

Physical Science Chapter 1: Intro to Science

Key Ideas

(Complete these questions AFTER you have taken notes and finished the section worksheet.)

Section 1.1: The Nature of Science

1. How do scientists explore the world?

2. How are the many types of science organized?

3. What are scientific theories, and how are they different than scientific laws?

Section 2: The Way Science Works

1. How can I think and act like a scientist?

2. How do scientists measure things?

Section 3: Organizing Data

1. Why is organizing data an important science skill?

2. How do scientists handle very large and very small numbers?

3. How can you tell the precision of a measurement?

Concepts I need to review/practice before the chapter test.

Physical Science Chapter 1: Intro to Science

Section 1.1: The Nature of Science

1. Identify the 2 Main branches of science and give a short description of each.

a. _____

b. _____

2. What are the 3 branches of natural science?

a. _____

b. _____

c. _____

3. Give 2 examples for each branch of natural science.

a. _____

b. _____

4. Define scientific theory and scientific law AND give an example of each.

a. _____

b. _____

5. Explain how a scientific theory and a scientific law are different.

Physical Science Chapter 1: Intro to Science

6. For a scientific theory to be valid, it must...

a. _____

b. _____

c. _____

7. Compare AND contrast qualitative data and quantitative data.

8. Identify the following as qualitative data (L) or quantitative data (T).

Red _____ 32 grams _____ 12 feathers _____

Round _____ Large _____ 3 g/ml _____

12 m _____ Fuzzy _____ 0.45 m/s _____

9. Circle the qualitative data and place a rectangle around the quantitative data in the following statements.

a. The small, round ball had a mass of 2.5 grams.

b. Sixteen people waiting in line for more than 4 hours to see Imagine Dragons.

c. In the last basketball game, two people scored more than 15 points.

d. If a tall, brown tree falls in the forest, does it make a sound?

e. If you combine 3 red jars of water with 2 yellow jars of water, what color will it be?

Complete the Key Ideas Section

Physical Science Chapter 1: Intro to Science

Section 1.2: The Way Science Works

10. The data in Table 1 was collected during an experiment. Use this data to complete the following questions.

- a. Identify the variable(s) in the experiment.

- b. Identify the **dependent** variable(s) in the experiment.

- c. Identify the **independent** variable(s) in the experiment.

- d. Identify the control(s) in the experiment.

- e. Identify the constant(s) in the experiment.

- f. Does the following experiment prove the fertilizers helped the plants grow? Explain.

Plant	Amount of Water Received (mL every 3 days)	Amount of Sunlight received (Hours/day)	Fertilizer Brand	Height after 2 weeks (cm)
A	10	6	A	16
B	10	6	B	8
C	10	6	C	18
D	10	6	None	10

Physical Science Chapter 1: Intro to Science

Asking Questions: The Scientific Method

The **scientific method** is a systematic approach to solving problems. Professional scientists are not the only people to use this approach. It is a method you use every day to solve problems, from deciding what to wear to figuring out a new video game.

There are 7 steps to the scientific method:

- ❖ State the problem
 - Before one can solve a problem, he/she must understand what the problem is and be able to state it.
 - To understand a problem and find the best answers, you must ask the right questions: Who? What? When? Where? Why? How?
 - One of the hardest steps of the scientific method

- ❖ Make observations—gather information on the problem.
 - Ask Who? What? When? Where? Why? How?

- ❖ Form a hypothesis
 - hypothesis-

- ❖ Experiment to test the hypothesis
 - Every experiment has 2 groups
 - Variable group-
 - Independent variable

 - Dependent variable
 - Control group

- ❖ Record and analyze data
 - Use graphs, tables, charts, etc.

- ❖ State conclusion

- ❖ Repeat the work/share results

Physical Science Chapter 1: Intro to Science

Part I.

11. List the 7 steps of the scientific method in order AND give a one sentence explanation of each.

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

12. Before proposing a hypothesis, what 2 steps must a scientist take?

n. _____

o. _____

13. How does a scientist test a hypothesis?

14. What is a variable?

15. What two groups does every well designed experiment have?

p. _____

q. _____

16. What are some ways data is recorded and analyzed?

17. Why is the work repeated?

18. Is the scientific method always so orderly?

19. Explain what bias is and how it can affect the results of an experiment.

Physical Science Chapter 1: Intro to Science

Part II.

