapolate: extending the graph, along the same slope, above or below measured data.

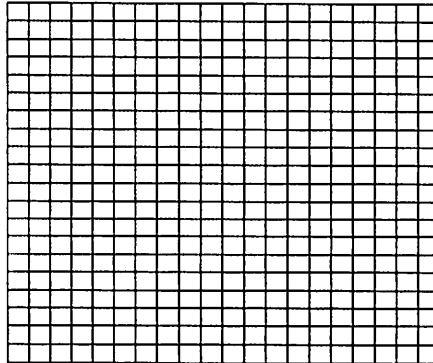
Interpolate: predicting data between two measured points on the graph

Graph Worksheet
Graphing & Intro to Science

Name: _____

1. Graph the following information in a **BAR** graph. Label and number the x and y-axis appropriately. (5pt)

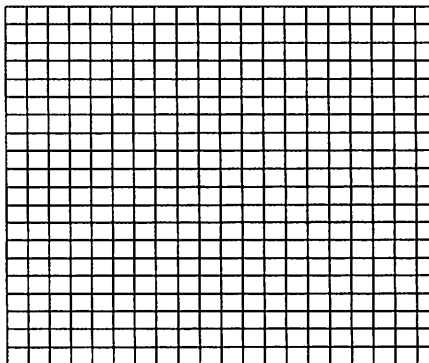
Month	# of deer
Sept	38
Oct	32
Nov	26
Dec	20
Jan	15
Feb	12



- a. What is the independent variable? _____
- b. What is the dependent variable? _____
- c. What is an appropriate title? _____
- d. What is the average number of deer per month? _____

2. Graph the following information in a **LINE** graph. Label and number the x and y-axis appropriately. (5pt)

# of Days	# of Bacteria
1	4
2	16
3	40
4	80
5	100
6	200



- a. What is the independent variable? _____
- b. What is the dependent variable? _____
- c. What is an appropriate title? _____

Graphing Practice

3. The amount of oxygen gas dissolved in water is important to the organisms that live in a river. The amount of dissolved oxygen varies with changes in both physical factors and biological processes. The temperature of the water is one physical factor affecting dissolved oxygen levels as shown in the data table below. The amount of dissolved oxygen is expressed in parts per million (ppm).

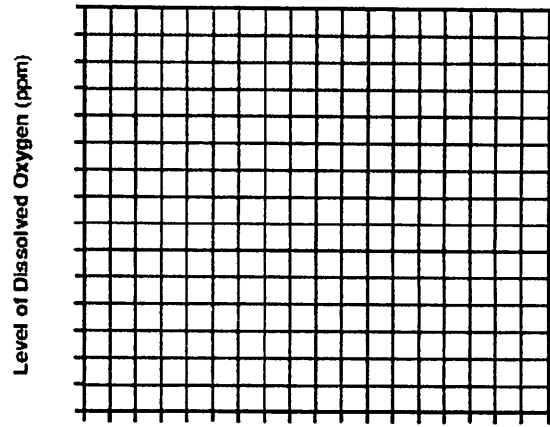
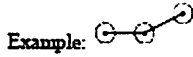
5 pts.

Dissolved Oxygen Levels at Various Temperatures

Water Temperature (°C)	Level of Dissolved Oxygen (ppm)
1	14
10	11
15	10
20	9
25	8
30	7

Using the information in the data table, construct a line graph on the grid, following the directions below.

- Mark an appropriate scale on each labeled axis.
- Plot the data for dissolved oxygen on the grid. Surround each point with a small circle and connect the points.



Water Temperature (°C)

- c. If the trend continues as shown in the data, what would the dissolved oxygen level most likely be if the temperature of the water was 35°C?

_____ ppm

- d. State the relationship between the level of dissolved oxygen and water temperature.

4. Each year, a New York State power agency provides its customers with information about some of the fuel sources used in generating electricity. The table below applies to the period of 2002–2003.

