Name: Answer Key _____ Pd: _____ Date: _____

8th Grade Physical Science
Final EXAM Review Packet

1. Match the following vocabulary words with the correct definition on the right

E Physical Science
D Period (of Pendulum)
B Matter
A Experiment
C Bias
F Hypothesis
I Scientific Theory
J Scientific Law
H Properties
K Composition
G Technology

A. A systematic investigation to test a hypothesis
B. Anything that has mass and takes up space
C. Expectations alter the way results are analyzed or conclusions are made
D. The amount of time for that the bob takes to complete one full swing
E. The study of energy and matter
F. Testable idea based on background knowledge
G. The application of scientific knowledge
H. Characteristics of matter
I. An explanation based on repeated observations
J. Scientific "rule", describes the behavior of something in nature
K. The makeup of matter

2. Circle the vocabulary term that best fits the statement.

a. The taller a person is, the higher they can jump.
Scientific Theory **Hypothesis** **Scientific Law**

b. All matter is made of tiny atoms in constant motion.
Scientific Theory **Hypothesis** **Scientific Law**

c. A push or pull is required for an object to be set into motion.
Scientific Theory **Hypothesis** **Scientific Law**

3. TRUE or FALSE: Write the word "TRUE" If the statement is true. If the statement is false write the word that replaces the underlined word to make the statement true.

Independent The **Dependent** Variable is the variable "I" change (investigator changes).

TRUE You are only allowed to change **ONE** thing during an experiment.

Extensive Theories are based on **limited** knowledge and observations.

TRUE Scientific knowledge changes every day when new **observations** are made.

Control A **constant** is the standard used for comparison observations in an experiment.

TRUE A method for making any object or tool is considered a type of **technology**

4. I wanted to see if the composition of a baking sheet had an effect on the amount of time it took to bake cookies. I made the cookie dough using the same amount of ingredients and mixed both for the same amount of time. I used a "cookie scooper" to measure out the dough so that each cookie was the same size. Tray #1 was made from Aluminum and Tray #2 was made from Teflon. For tray # 1, I used the Whirlpool model 457 oven and baked the cookies at 350 °F. For tray #2 I used the Whirlpool model 457 oven and baked the cookies at 400°F. I used the same timer for both trays to measure how long it took to finish.

Explain where did I go wrong? Use ALL of the following words:

independent variable, dependent variable, fair test, constant, control. (Write in complete sentences)

This experiment was not a FAIR TEST. The original INDEPENDENT VARIABLE was to see how a change in the amount of time would affect the DEPENDENT VARIABLE (Finishing time of baked cookies). This means the time in the oven should have been the only variable to change, but the experimenter also changed the type of tray, and the oven temperature. Both trays should have remained CONSTANT along with the size of the cookies, the oven used, the temperature, and ingredients.

A better test would have been to see how the oven temperature affected the finishing time of the cookies. The experimenter would have kept everything constant except the oven temperature and used the cookie recipe's suggested temperature as the CONTROL.

5. Match the uses for each of the following pieces of lab equipment to its name:

C Graduated Cylinder

B Erlenmeyer Flask

A Beaker

A. Used to hold/heat/mix lab specimens (liquid or solid); NOT used to measure precise quantities

B. Holds and heats lab specimens; mixing done through swirling

C. Used to measure precise quantities of liquid

6. The goal of this project was to determine if the air pressure of the tires on a dirt bike affects the stopping distance of the vehicle. I predicted that as the air pressure in a tire decreases the stopping distance would decrease. Additionally, I thought that as the pressure increases, the stopping distance would increase as well. The dirt bike rider accelerated to a speed of 4 km/hr and at a predetermined point, applied the brakes. The stopping distance was measured, recorded, and averaged. 10 trials were done at tire pressures of 10 psi, 12 psi, 15 psi (recommended on the tire), 17 psi and 20 psi. Psi stands for "pounds per square inch". The table summarizes the results of my tests.

Tire Pressure	Average Stopping Distance (meters)
10 psi	1.2 m
12 psi	1.5 m
15 psi	1.6 m
17 psi	1.8 m
20 psi	2.2 m

From my experiment I found that the best tire pressure for stopping distance was 10 psi.

a) What was the research question/problem? **Does air pressure of the tires affect the stopping distance of a dirt bike?**

b) What is the investigator's hypothesis? **As air pressure decreases, the stopping distance would also decrease.**

c) What is the Independent Variable? **Tire Pressure**

d) How many levels of the Independent Variable were used? **5 Levels**

What where they? **10 psi, 12 psi, 15 psi, 17 psi, 20 psi**

e) What is the Dependent Variable? **Stopping Distance**

f) What is the Control? **15 psi (it is recommended on these tires)**

g) What were 3 constants throughout this test?