You are a doctor and you specialize in stomach cancer. Over the last several years, you have noticed that patients who drink Diet Coke seem to recover more quickly and have less severe cases of stomach cancer. You want to conduct a formal scientific study to determine if this might be true. Using the steps of the scientific method do the following:

20. What is your problem?

21. What sources would you use to gather information?

22. State a hypothesis.

23. Design an experiment to test your hypothesis. In your experiment, CLEARLY identify **variable group**, **control group**, **independent variable**, and **dependent variable**.

Physical Science Chapter 1: Intro to Science

24. Identify the 3 countries that use the English system of measurement.

r. _____

s. _____

t. _____

25. What is the abbreviation for International System of Units?

26. Complete the following table.

Quantity	SI Unit	SI Abbreviation
Mass		
Length		
	Mole	
Temperature		
		s

27. What is a derived unit?

28. Circle ALL of the data that utilizes derived units.

45 g/mL 16 m 12 kg 0.55 m/s 1.5 kg*s

29. Write down 3 other examples of a derived unit label.

Physical Science Chapter 1: Intro to Science

30. Write the abbreviations for the following prefixes UNDER each prefix.

Kilo- Hecto- Deca- Base Unit Deci- Centi- Milli-

31. Write down a mnemonic to help you remember the order of the prefixes. (You will be required to memorize the order of these prefixes!!)

32. Complete the following table by writing in the abbreviation OR the actual label.

Label	Abbreviation	Label	Abbreviation
Kilometer	km		mm
Milligram			ks
	hg	Hectometer	
Decisecond			dag

33. Complete the following conversions.

Make sure to show your work using the "Cross Method"

Measurement	=	Conversion	Work
805 m	=	_____ km	
596,254 mm	=	_____ hm	
456 dag	=	_____ cg	
98 km	=	_____ m	

Physical Science Chapter 1: Intro to Science

34. Complete the following conversions.

Make sure to show your work using the "Cross Method"

Measurement	=	Conversion	Work
123.55 mm	=	_____ km	
9381 L	=	_____ mL	
0.05 dm	=	_____ mm	
0.099 dag	=	_____ cg	
98 s	=	_____ min	

35. Complete the following **HARDER** conversions.

Make sure to show your work using the "Cross Method"

Measurement	=	Conversion	Work
28 hrs	=	_____ days	
1.2 hr	=	_____ s	
1.4 months	=	_____ s	

36. You are walking on a dirt path when you trip over a rectangular block of metal. It has a length of 3.5 cm, a width of 14 cm, and a height of 0.15 m. If this block has a mass of 735 grams, what is the density of the block? (Show work)

Physical Science Chapter 1: Intro to Science

37. You are walking on a dirt path when you trip over a shiny, distorted hunk of metal. You decided to determine the density of the hunk of metal so you place it in a graduated cylinder of water. If the hunk of metal displaces 55 mL of water and has a mass of 12 grams, what is the density of the block? (Show work)

38. You drop a rock from the top of a 2.1 meter tall ladder. How far does the rock drop in kilometers? (Show work)

39. Complete the following conversions. (Remember that when you are multiplying measurements, the units MUST be the same)

Measurement 1		Measurement 2	Work and LABELED Answer
3 cm	x	5 cm	
62 m	x	1.25 m	
34 g	÷	150 mL	
12.8 kg	÷	1.4 L	
13.5 cm	x	125 mm	

Complete the Key Ideas Section

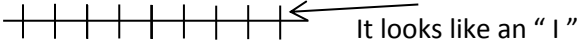
Physical Science Chapter 1: Intro to Science

Section 1.3: Organizing Data

You will be completing a majority of the Section 1.3 Worksheet IN CLASS.