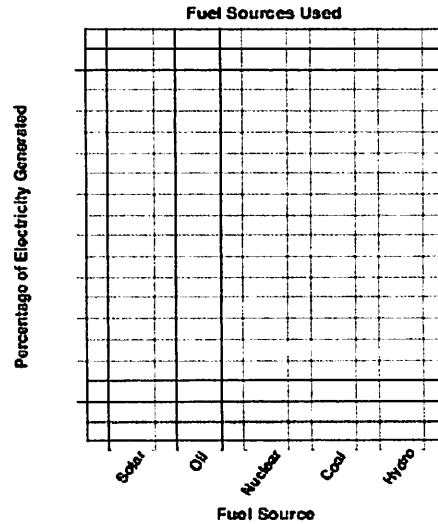
Fuel Sources Used

Fuel Source	Percentage of Electricity Generated
hydro (water)	86
coal	5
nuclear	4
oil	1
solar	0

5 pts

Using the information in the data table, construct a bar graph on the grid, following the directions below.

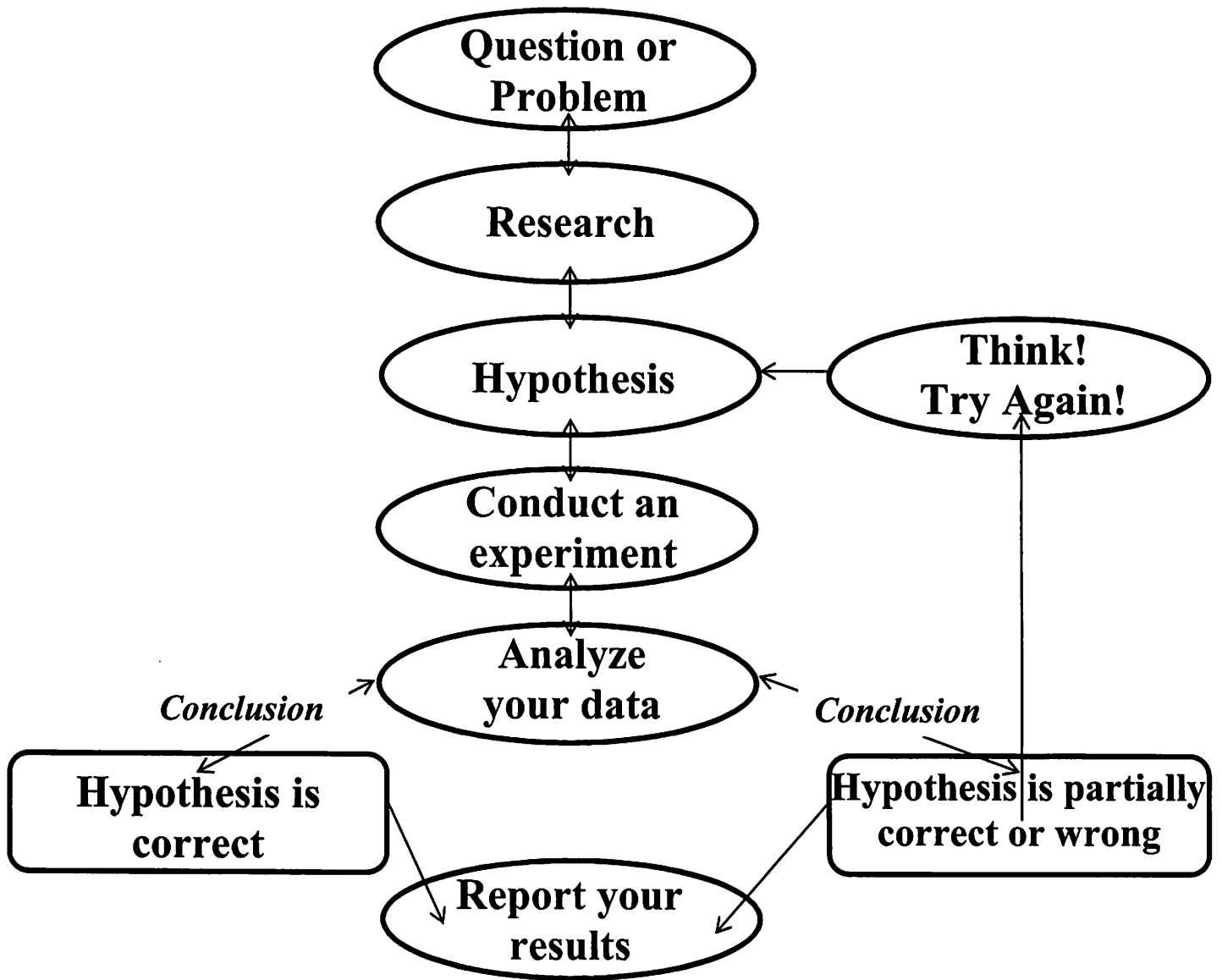
- Mark an appropriate scale on the axis labeled “Percentage of Electricity Generated.”
- Construct vertical bars to represent the data. Shade in *each* bar.