Always traveling at the same speed
Always applied the brakes at the same place
Distances were always measured in m

h) How many trials were performed for each level of Independent Variable? **10**

7. Design your own Experiment: Consider the design of an experiment for the research question below. Fill in the components in order to design a VALID Experiment.

Research Question: Does the temperature of water used (to water a plant) have an effect on the rate of plant growth? **EXAMPLE:**

- Hypothesis: **The higher the temperature of the water, the faster the plant will grow.**
- Independent Variable: **The temperature of the Water given to the plant**
  - Levels of IV (at least 3): **5° C water, 22° C water (Room temperature), 95° water**
- Dependent Variable: **The rate of Growth**
- Control: **The 22° Water**
- Why is it the best control?

  It is most likely the temperature of water that is normally used

- Constants (at least 3):

  Same type of plant, same amount of light, same amount of fertilizer, etc.

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8. Complete the table below:

Quantity	Unit	Symbol
Time	Second	s
Temperature	Kelvin	K
Distance	Meter	m
Volume	Liter	L
Mass	Gram	g

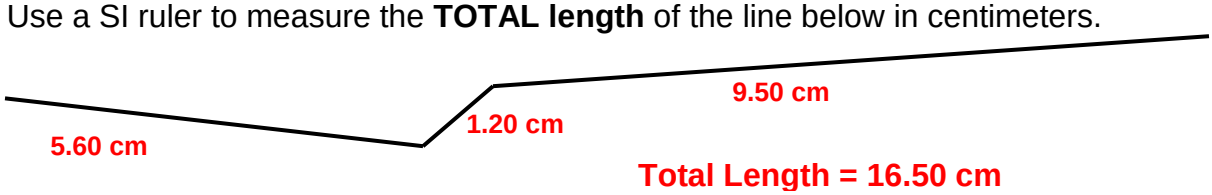
9. Write the correct order of the SI system prefixes from LARGEST to SMALLEST.

Kilo Hecto Deka Base Deci Centi Milli

10. What does 7,206.95 cm equal in Km? **0.0720695 km**

11. What does 9.4 km equal in mm? **9400000.0 km**

12. Use a SI ruler to measure the **TOTAL length** of the line below in centimeters.



Total Length = 16.50 cm

DENSITY

Directions: Below are several data tables similar to the ones that you used when we were doing the density labs. Use a calculator to **complete** the data tables. **DO NOT FORGET THE LABELS**. And always round your answer to the nearest hundredths.

$V = l \times w \times h$ $V = \pi r^2 h$ $\pi = 3.14$

13. Density of Cubes

Length	Width	Height	Volume	Mass	Density
13.5 cm	3.8 cm	4.0 cm	**205.2 cm^3**	145.0 g	**0.706 g/cm^3**
5.2 cm	9.7 cm	1.4 cm	**70.6 cm^3**	12.6 g	**0.178 g/cm^3**

14. Density of Cylinders

Diameter	Radius	Height	Volume	Mass	Density
17.5 cm	**8.75 cm**	73.0 cm	**17558.55 cm^3**	12.6 g	**0.00071 g/cm^3**
19.6 cm	**9.8 cm**	45.78 cm	**13812.68 cm^3**	115.2 g	**0.0083 g/cm^3**

15. Density of "Irregularly Shaped" Objects – Overflow Cup

Volume of H_2O Displaced	79.8 ml	36.6 ml
Mass of Object	185.4 g	44.4 g
Density of Object	**2.32 g/ml**	**1.21 g/ml**

16. The following is a list of substances that will be placed into it. First determine the Density of each item, and then list the objects in the graduated cylinder in the order they would appear.

