

Eagen

Science 7

Accommodated

Potential & Kinetic Energy

Potential Energy - stored energy

$$PE = mgh \quad | \quad PE = \text{Mass} \times 9.18 \times \text{Height}$$

↳ based on Mass or Height

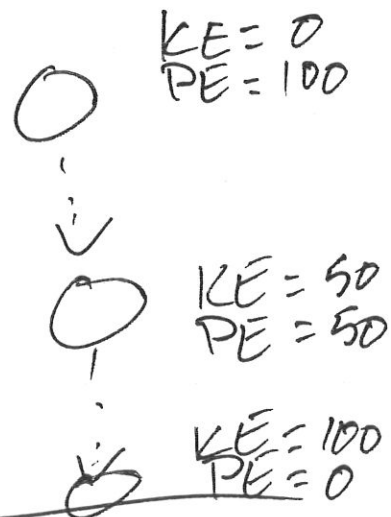
Kinetic Energy - moving energy

$$KE = \frac{1}{2} MV^2$$

↳ based on Mass or Velocity

Ball dropping

Ground



Name _____ Date _____ Period _____

Potential vs. Kinetic Energy

Potential Energy is stored energy. It can be released or harnessed to do work. Kinetic energy is the energy possessed by an object as a result of its motion. Label each description as an example of kinetic energy or potential energy.

1. ~~_____ A skier is poised at the top of a steep slope.~~
2. _____ A concrete dam holds back a large reservoir of water.
3. _____ An archer has pulled back the string of his bow, ready to release the arrow at the distant target.
4. ~~_____ A woman swings her golf club down toward the golf ball sitting on the tee.~~
5. _____ A man swings an axe toward a log.
6. _____ A flowerpot is falling from a windowsill.
7. _____ A catapult is loaded with a boulder and pulled back into position. It is ready to be launched.
8. ~~_____ A fast-moving stream runs toward the mill.~~
9. _____ The baseball player swings her bat.
10. _____ A roller coaster has reached the top of the highest hill.
11. _____ A marble rolls across the table.
12. ~~_____ A child is about to let go of a yo-yo.~~

Name

Key

Date

Period

Potential vs. Kinetic Energy

Potential Energy is stored energy. It can be released or harnessed to do work. Kinetic energy is the energy possessed by an object as a result of its motion. Label each description as an example of kinetic energy or potential energy.

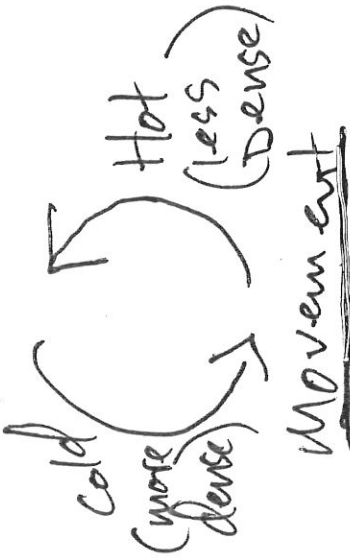
1. Potential A skier is poised at the top of a steep slope.
2. Potential A concrete dam holds back a large reservoir of water.
3. Potential An archer has pulled back the string of his bow, ready to release the arrow at the distant target.
4. Kinetic A woman swings her golf club down toward the golf ball sitting on the tee.
5. Kinetic A man swings an axe toward a log.
6. Kinetic A flowerpot is falling from a windowsill.
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9. Kinetic The baseball player swings her bat.
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11. Kinetic A marble rolls across the table.
12. Potential A child is about to let go of a yo-yo.

Heat Transfer

Conduction
Heat transfer
when the
objects are
in physical
contact

Touching

Convection
Heat transfer
in liquids/gases
Hot air rises
Cold air falls



Radiation
Heat transfer
through electro-
magnetic waves
Waves

Conduction, Convection, or Radiation

Objective: Students will know how to separate the different types of thermal energy.

Matching: Use these definitions to help you with the rest of the worksheet.

Radiation	A. Heat transfer from a heat source through a solid.
_____ convection	B. Infrared heat waves like in the Electromagnetic spectrum.
Conduction	C. Heated gas or liquid particles rise.

Label each example with the appropriate type of heat transfer: **radiation, convection, or conduction**. Explain why you think so for each example (**hint:** use the definitions above to help you).

1. ~~_____~~ Heat we feel from the sun.

a. Why? _____

2. _____ The heat you feel when you touch a hot stove.

a. Why? _____

3. _____ Heat you feel when you put your hands above a fire.

a. Why? _____

4. ~~_____~~ My spoon is hot after leaving it on the pot that was on the stove.

a. Why? _____

5. _____ This is responsible for making macaroni rise and fall in a pot on the stove.

a. Why? _____

6. _____ The heat my snake feels from the heat lamp above him.

a. Why? _____

7. ~~_____~~ Transfer of heat by the actual movement of the warmed matter (i.e. gas or liquid).

a. Why? _____

8. _____ The reason heating vents are usually placed on the floor of a home.

a. Why? _____

9. _____ Insulation is used to prevent this type of heat transfer.

a. Why? _____

10. ~~_____ This type of heat transfer is trapped by green houses.~~

a. Why? _____

11. _____ Why the dog lays down next to the wood stove.

a. Why? _____

12. _____ Why the cat sits on a stove above the stove.

a. Why? _____

13. ~~_____ Why the kettle on the stove gets hot.~~

a. Why? _____

14. _____ Why you use a pot holder when getting the cookie sheet out of the oven.

a. Why? _____

15. _____ Heat you feel when you sit next to a campfire.

a. Why? _____

16. _____ Heat you feel from your electric blanket.

a. Why? _____

Conduction, Convection, or Radiation

Objective: Students will know how to separate the different types of thermal energy.