- c. Identify *one* fuel source in the table that is considered a fossil fuel.

- d. Identify *one* fuel source in the table that is classified as a renewable resource.

The Scientific Method



Key Vocabulary

Analyze – Examine data collected in an experiment to determine what it means.

Conclude – Reach a decision based on the analysis of data.

Data – Information collected during an experiment.

Experiment – A test that is done to determine if a hypothesis is correct or not.

Hypothesis – Your proposed answer to the question or solution to the problem.

Inference (Infer) – Coming to a conclusion based on your existing knowledge. (Example – seeing a student wearing a sports team jersey and concluding the student likes that team.)

Observe – Watch something carefully.

Qualitative data – Data dealing with descriptions; data is observed (colors, textures, smells, tastes, appearance, beauty, etc.).

Quantitative data – Data which can be measured (length, height, area, volume, weight, speed, time, temperature, etc.).

Results – Outcome of an experiment.

Tentative – Basic results that may or may not be accurate; basic results.

Variable – Something that can be changed.

Experimental - Controls and Variables

Definition of Key Terms

- **Control** - A part of the experiment that is not being tested and is used for comparison.
- **Variable** - Any part of an experiment that can change.
- **Independent Variable** - The part of the experiment that is changed by the scientists or person performing the experiment.
- **Dependent Variable** - The part of the experiment that is affected by the independent variable.



Practice Identifying Parts of the Scientific Method

Directions: The following is an experimental scenarios. Read the experiments and then identify the components of the scientific method by completing the graphic organizer provided.

Experimental Scenario

A student investigated whether ants dig more tunnels in the light or in the dark. She thought that ants used the filtered light that penetrated the upper layers of earth and would dig more tunnels during the daytime. Ten ant colonies were set up in commercial ant farms with the same number and type of ants per ant farm. The same amount of food was given to each colony, and the colonies were in the same temperature. Five of the colonies were exposed to normal room light and five were covered with black construction paper so they did not receive light. Every other day for three weeks the length of the tunnels was measured in millimeter using a string and a ruler. Averages for the light and dark groups for each measured were then computed. The averages are listed in the following chart.

Length of Tunnels (mm) Constructed by Ants in Different Light Conditions

	<u>Day</u>	<u>Light</u>	<u>Dark</u>
	1	5	7
	3	10	15
	5	20	25
	7	26	32
	9	32	47
	11	50	62
	13	61	93
	15	66	110
	17	90	115
	19	95	120
	21	103	136

**Analysis of Experimental Scenario
– Graphic Organizer –**

Problem/Observation(2pt):

Question(2pt):

Hypothesis(2pt):

Experiment(6pt):