Density = $\frac{M}{V}$

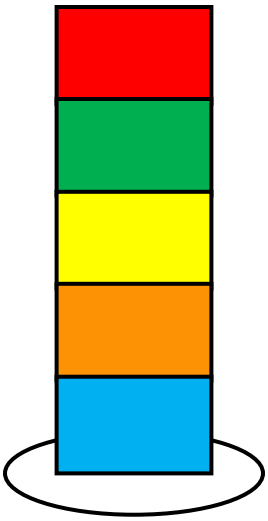
BLUE = Mass = 44.00 g Volume = 15.00 ml
DENSITY = **2.93 g/ml**

GREEN = Mass = 43.00 g Volume = 75.00 ml
DENSITY = **0.573 g/ml**

YELLOW = Mass = 90.0 g Volume = 110.20 ml
DENSITY = **0.816 g/ml**

RED = Mass = 1.38 g Volume = 11.10 ml
DENSITY = **0.124 g/ml**

ORANGE = Mass = 59.04 g Volume = 85.43 ml
DENSITY = **0.691 g/ml**



16. Describe the volume, shape and molecular arrangement in the following states of matter:

State of Matter	Volume	Shape	Molecular Arrangement
Solid	**Definite**	**Definite**	**tightly packed, crystal**
Liquid	**Definite**	**Takes shape of container**	**tightly packed, able to rearrange**
Gas	**Takes volume of container**	**Takes shape of container**	**spread out, constantly moving in all directions, *NOT charged**
Plasma	**Takes volume of container**	**Takes shape of container**	**spread out, constantly moving in all directions, *charged**

17. Provide one real life example of Thermal Expansion.

In the Summer, Bridges expand in the heat and in the winter they contract in the cold.

18. What is the Kinetic Theory of Matter?

All matter is made of tiny particles that are in a constant state of motion

19. *Match the following terms to their definitions:*

_E_ Heat of Fusion

_C_ Heat of Vaporization

_B_ Specific Heat

_D_ Pressure

_A_ Buoyancy

20. If a boat weighs 100 grams, how much water does it need to displace in order to float in the liquid? Use Archimedes' Principle to explain your answer.

The upward buoyant force exerted on an object equals the weight of the fluid displaced by the object. So, it needs to displace 100 ml of water (which equals 100 grams)

21. Match the phase change to the proper description:

F	Melting
D	Freezing
B	Evaporating
C	Boiling
A	Condensation
E	Sublimation

A. Phase change from gas to liquid
B. Phase change from liquid to gas; occurs only at the surface
C. Phase change from liquid to gas; occurs throughout liquid
D. Phase change from liquid to solid
E. Phase change from solid directly to gas. Ex: moth balls
F. Phase change from solid to liquid

22. Use PTV to answer the following: Circle your answer

If the **VOLUME** remains constant – and you **DECREASE** the temperature, what happens to the pressure?

It Increases **It Decreases** **It Stays the Same**

If the **TEMPERATURE** remains constant – and you **DECREASE** the pressure, what happens to the volume?

It Increases **It Decreases** **It Stays the Same**

If the **TEMPERATURE** remains constant – and you **DECREASE** the volume, what happens to the pressure?

It Increases **It Decreases** **It Stays the Same**

23. With how much force do you have to push down on the Large side to lift the car? (Show all work – circle final answer!)

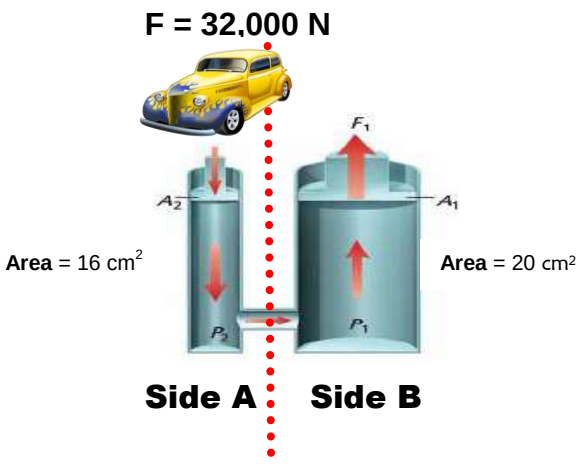
Step 1: First solve for P on Side B

$$P = \frac{F}{A} = \frac{32{,}000\ N}{20\ cm^2} = \frac{1600\ N}{cm^2}$$

Step 2: Last solve for F on Side A

$$F = P \times A$$

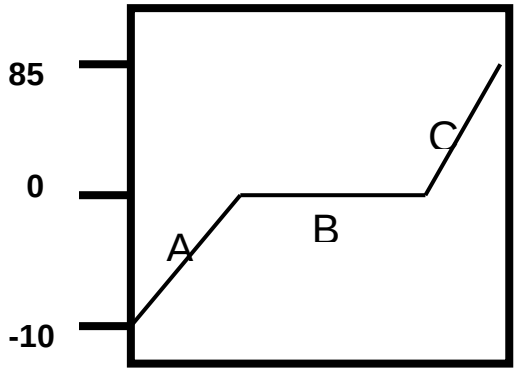
$$F = \frac{1600\ N}{cm^2} \times 16\ cm^2 = 25{,}600\ N$$