40. What is the definition of a graph?

Graph Requirements

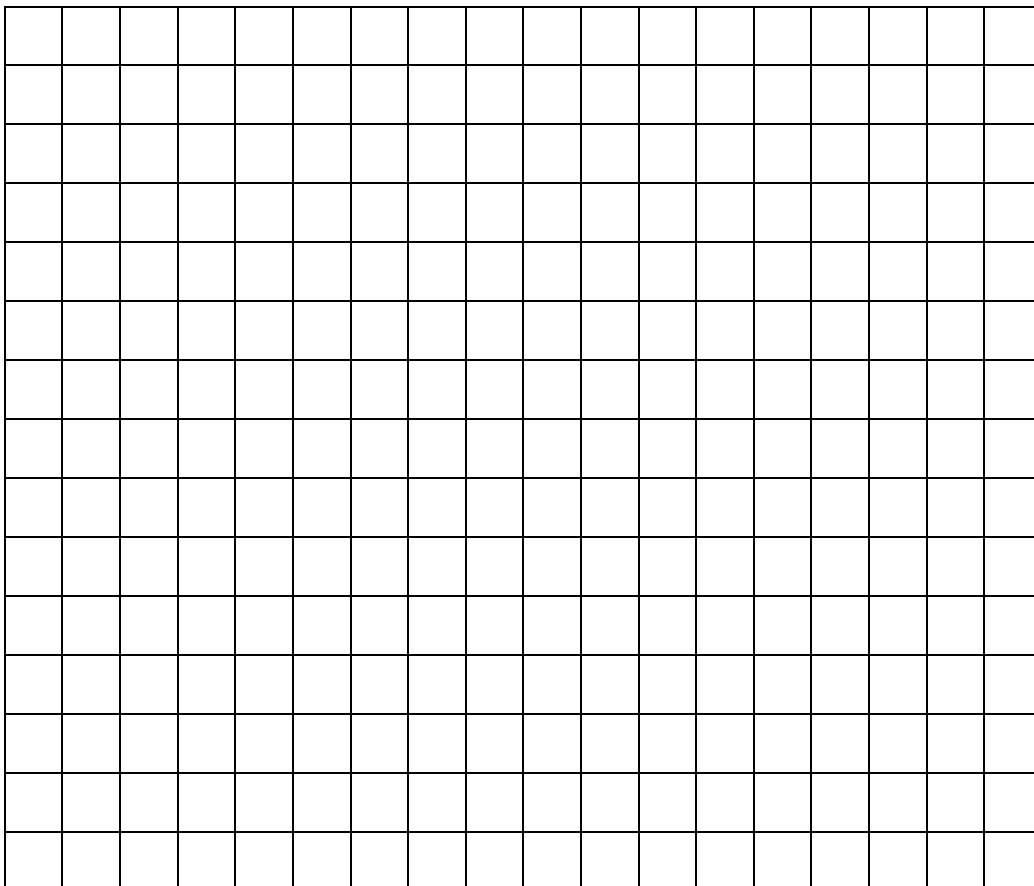
- When making a graph the independent variable is on the horizontal axis (x-axis) and the dependent variable is always on the vertical axis (y-axis).
 - You can remember this because the “ticks” on the horizontal axis look like “I’s”
 -  It looks like an “I”
- A graph should ALWAYS have a **TITLE** and **LABELED AXIS**
- When making a graph, you should make it large enough to use (i.e. don’t make a graph in the corner of a page, use most of the page).

Physical Science Chapter 1: Intro to Science

A **line graph (scatter graph)** can show any relationship where the dependent variable changes due to a change in the independent variable.

41. Graph the following data in a **line/scatter** graph.

Time (min)	Distance from start for car A (km)	Distance from start for car B (km)	Distance from start for car C (km)
10	2	2	1
20	4	3	3
30	6	5	6
40	8	7	7
50	10	8	4
60	12	11	0