Procedures

Independent Variable

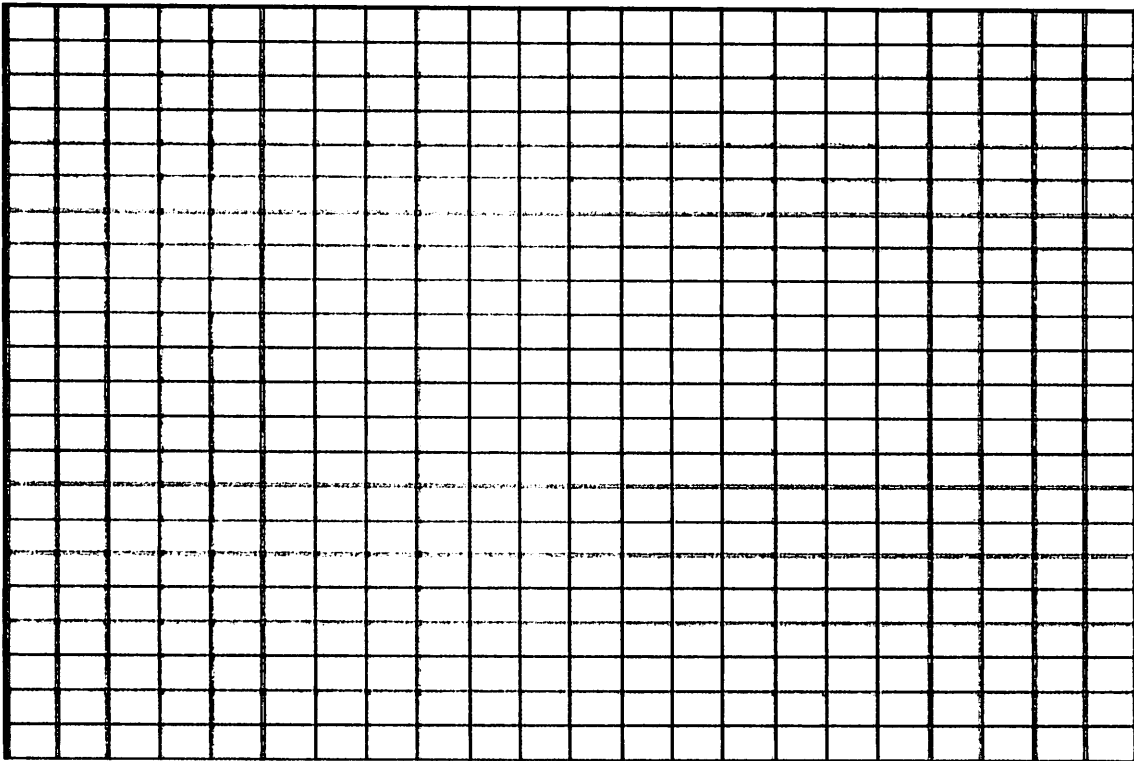
Dependent Variable

Controls

Control Group

Experimental Group(s)

Results/Data (Graph)(5pt):



Conclusions (3pt):

Scientific Instruments and Measurement

(1pt per Question)

Use a ruler to answer the following questions.

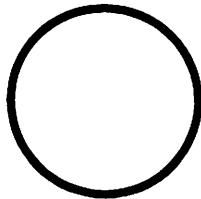
Use the line to answer questions 1-2.



1. What is the length of the line in centimeters? _____

2. What is the height of the line in millimeters? _____

Use the circle to answer question 3.



3. What is the diameter of the circle centimeters? _____

Use the rectangle to answer questions 4-5.



4. What is height of the square in centimeters? _____

5. What is the length of the square in centimeters? _____

Match the following scientific instruments with their function.

- | | |
|--|---|
| 1. _____ Ruler | a. Measures mass |
| 2. _____ Thermometer | b. Organize data and makes graphs |
| 3. _____ Graduated Cylinder and beaker | c. Measures temperature |
| 4. _____ Balance | d. Measures length or distance |
| 5. _____ Spring Scale | e. Magnifies small objects |
| 6. _____ Stop watch | f. Reveals the details of faraway objects |
| 7. _____ Microscope | g. Measures weight |
| 8. _____ Binoculars and telescopes | h. Measures time |
| 9. _____ Calculators and computers | i. Measures volume |

Applications of Mathematics

Literal Equations:

Given each formula below, solve for the indicated variable. (Rearrange the equation so it says *variable = the rest of the terms*.)

1. $I = Prt$ (Interest = Principal \cdot rate \cdot time) 3pts

a) Solve for P: _____

b) Solve for r : _____

c) Solve for t : _____

2. $W = VA$ (watts = volts \cdot amps) 2 pts

a) Solve for V: _____

b) Solve for A: _____

3. $d = rt$ (Distance = rate \cdot time) 2pts

a) Solve for r: _____

b) Solve for t: _____

4. $y = mx + b$ (Slope-intercept form of a line) 3 pts

a) Solve for x: _____

b) Solve for m: _____

c) Solve for b: _____

Solve each equation for the specified variable (2 pts ea.)