24. Calculate the amount of energy needed to change 15kg of Ice at -10 °C to liquid water at 85°C? (Use the graph and information below to help you AND **SHOW ALL WORK)**

Specific Heat of *Solid* H_2O (ICE):	$\frac{2.00\ KJ}{kg\ °C}$
Specific Heat of *Liquid* H_2O (WATER):	$\frac{4.18\ KJ}{kg\ °C}$
Specific Heat of *Gas* H_2O (STEAM):	$\frac{2.02\ KJ}{kg\ °C}$

Heat of Fusion of H_2O	$\frac{334\ kJ}{kg}$
Heat of Vaporization of H_2O	$\frac{2260\ kJ}{kg}$



Part A: Warm the Ice from –10 °C to 0 °C

What is Changing? Temperature or State of Matter

E = Mass x Δ Temperature x Specific Heat

E = 15 ~~kg~~ x 10 ~~°C~~ x $\frac{2.00\ kJ}{~~kg~~\ ~~°C~~}$ **E = 300 KJ**

Part B: Melt the Ice into water at a constant temperature of 0 °C

What is Changing? Temperature or State of Matter

E = Mass x Heat of Fusion

E = 15 ~~kg~~ x $\frac{334\ kJ}{~~kg~~}$ **E = 5010 KJ**

Part C: Warm the water from 0 °C to 85 °C

What is Changing? Temperature or State of Matter

E = Mass x Δ Temperature x Specific Heat

E = 15 ~~kg~~ x 85 ~~°C~~ x $\frac{4.18\ kJ}{~~kg~~\ ~~°C~~}$ **E = 5329.5 KJ**

TOTAL Energy = 10639.5 KJ

25. Two silver blocks are placed into a hot water bath that is currently boiling. One has a mass of 100 grams while the other has a mass of 500 grams.

A. How do the temperatures of both blocks compare?

The Temperatures are the same. (Average)

B. How does the Thermal Energy of both blocks compare?

The 500 g block has more Thermal Energy. (More Mass = More Thermal Energy)

26. Fill in the blank:

- What three things can matter do when it comes in contact with Radiant Energy?

  Absorb, Reflect, or Transmit

- What two states of matter are considered fluid? **Liquids & Gases (Also Plasma)**

- The **Sun** is the main source of radiant energy on earth

- In order for conduction to occur, two objects must have **Different** temperatures and must be in direct **Contact**

27. Fill in the equations for the temperature conversions. (YES – you need to know these!)

Fahrenheit to Celsius	**°F - 32 = x 5 ÷ 9 =**
Celsius to Fahrenheit	**°C x 9 ÷ 5 + 32 =**
Kelvin to Celsius	**K – 273 =**
Celsius to Kelvin	**°C + 273 =**

28. What would you do if you needed to convert from Fahrenheit to Kelvin or Kelvin to Fahrenheit?

First convert into Celsius

29. Change 200 °F to °C

200°F - 32 = x 5 ÷ 9 = 93.33 °C

30. Change 19.5 K to °C

19.5 K – 273 = - 253.5 °C

31. Change 239 K to °F

239 K – 273 = - 34 °C

-34 °C x 9 ÷ 5 + 32 = - 29.2 °F

32. Change 301 °F to K

301°F - 32 = x 5 ÷ 9 = 149.44 °C

149.44 °C + 273 = 422.44 K

33. Temperature Estimates: Circle the temperature that is most appropriate.

A. The temperature of a fresh bowl of soup: 87°C 34°K 210°C

B. Room temperature is usually set to this: 22 °C 273°K 99 °F

34. Who Said That? Use **F** for Fahrenheit **K** for Kelvin or **C** for Celsius

C Used for scientific measurements and is used in this classroom

F Used in households in the US

K The scale that is based on the temperature at which all-molecular motion stops.

F Normal room temperature on this scale is 71.6

F Water freezes at 32 on this scale.

K Water freezes at 273 on this scale.

C Water freezes at 0 on this scale.