Matching: Use these definitions to help you with the rest of the worksheet.

<u>B</u> Radiation	A. Heat transfer from a heat source through a solid.
<u>C</u> convection	B. Infrared heat waves like in the Electromagnetic spectrum.
<u>A</u> Conduction	C. Heated gas or liquid particles rise.

Label each example with the appropriate type of heat transfer: **radiation, convection, or conduction.**

Explain why you think so for each example (**hint:** use the definitions above to help you).

- R Heat we feel from the sun.
 - Why? _____
- Cond. The heat you feel when you touch a hot stove.
 - Why? _____
- Conv. Heat you feel when you put your hands above a fire.
 - Why? _____
- Cond. My spoon is hot after leaving it on the pot that was on the stove.
 - Why? _____
- Conv. This is responsible for making macaroni rise and fall in a pot on the stove.
 - Why? _____
- Radiation The heat my snake feels from the heat lamp above him.
 - Why? _____
- Conv. Transfer of heat by the actual movement of the warmed matter (i.e. gas or liquid).
 - Why? _____

8. Conv. The reason heating vents are usually placed on the floor of a home.

a. Why? _____

9. Conv. Insulation is used to prevent this type of heat transfer.

Radiation

a. Why? _____

10. Rad. This type of heat transfer is trapped by green houses.

conv.

a. Why? _____

11. Rad. Why the dog lays down next to the wood stove.

a. Why? _____

12. Conv. Why the cat sits on a stove above the stove.

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13. Cond. Why the kettle on the stove gets hot.

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a. Why? _____

16. Cond. Heat you feel from your electric blanket.

a. Why? _____

Identifying Forces

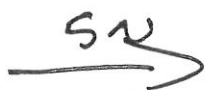
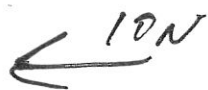
Notes

Balanced forces -
Forces cancel out

Net force = 0 Generally,
results in no motion



Unbalanced forces -
Forces do not cancel



Net force
= 5N left



subtract



subtract



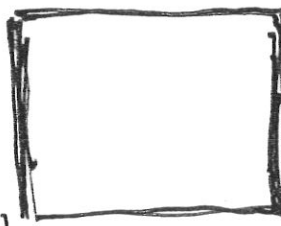
add



add



gravity



Normal



Friction

Name _____

Date _____

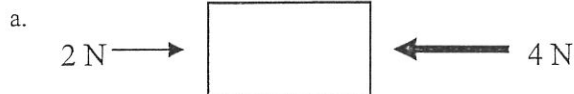
Net Force Worksheet

What causes objects to move? For each problem, complete the questions using your notes and what you have learned so far in this Forces Unit.

1. Write the definition of each term in the definition column. Then decide whether that force produces motion and write either yes, no or it depends in the motion column.

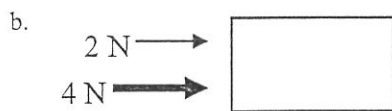
Vocabulary term	Definition	Change in motion? (yes, no or it depends)
Net force		
Balanced forces		
Unbalanced forces		

2. For each of diagram, determine the net force acting on the object. Follow the format for showing your work shown in (a). Then, write whether or not there will be a change in motion. If yes, write the direction the object will move in.



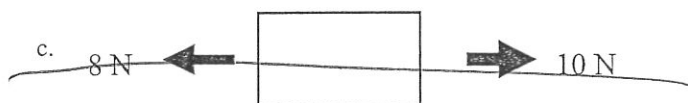
Net force: $4\text{ N} - 2\text{ N} = 2\text{ N}$ to the left.

Change in motion: The box will move to the left.



Net force:

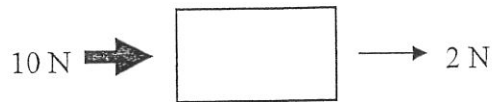
Change in motion:



Net force:

Change in motion:

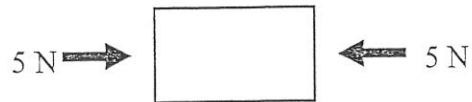
d.



Net force:

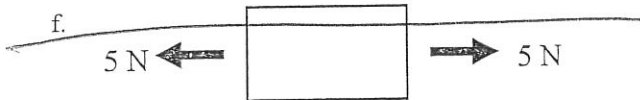
Change in motion:

e.



Net force:

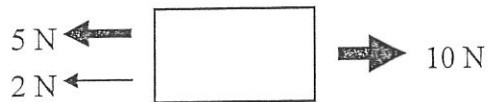
Change in motion:



Net force:

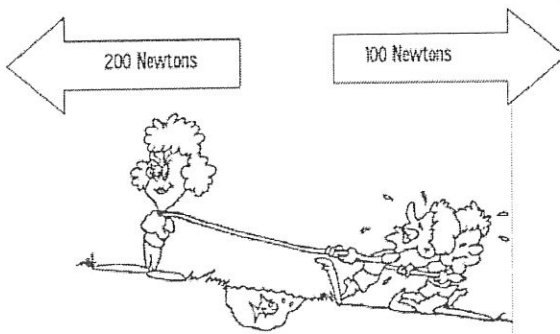
Change in motion:

g.



Net force:

Change in motion:



Below is a diagram of a tug-a-war. Write a short paragraph to describe what will happen, using the terms *net force*, *balanced OR unbalanced forces*, *AND* *change in motion*.