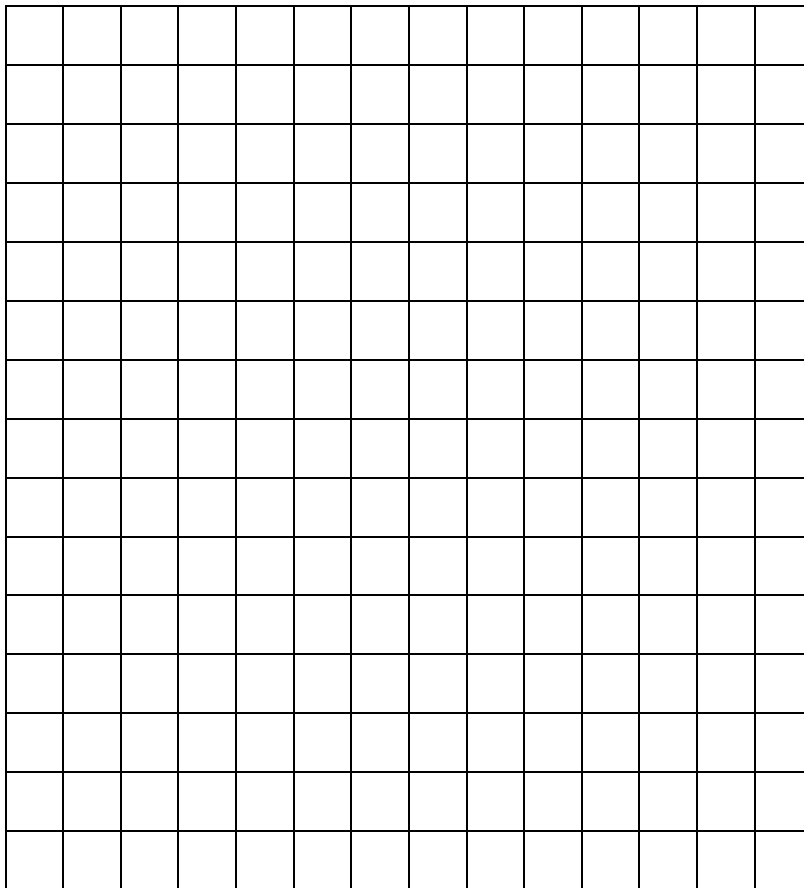


Physical Science Chapter 1: Intro to Science

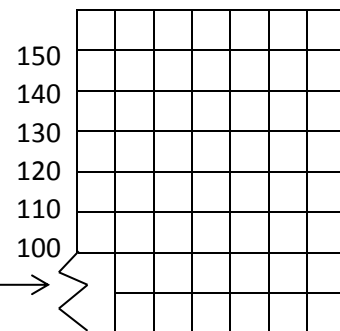
A **bar** graph is useful for comparing information collected by counting.

42. Graph the following data in a **bar** graph.

Day of the Week	Time spent studying for person A (hr)	Time spent studying for person B (hr)
Monday	0.5	0.5
Tuesday	0	0.5
Wednesday	0	1.5
Thursday	0.5	2
Friday	4	2
Saturday	3.5	1
Sunday	1	3.5



Sometimes when you are graphing, the data you collected is a long way away from "0". When this happens you can make a squiggly line (like below) and start you axis data at a higher number.



When would you use the "squiggly line"?

Physical Science Chapter 1: Intro to Science

A **circle** graph, or **pie** graph, is used to show how some fixed quantity is broken down into parts.

How to accurately create a pie graph

1. To create a circle graph, you start with the **total** of what you are analyzing.
2. Then you divide the number of each type by the total.
3. You then multiply that decimal by 360 to determine the angle that the decimal makes in the circle.

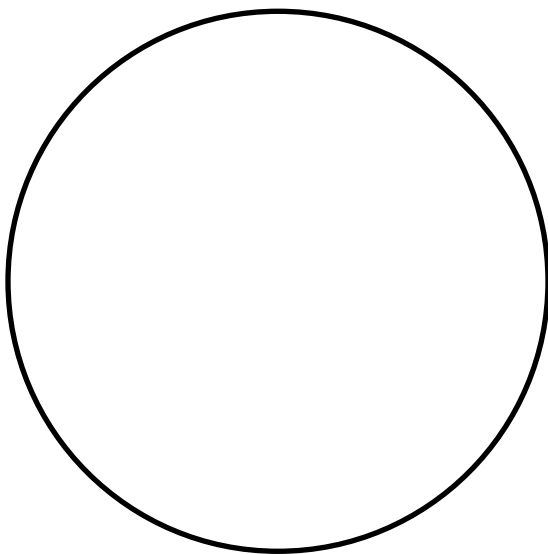
For example: if 18 of the 72 kids liked dogs you would...