F Water boils at 212 on this scale.

K This scale has the same number of divisions as the Celsius scale.

F Normal body temperature on this scale is 98.6

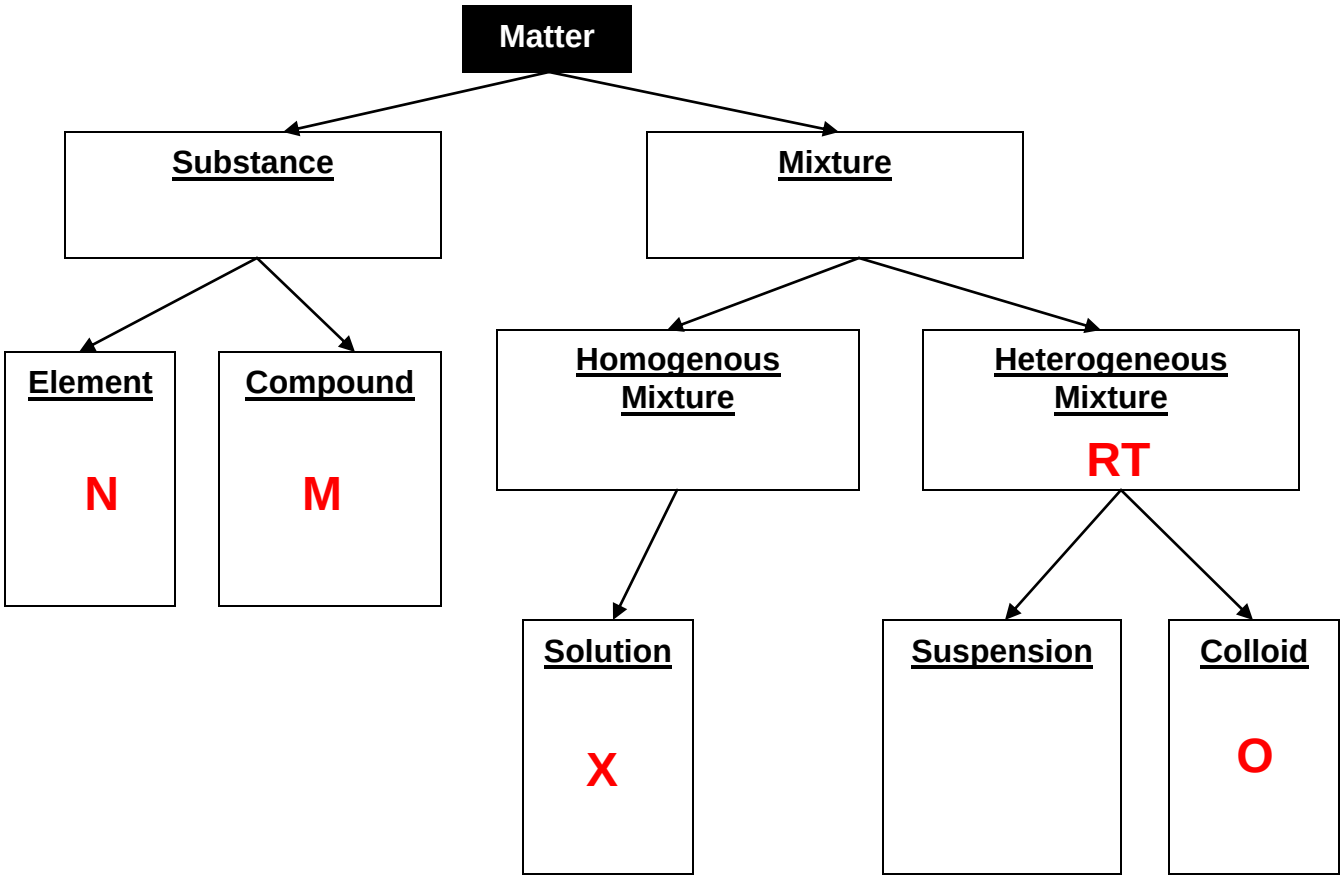
35. Determine whether the following describes a <u>PHYSICAL</u> or <u>CHEMICAL</u> Property of Wood:

PHYSICAL Brown
CHEMICAL Flammable
PHYSICAL Solid
PHYSICAL Tough
PHYSICAL Floats in Water
CHEMICAL Decays in the presence of fungus