Name key

Date _____

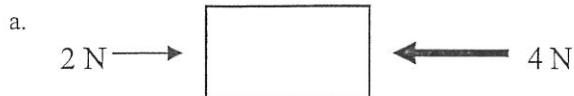
Net Force Worksheet

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1. Write the definition of each term in the definition column. Then decide whether that force produces motion and write either yes, no or it depends in the motion column.

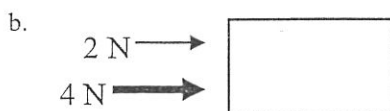
Vocabulary term	Definition	Change in motion? (yes, no or it depends)
Net force	Sum of all forces	Depends
Balanced forces	Equal forces that cancel	No
Unbalanced forces	Unequal forces	Yes

2. For each of diagram, determine the net force acting on the object. Follow the format for showing your work shown in (a). Then, write whether or not there will be a change in motion. If yes, write the direction the object will move in.



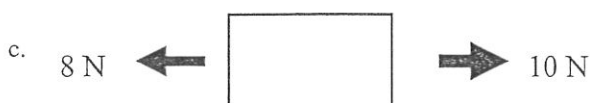
Net force: $4\text{ N} - 2\text{ N} = 2\text{ N to the left.}$

Change in motion: The box will move to the left.



Net force: 6 N \rightarrow

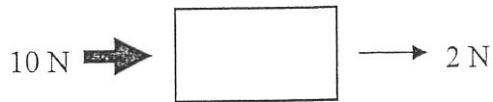
Change in motion:



Net force: 2 N

Change in motion: \rightarrow

d.



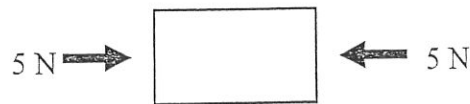
Net force:

12 N

Change in motion:



e.

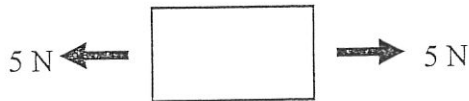


Net force:

0 N

Change in motion:

f.

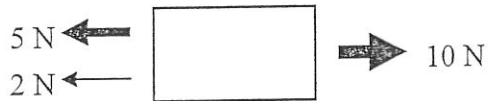


Net force:

0 N

Change in motion:

g.

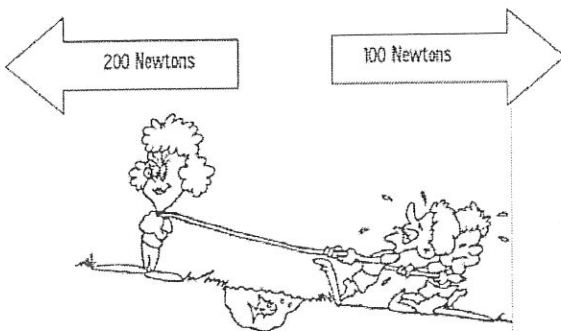


Net force:

3 N →

Change in motion:

Below is a diagram of a tug-a-war. Write a short paragraph to describe what will happen, using the terms *net force*, *balanced OR unbalanced forces*, AND *change in motion*.



The net force is equal to 100 N to the left. This is an unbalanced force. This force will cause a change in motion to the left.

Chem. / Physical Properties & Changes Notes ^{c/c,}

Physical Properties - describe the appearance or something we can measure

Ex. Color, shape, M.P., B.P., volume

Chem. Prop. - describe how it reacts w/ other chemicals

Ex. Reactivity, Combustion, flammable

Chem. Change - creates new chem.

3 Signs
1.) Bubbles 2.) Color change - we didn't add 3.) Heat/Light

Phys. Change - Does not create new chem.
- changes the appearance only

Chem & Phys. Change ⁴⁷

Notes

Chem. change - creates a new substance

3 Signs

1. Bubbles
2. Heat/light
3. color change - we didn't add

Physical change - doesn't create a new substance
↳ only changes appearance

PHYSICAL AND CHEMICAL PROPERTIES AND CHANGES

Name _____

PHYSICAL PROPERTY

1. observed with senses
2. determined without destroying matter

CHEMICAL PROPERTY

1. indicates how a substance reacts with something else
2. matter will be changed into a new substance after the reaction

Identify the following as a chemical (C) or physical property (P):

- _____ 1. blue color
- _____ 2. density
- _____ 3. flammability (burns)
- _____ 4. solubility (dissolves)
- _____ 5. reacts with acid
- _____ 6. supports combustion
- _____ 7. sour taste

- ~~_____ 8. melting point~~
- ~~_____ 9. reacts with water~~
- ~~_____ 10. hardness~~
- ~~_____ 11. boiling point~~
- ~~_____ 12. luster~~
- ~~_____ 13. odor~~
- ~~_____ 14. reacts with air~~

PHYSICAL CHANGE

1. a change in size, shape, or state
2. no new substance is formed

CHEMICAL CHANGE

1. a change in the physical and chemical properties
2. a new substance is formed

Identify the following as physical (P) or chemical (C) changes.

- _____ 1. NaCl (Table Salt) dissolves in water.
- _____ 2. Ag (Silver) tarnishes.
- _____ 3. An apple is cut.
- _____ 4. Heat changes H₂O to steam.
- _____ 5. Baking soda reacts to vinegar.
- _____ 6. Fe (Iron) rusts.
- _____ 7. Alcohol evaporates .
- _____ 8. Ice melts.

- ~~_____ 9. Milk sours.~~
- ~~_____ 10. Sugar dissolves in water.~~
- ~~_____ 11. Wood rots.~~
- ~~_____ 12. Pancakes cook.~~
- ~~_____ 13. Grass grows.~~
- ~~_____ 14. A tire is inflated.~~
- ~~_____ 15. Food is digested.~~
- ~~_____ 16. Paper towel absorbs water.~~

Physical and Chemical Changes

Part A

Can you recognize the chemical and physical changes that happen all around us? If you change the way something looks, but haven't made a new substance, a **physical change** (P) has occurred. If the substance has been changed into another substance, a **chemical change** (C) has occurred.