5. Solve for x: $-3x + b = 6x$

6. Solve for a: $v = 4 + at$

7. Solve for b: $4b - 5 = -t$

8. $\frac{5x + y}{a} = 2$

Celsius (used in other countries) and Fahrenheit (used in the U.S.) are the two most commonly used scales for measuring temperature. Water freezes at 0°C and at 32°F . The boiling point of water is 100°C and 212°F .

To convert temperature between Celsius and Fahrenheit, by using the formula $C(1.8) = F - 32$, where C is degrees Celsius and F is degrees Fahrenheit. (2 pts ea.)

9. Convert 45°C to $^{\circ}\text{F}$.

10. Convert 45°F to $^{\circ}\text{C}$.

11. Convert 20°F to $^{\circ}\text{C}$.

12. Convert 110°C to $^{\circ}\text{F}$.

Dimensional Analysis:

Use dimensional analysis to convert each rate. Show all of your work and draw a line through the units that cancel. Round your answer to the nearest hundredth. (2 pts ea.)

13. Convert 25 feet per second to miles per hour.

14. Convert 75 miles per hour to feet per second.

15. Last seasons "Biggest Loser" lost .952 ounce per hour. Convert this to pounds per week.

16. Convert 4.824 meters per second to kilometer per hour

17. A giraffe can run 32 miles per hour. What is this speed in meters per minute?

18. Convert 3.82 meters per second to kilometer per hour

The Language of Science

The main reason students find it difficult to understand science is because of all the hard to write, spell and read words. Actually, scientific vocabulary is a hodge podge of little words that are linked together to have different meanings. If you learn the meanings of the little words, you'll find scientific vocabulary much easier to understand.

Word	Meaning
a or an	not or non
meso	middle
endo	inner, inside
aero	needing oxygen or air
anti	against
amphi	both, doubly
aqua	water
arthro	joint
auto	self
bi	two, twice, double
bio	life, living
cephal	head
chloro	green
chromo	color
cide	killer, kill, killing
cyto	cell
derm	skin
di	two, double
ecto (exo)	outer, external
endo	internal
epi	above
gastro	stomach
genesis	origin, beginning
herba	plants
hetero	different
homo	alike, similar
hydro	water

Word	Meaning
hemo	blood
hyper	above
hypo	below
intra	within, inside
itis	disease, inflammation
lateral	side
logy	study of
lys	break down
meter	measurement
mono	one, single
morph	form
micro	small
macro	large
multi	many
pod	foot
phobia	dislike, fear
philia	like
plasm	form
proto	first
photo	light
poly	many
synthesis	to make
sub	lesser, below
troph	eat, consume
therm	heat
tri	three
zoo, zoa	animal

Use the list above to interpret the meaning of each of the following terms (1/2pt ea.)

- | | |
|--------------------------|-----------------------|
| 1. Hydrology _____ | 2. Cytology _____ |
| 3. Protozoa _____ | 4. Epidermis _____ |
| 5. Spermatogenesis _____ | 6. Cytoskeleton _____ |
| 7. Abiotic _____ | 8. Dermatitis _____ |
| 9. Hypodermic _____ | 10. Hemophilia _____ |
| 11. Endocytosis _____ | 12. Insecticide _____ |
| 13. Anaerobic _____ | 14. Bilateral _____ |
| 15. Endotherm _____ | 16. Subspecies _____ |
| 17. Arthropod _____ | 18. Micrometer _____ |
| 19. Hypothermia _____ | 20. Bilateral _____ |

Using your prefix-suffix list, write the biological term for each of the following. (1/2 pt ea.)

Example: A bacteria killer – *cide* means killer so the term is *bactericide*.

1. outside skeleton _____
2. outside of the cell _____
3. a one-celled organism _____
4. a term describing an organism made up of many cells _____
5. study of animals _____
6. a carbohydrate with two sugar units _____
7. a meat eater _____
8. an instrument to observe small items _____
9. study of cells _____
10. A condition of the brain _____
11. A place where water is _____
12. true nucleus _____