36. Determine whether the following is a PHYSICAL or CHEMICAL change

CHEMICAL Alka-Seltzer and Water fizz
PHYSICAL Grinding whole black pepper for dinner
PHYSICAL Sharpening a knife to carve a turkey
CHEMICAL Lightening
PHYSICAL Melting Ice
PHYSICAL Making Kool-Aid

37. USE the Clues in the next question and place the "CHEMICALS" into the right places on the diagram below.



38. CLUES For the Previous Question.

- **Chemical N** is made of one kind of atom. It is found on the Periodic Table. It's symbol is "Pt"

- **Chemical X** is a mixture of blue solid particles and a clear liquid. After stirring for 5 minutes, this mixture becomes evenly mixed & no particles are settling. This mixture is blue in color. A Tyndall test revealed a negative result.

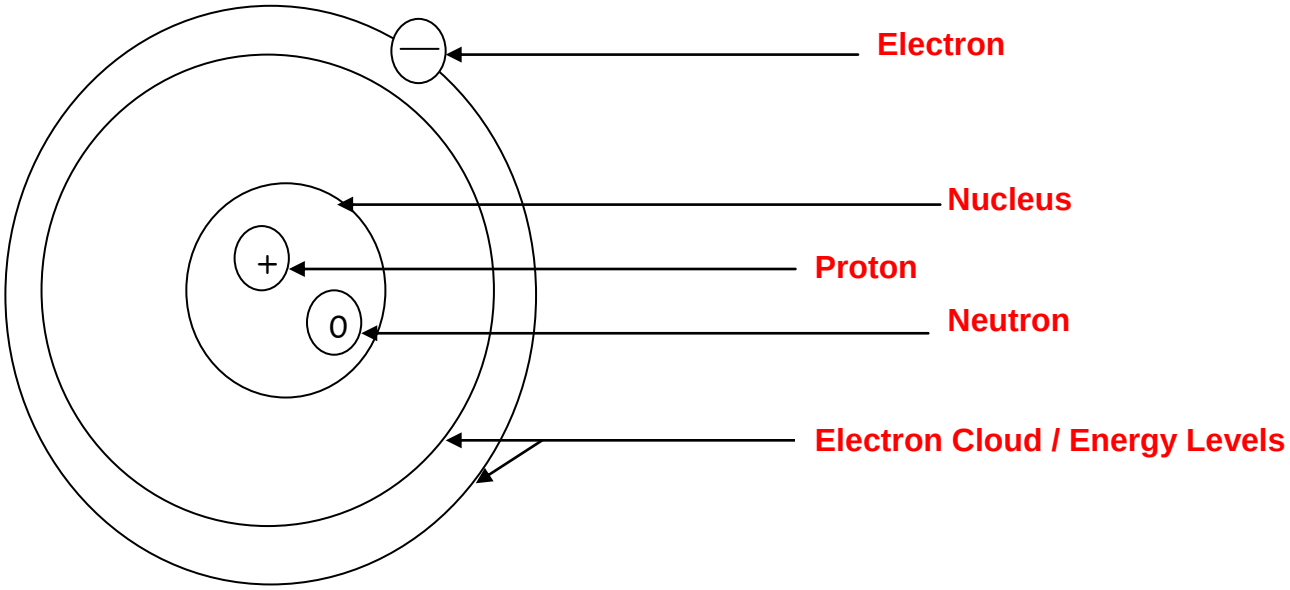
- **Chemicals RT:** Chemicals R and T have been mixed together through a shaking process. Both of them are found in the solid state. After combining, you decide to divide the "RT" mixture into 4 different containers in a random fashion. When your task is complete you notice that the ratio of R:T in each container is NOT the same. There was no use for a filter and you did not complete a Tyndall test.

- **Chemical M** is made up of two different atoms bonded together in a fixed ratio.

- **Chemical O** is a mixture of two substances. One is a red powder and the other is a blue liquid. After mixing for 5 minutes, you observe a resulting purple liquid. It is unevenly mixed and no particles are settling. A Tyndall test has revealed a positive result.