1.	An ice cube is placed in the sun. Later there is a puddle of water. Later still the puddle is gone.
2.	Two chemicals are mixed together and a gas is produced.
3.	A bicycle changes color as it rusts.
4.	A solid is crushed to a powder.
5.	Two substances are mixed and light is produced.
6.	A piece of ice melts and reacts with sodium.
7.	Mixing salt and pepper.
8.	Chocolate syrup is dissolved in milk.
9.	A marshmallow is toasted over a campfire.
10.	A marshmallow is cut in half.

PHYSICAL AND CHEMICAL PROPERTIES AND CHANGES

Name Kelly

PHYSICAL PROPERTY

1. observed with senses
2. determined without destroying matter

CHEMICAL PROPERTY

1. indicates how a substance reacts with something else
2. matter will be changed into a new substance after the reaction

Identify the following as a chemical (C) or physical property (P):

- P 1. blue color
- P 2. density
- C 3. flammability (burns)
- P 4. solubility (dissolves)
- C 5. reacts with acid
- C 6. supports combustion
- P 7. sour taste

- P 8. melting point
- C 9. reacts with water
- C 10. hardness
- P 11. boiling point
- P 12. luster
- P 13. odor
- C 14. reacts with air

PHYSICAL CHANGE

1. a change in size, shape, or state
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CHEMICAL CHANGE

1. a change in the physical and chemical properties
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Identify the following as physical (P) or chemical (C) changes.

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- P 3. An apple is cut.
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- C 6. Fe (Iron) rusts.
- P 7. Alcohol evaporates .
- P 8. Ice melts.

- C 9. Milk sours.
- P 10. Sugar dissolves in water.
- C 11. Wood rots.
- C 12. Pancakes cook.
- C 13. Grass grows.
- P 14. A tire is inflated.
- C 15. Food is digested.
- P 16. Paper towel absorbs water.

Physical and Chemical Changes

Part A

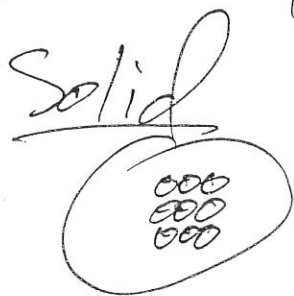
Can you recognize the chemical and physical changes that happen all around us? If you change the way something looks, but haven't made a new substance, a **physical change** (P) has occurred. If the substance has been changed into another substance, a **chemical change** (C) has occurred.

1.	<u>P</u>	An ice cube is placed in the sun. Later there is a puddle of water. Later still the puddle is gone.
2.	<u>C</u>	Two chemical are mixed together and a gas is produce.
3.	<u>C</u>	A bicycle changes color as it rusts.
4.	<u>P</u>	A solid is crushed to a powder.
5.	<u>C</u>	Two substances are mixed and light is produced.
6.	<u>C</u>	A piece of ice melts and reacts with sodium.
7.	<u>P</u>	Mixing salt and pepper.
8.	<u>P</u>	Chocolate syrup is dissolved in milk.
9.	<u>C</u>	A marshmallow is toasted over a campfire.
10.	<u>P</u>	A marshmallow is cut in half.

States of Matter

Notes
Solid, liquid, Gas

State = phase



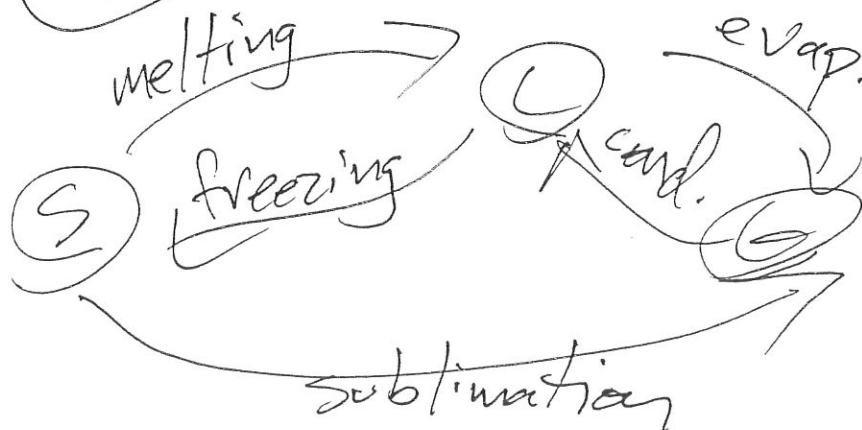
- tightly packed
- vibrate in place
- Definite shape & volume



- move around
- close together
- Definite volume but no def. shape



- move quickly
- No def. shape or volume



Name

Date _____

Three States of Matter

Matter comes in three states: solid, liquid, and gas. The state of matter is determined by the strength of the bonds holding its molecules together. Matter can be changed from one state to another through the use of heat. Changes in the three states of matter are physical changes. Classify the phrases in the word box for each state of matter. Some phrases are used more than once.