- a. Divide 18 by 72 and take it time 360. This equals 90 (or 90° on the circle graph)
- b. You then would measure and mark out 90° on the circle using a protractor

- Each section of a pie graph represents a percentage of a whole. The larger the slice, the larger the percentage.
- This is the type of graph you would use when dividing up a whole. This is also the graph you usually use when dealing with percentages.

43. Complete the table and Graph the following data in to a **circle** graph.

Color	Number of vehicle with that color	Percentage of circle
Blue	15	
Green	5	
Grey	17	
White	16	
Black	25	
Red	38	
Purple	1	



Show your work for the Blue and Green car data below.

Blue Car Work
Green Car Work

Physical Science Chapter 1: Intro to Science

44. Explain why you would use scientific notation when writing down a number.

45. Complete the following table by either writing the number in scientific notation format or by reverting the number into standard format. (Make sure to label your answer)

Standard Format	Scientific Notation Format
145,000,000 grams	1.45×10^8 grams
85,450,000,000 m	
	6.5×10^3 kilograms
	1.5×10^{-4} km
0.0000000095 km	
15,000 m	
Tricky! 1,459,824km	_____m

46. What are the rules for multiplying and dividing scientific notation?

Multiplying: _____

Dividing: _____

47. What are the rules for adding and subtracting scientific notation?

Adding: _____

Subtracting: _____

Physical Science Chapter 1: Intro to Science

48. Using the scientific notation rules for adding, subtracting, multiplying, and dividing, answer the following math problems.

(Show your work and answer in scientific notation)

a. $1.2 \times 10^3 + 4.5 \times 10^2 =$ _____

Work

b. $1.24 \times 10^3 - 3.2 \times 10^5 =$ _____

Work

c. $4.5 \times 10^{12} \times 6.854 \times 10^3 =$ _____

Work

d. $5.28 \times 10^2 / 7.1 \times 10^3 =$ _____

Work

49. Why do you think significant figure are important?

Physical Science Chapter 1: Intro to Science

50. How many significant figures on in the following numbers?

Number	Sig Figs	Number	Sig Figs
158		0.40550	
1.92		0.0080501	
1.560		159000	
0.058		0.0505	
186.220		1050	

51. What are the rules for multiplying and dividing sig figs?

Multiplying: _____

Dividing: _____

52. What are the rules for adding and subtracting sig figs?

Adding: _____

Subtracting: _____

53. Answer the following math problem using significant figure rules.

(Make sure to get your labels correct)

a. $1.5 \text{ cm} \times 0.25 \text{ cm} =$ _____

b. $150 \text{ m} / 4 \text{ s} =$ _____

c. $84.26 \text{ cm} + 1.5999 \text{ cm} =$ _____

d. $1000 \text{ g} - 250 \text{ g} =$ _____

Your answers
may look
wrong to you
but trust the
process!

Physical Science Chapter 1: Intro to Science

54. Determine if the following statements are accurate, precise, both, or neither.

Statement	Accurate, precise, both, or neither
a. You throw 10 darts at the bulls-eye of a dart board. All of them hit the upper left hand corner of the dart board.	
b. You shoot 15 three point shots from the top of the three point line and make 13 of the shots; your other 2 shots bounce off the front of the rim.	
c. You try to throw 5 washers into a can but miss 2 long, 1 short, and 2 to the left of the can.	
d. You shoot an arrow into the bulls-eye of a target. (You were aiming for the bulls-eye)	
e. You measure the length of a board with a meter stick 5 times. Each time you get the same measurement of 76 cm. You find out later that the first 5 cm of the meter stick is missing.	

55. Explain why you chose your answers for question 54.

Reasoning
a.
b.
c.
d.
e.

Complete the Key Ideas Section