39. Please label the diagram below:

This diagram shows the structure of a(n) **Atom**



40. What vocabulary term describes how the following three atoms are related to each other? **These are all ISOPTOPES of the Carbon Atom**

Carbon – 12, Carbon - 14, and Carbon – 16

41. What is the common name of…

Group IA? **Alkali Metals**

Group IIA? **Alkaline Earth Metals**

B Groups? **Transition Metals**

Group VIIIA? **Noble Gases**

What is the common name of the group that contains Uranium? **Actinide Series**

42. Compare and Contrast the properties of Metals and Non-metals on the periodic table:

Metals	Non-Metals
Shiny	**Dull**
Good Conductor of Heat and Electricity	**Poor Conductor of Heat and Electricity**
Ductile	**Brittle**
Malleable	

43. Use the diagram to the right to answer the following questions.

26
Fe
55.84

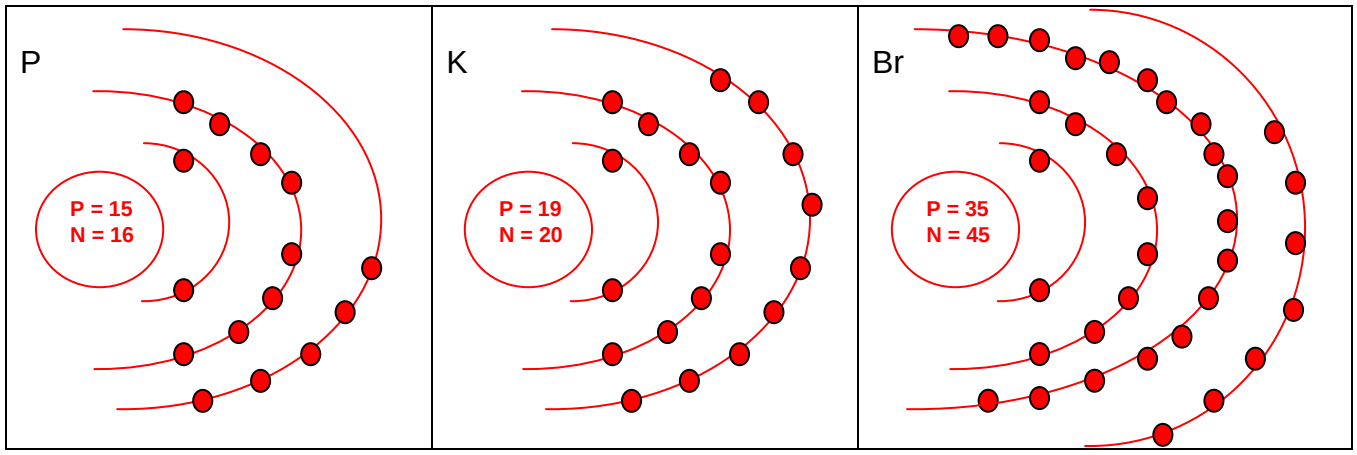
Element Name: **Iron**

Number of Protons: **26**

Number of Neutrons: **30**

Number of Electrons: **26**

44. In the blocks below, please draw the <u>atomic structure</u> for the elements given. Please include the name of the element (with the correct spelling), the number of protons, electrons, and neutrons.



45. For the following Atom, fill in the information asked:

13
Al
26.98

Name: **Aluminum**

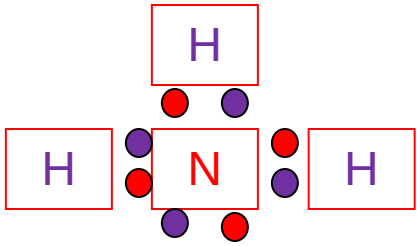
P **13** # E **13** #N **14**

Group # **III A**

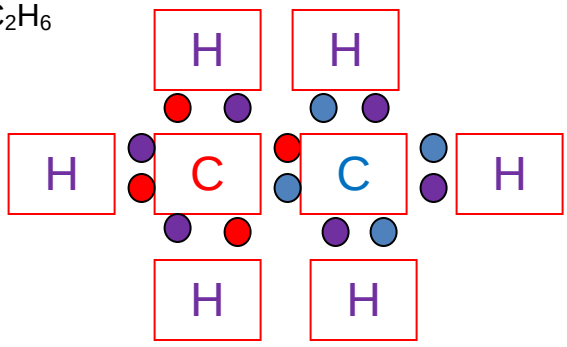
Period # **3**

46. In the boxes below, please draw the <u>dot diagram</u> of the following compounds.

NH_3



C_2H_6



47. Find the Percent Error of the following information:

Calculated Distance = 5.23 meters

Actual Distance = 5.75 meters

$$\% \text{ Error} = \left| \frac{\text{Calculated - Actual}}{\text{Actual}} \right| \times 100 = \left| \frac{5.23 \text{ m/s} - 5.75 \text{ m/s}}{5.75 \text{ m/s}} \right| \times 100$$