molecule movement is greatest

takes shape of container

~~weak bonds between molecules~~

~~spreads in all directions~~

~~virtually no bonds between molecules spreads in direction of gravity~~

molecule movement is smallest

has mass

- has definite volume

does not expand

expands

~~spreads in direction of gravity~~

~~strong bonds between molecules~~

has shape of its own

has no definite volume

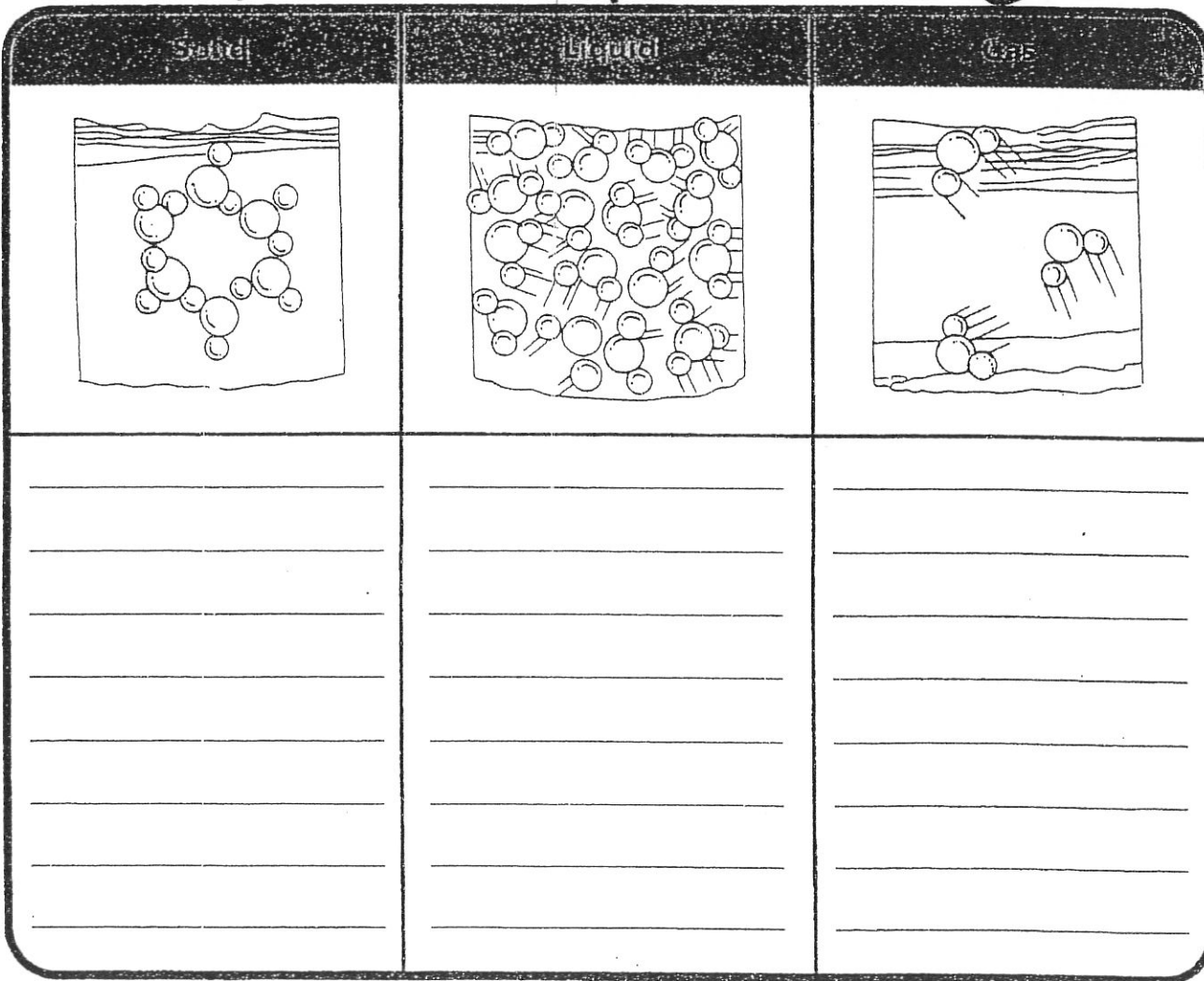
~~hard to deform~~

takes up space

Solid

Liquid

Gas



Name

Key

Date

Three States of Matter

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molecule movement is greatest
takes shape of container
weak bonds between molecules
spreads in all directions
virtually no bonds between molecules
molecule movement is smallest

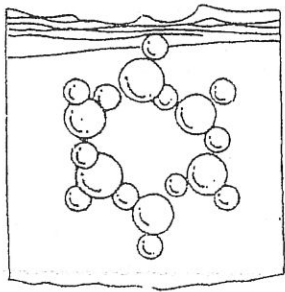
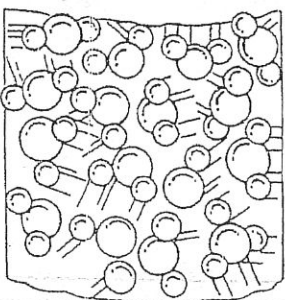
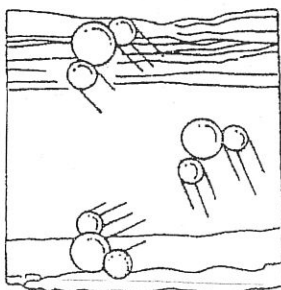
has mass
has definite volume
does not expand
expands
spreads in direction of gravity
strong bonds between molecules

has shape of its own
has no definite volume
hard to deform
takes up space

Solid

Liquid

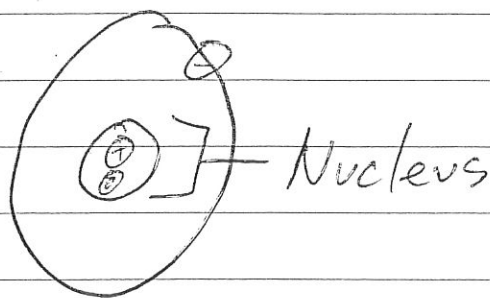
Gas

Solid	Liquid	Gas
		
molec. move small has mass Def. vol. doesn't expand Strong bond has own shape hard to deform takes up space	takes shape of container spreads weak bonds has mass Def. vol. expands spread w/ grav. takes up space	molec. move greatest weak bonds virtually no bonds has mass expands No def. vol. takes up space spreads in all directions

Charge
location
mass

Parts of Atom notes

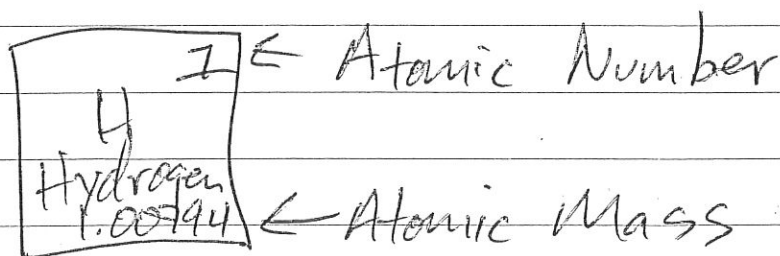
53



Proton - Positive charge, inside the nucleus, 1 amu

Neutron - Neutral, inside, 1 amu

Electron - Negative, outside, 0 amu

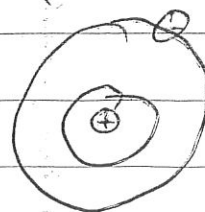


Atomic # = P, E

Mass
- A. #
Neutrons

Hydrogen

1 P⁺
1 e⁻
0 n⁰



55

Identifying P, N, E

1	← Atomic #
H	← Symbol
Hydrogen	← Name
1.00	← Atomic Mass

APE

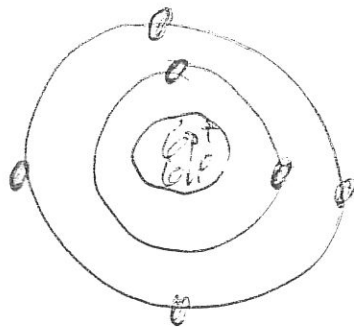
MAN

APE Atomic # = Protons = Electrons

MAN

$$= \frac{\text{Mass} - \text{Atomic \#}}{\text{Neutrons}}$$

Carbon



The Periodic Table of Elements

6 ←		Atomic Number = Number of Protons = Number of Electrons															
C		Chemical Symbol															
CARBON		Chemical Name															
12 ←		Atomic Weight = Number of Protons + Number of Neutrons *															

1	2	NON-METALS																
H HYDROGEN 1	He HELIUM 4																	
3	4	5	6	7	8	9											10	
Li LITHIUM 7	Be BERYLLIUM 9	B BORON 11	C CARBON 12	N NITROGEN 14	O OXYGEN 16	F FLUORINE 19	Ne NEON 20											Ar ARGON 40
11	12	13	14	15	16	17	18											19
Na SODIUM 23	Mg MAGNESIUM 24	Al ALUMINUM 27	Si SILICON 28	P PHOSPHORUS 31	S SULFUR 32	Cl CHLORINE 35	Ar ARGON 40											Kr KRYPTON 84
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K POTASSIUM 39	Ca CALCIUM 40	Sc SCANDIUM 45	Ti TITANIUM 48	V VANADIUM 51	Cr CHROMIUM 52	Mn MANGANESE 55	Fe IRON 56	Co COBALT 59	Ni NICKEL 59	Cu COPPER 64	Zn ZINC 65	Ga GALLIUM 70	Ge GERMANIUM 73	As ARSENIC 75	Se SELENIUM 79	Br BROMINE 80		
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb RUBIDIUM 85	Sr STRONTIUM 88	Y YTRIUM 89	Zr ZIRCONIUM 91	Nb NIOBIUM 93	Mo MOLYBDENUM 96	Tc TECHNETIUM 98	Ru RUTHENIUM 101	Rh RHODIUM 103	Pd PALLADIUM 106	Ag SILVER 108	Cd CADMIUM 112	In INDIUM 115	Sn TIN 119	Sb ANTIMONY 122	Te TELLURIUM 128	I IODINE 127		
55	56																	86
Cs CESIUM 133	Ba BARIUM 137																	Rn RADON 222
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	
Fr FRANCIUM 223	Ra RADIUM 226	Ac ACTINIUM 227	Th THORIUM 232	Pa PROTACTINIUM 231	U URANIUM 238	Np NEPTUNIUM 237	Pu PLUTONIUM 244	Am AMERICIUM 243	Cm CURIUM 247	Bk BERKELIUM 247	Cf CALIFORNIUM 251	Es EINSTEINIUM 252	Fm FERMIUM 257	Md MENDELEVIUM 258	No NOBELIUM 259	Lr LAWRENCIUM 262		

KEY

= Solid at room temperature

= Liquid at room temperature

= Gas at room temperature

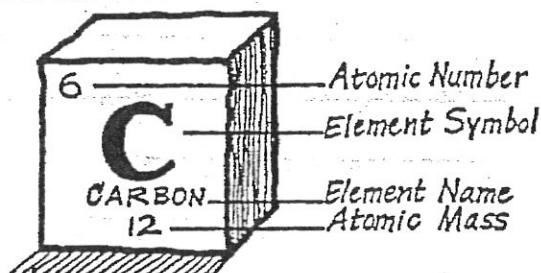
= Radioactive

= Artificially Made

* The atomic weights listed on this Table of Elements have been rounded to the nearest whole number. As a result, this chart actually displays the mass number of a specific isotope for each element. An element's complete, unrounded atomic weight can be found on the It's Elemental web site: <http://education.jlab.org/itselemental/index.html>