= 0.090 % Error

48. During a big Franklin Regional track race, a runner ran the 500-meter race in 210 seconds. What was the runner's speed?

$$V = \frac{D}{T} = \frac{500 \text{ m}}{210 \text{ sec}} = 2.38 \text{ m/s}$$

49. A motorcycle is moving at a constant speed of 42 km/hr and travels for 2.25 hrs. How far did the motorcycle travel?

$$D = V \times T = \frac{42 \text{ km}}{\text{hr}} \times 2.25 \text{ hr} = 94.5 \text{ km}$$

50. A cyclist starts at rest and accelerates at 1.0 m/s^2 North for 20 seconds. What is the cyclist's Final Velocity?

$$A = \frac{\Delta V}{T} \qquad V_F = A \times T + V_i = \frac{1.0 \text{ m}}{\text{Sec}^2} \times \frac{20 \text{ sec}}{1} + \frac{0 \text{ m}}{\text{sec}} = 20 \text{ m/s}$$

51. As you are walking through Pittsburgh, you come across a very tall building. You decide to use what you learned in science to find the height of the building. You measure 50 meters away from it, and measure the angle to the top of the building as 35°. What is the height of the building?

$$H = D \times \text{TAN } \theta = 50 \text{ m} \times \text{TAN } 35° = 50 \text{ m} \times 0.7002 = 35.01 \text{ m}$$

52. Convert 5,463 yards to miles.

$$\frac{5463 \text{ yd}}{1} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{1 \text{ mile}}{5280 \text{ ft}} = 3.10 \text{ km/hr}$$

56. Fill in the table below:

Newton's Laws	Definition	Example
First Law	An object Stays in the state of rest or motion unless acted on by another force	In a head-on automobile accident, the car may have stopped, but the driver continues moving forward unless held in place by a seatbelt
Second Law	When a force acts on an object, the object will accelerate proportionally to the force and in the same direction.	A backhoe is able to exert more force on the rock, which will make it accelerate faster than when you push it with your bare hands
Third Law	For every action, there is an equal and opposite RE-Action.	A baseball hits a bat in the direction it was thrown and the force is returned equally in the opposite direction by the bat.

θ	TAN
0	0.0000
1	0.0175
2	0.0349
3	0.0524
4	0.0699
5	0.0875
6	0.1051
7	0.1228
8	0.1405
9	0.1584
10	0.1763
11	0.1944
12	0.2126
13	0.2309
14	0.2493
15	0.2680
16	0.2868
17	0.3057
18	0.3249

θ	TAN
19	0.3443
20	0.3640
21	0.3839
22	0.4040
23	0.4245
24	0.4452
25	0.4663
26	0.4877
27	0.5095
28	0.5317
29	0.5543
30	0.5774
31	0.6009
32	0.6249
33	0.6494
34	0.6745
35	0.7002
36	0.7265
37	0.7536

θ	TAN
38	0.7813
39	0.8098
40	0.8391
41	0.8693
42	0.9004
43	0.9325
44	0.9657
45	1.0000
46	1.0355
47	1.0724
48	1.1106
49	1.1504
50	1.1918
51	1.2349
52	1.2799
53	1.3270
54	1.3764
55	1.4282
56	1.4826

θ	TAN
57	1.5399
58	1.6003
59	1.6643
60	1.7321
61	1.8041
62	1.8807
63	1.9626
64	2.0503
65	2.1445
66	2.2460
67	2.3559
68	2.4751
69	2.6051
70	2.7475
71	2.9042
72	3.0777
73	3.2709
74	3.4874
75	3.7321

θ	TAN
76	4.0108
77	4.3315
78	4.7046
79	5.1446
80	5.6713
81	6.3138
82	7.1154
83	8.1444
84	9.5144
85	11.4301
86	14.3007
87	19.0811
88	28.6363
89	57.2900
90	--------

Conversion Tables

Time
60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
365 days = 1 year
100 years = 1 century

English to SI
2.54 cm = 1 inch
0.9144 m = 1 yard
1.6 km = 1 mile

English-Distance
12 inches = 1 foot
3 feet = 1 yard
5280 feet = 1 mile

SI -Distance
10 mm = 1 cm
100 cm = 1 meter
1000 meters = 1 km

Gravity Constant

$g = 9.8\ m/s^2$