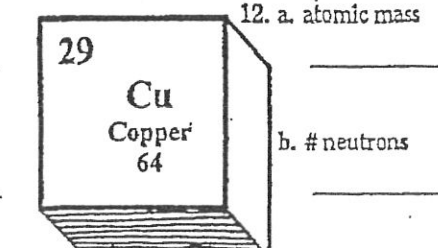
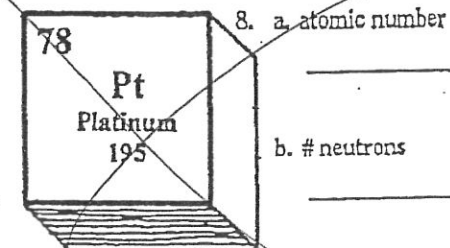
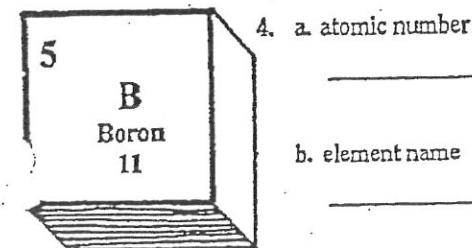
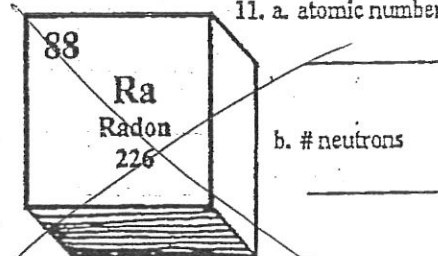
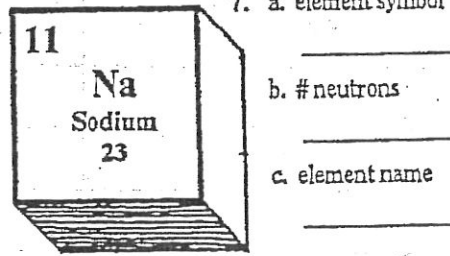
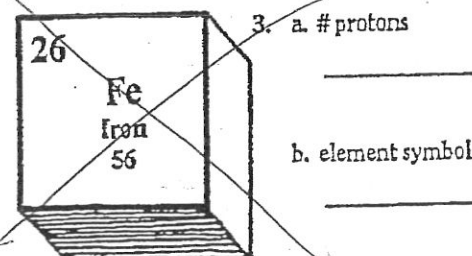
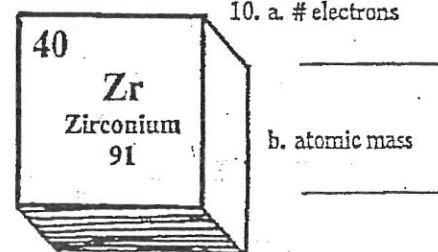
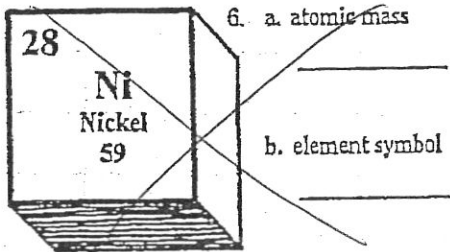
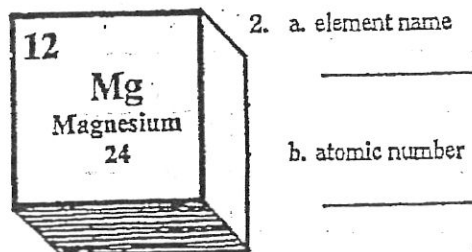
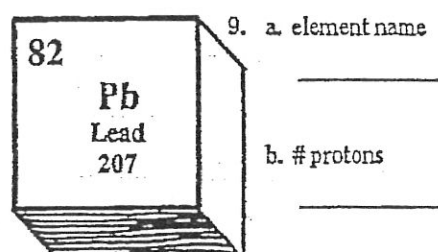
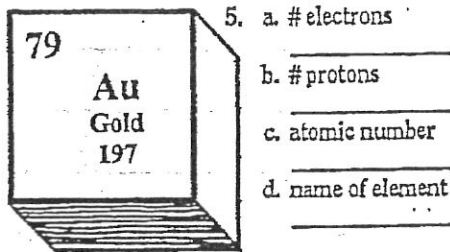
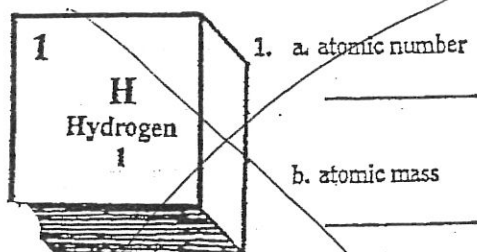
A WORLD-FAMOUS TABLE

There is a table (not one for dinner) that's probably the most famous table of science. (You can find it in your physical science book or on page 52 of this book.) If you learn how to read it, you'll have quick access to important stuff about elements. It's called the Periodic Table (because it's written in rows, called periods). Build your skill at reading the Periodic Table by finding the missing information in the samples below. You can get more practice with the Periodic Table on pages 11, 13, 14, and 15 of this book.



REMEMBER:

atomic mass = protons + neutrons
atomic number = # protons
protons = # electrons



Name _____

Element Calculations

Name _____ Date _____ Period _____

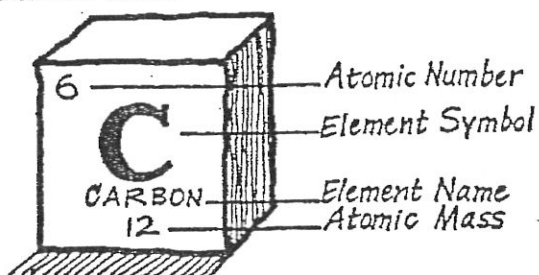
Complete the following chart with the correct information.

Atomic

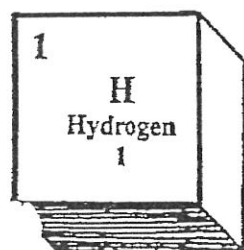
ELEMENT	SYMBOL	PROTONS	NEUTRONS	ELECTRONS	MASS #	ATOMIC #
sodium						
	Cu					
			74			
iodine		15				
				7		
potassium						
		56				
	Fe					
	W					
				50		
			0			
		35				
Magnesium						
			121			
Mercury	Cr					
				17		
		30				
Arsenic						
			8			
Oxygen	Si					

A WORLD-FAMOUS TABLE

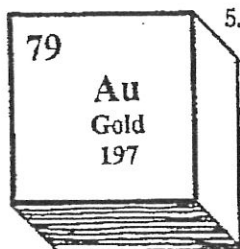
There is a table (not one for dinner) that's probably the most famous table of science. (You can find it in your physical science book or on page 52 of this book.) If you learn how to read it, you'll have quick access to important stuff about elements. It's called the Periodic Table (because it's written in rows, called periods). Build your skill at reading the Periodic Table by finding the missing information in the samples below. You can get more practice with the Periodic Table on pages 11, 13, 14, and 15 of this book.



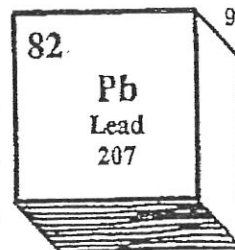
REMEMBER:
 atomic mass = protons + neutrons
 atomic number = # protons
 # protons = # electrons



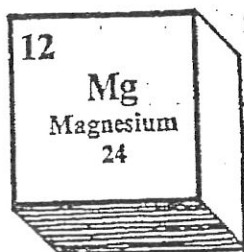
1. a. atomic number
1
 b. atomic mass
1



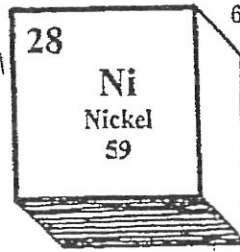
5. a. # electrons
79
 b. # protons
79
 c. atomic number
79
 d. name of element
Gold



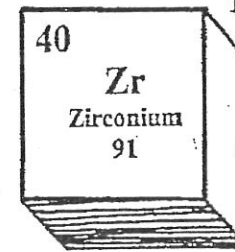
9. a. element name
Lead
 b. # protons
82



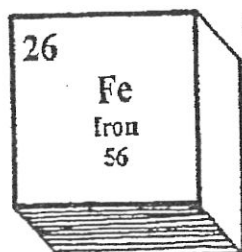
2. a. element name
Magnesium
 b. atomic number
12



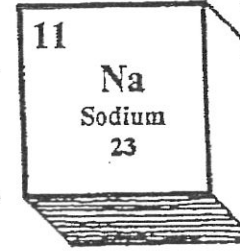
6. a. atomic mass
59
 b. element symbol
Ni



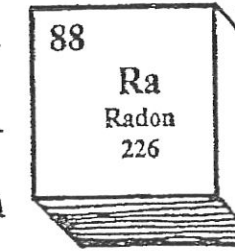
10. a. # electrons
40
 b. atomic mass
91



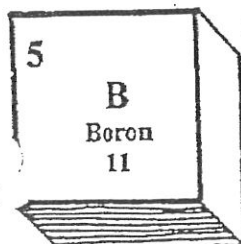
3. a. # protons
26
 b. element symbol
Fe



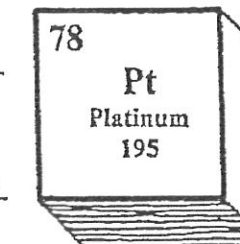
7. a. element symbol
Na
 b. # neutrons
12
 c. element name
Sodium



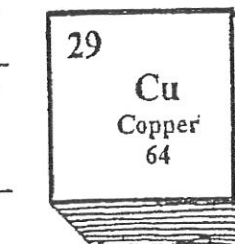
11. a. atomic number
88
 b. # neutrons
138



4. a. atomic number
5
 b. element name
Boron



8. a. atomic number
78
 b. # neutrons
117



12. a. atomic mass
64
 b. # neutrons
35

Name _____

Element Calculations

Name _____ Date _____ Period _____

Complete the following chart with the correct information.

ELEMENT	SYMBOL	PROTONS	NEUTRONS	ELECTRONS	Atomic MASS #	Atomic #
sodium	Na	11	12	11	23	11
Copper	Cu	29	35	29	64	29
Iodine	I	53	74	53	127	53
Phosphorus	P	15	16	15	31	15
Nitrogen	N	7	7	7	14	7
potassium	K	19	20	19	39	19
Barium	Ba	56	81	56	137	56
Iron	Fe	26	30	26	56	26
Tungsten	W	74	110	74	184	74
Tin	Sn	50	69	50	119	50
Hydrogen	H	1	0	1	1	1
Bromine	Br	35	45	35	80	35
Magnesium	Mg	12	12	12	24	12
Mercury	Hg	80	121	80	201	80
Chromium	Cr	24	28	24	52	24
Chlorine	Cl	17	18	17	35	17
Zinc	Zn	30	35	30	65	30
Arsenic	As	33	42	33	75	33
Oxygen	O	8	8	8	16	8
Silicon	Si	14	14	14	28	14