ENERGY- PRACTICE 1

1) Read pages 70–72 in your textbook and fill in the gaps:

 Energy comes in many _________. One form of energy can be _________ into another form of energy. Energy is the ability to do ________ or to effect _______. The unit of measurement for energy is the _______, represented by the symbol ______. According to the law of conservation of energy, the energy cannot be _________. It could be only _______. It could be only _______. In an isolated system, the total amount of energy remains _______.

Thermal energy results from the degree of ______ of the particles of a substance or from their ______ movement. It depends on two factors: the ______ present in a substance and the ______ of the substance.

The transfer of thermal energy between two environments is called _______. Heat always passes from the _______ environment to the _______ environment. It is important to distinguish between heat and temperature. Temperature takes into account only the _______ of a substance or their degree of agitation. Heat depends on the _______ of the particles and on their _______, which is the number of particles. Temperature is usually expressed in _______ (°C), and heat, in _______ (J).

2) True or false? Explain your answers.

- A) Energy comes in many shapes.
- B) Only solar energy can be trensformed into another forms of energy.

- C) Energy transformation is the movement of energy from one place to another.
- D) Energy transfer is the changing of energy from one form to another.
- E) In an isolated system, energy is dispated in the environment.
- F) The energy efficiency of a machine or a system is the percentage of energy consumed that is trnasformed into useful energy.
- G) The hydraulic energy of water can be transformed into mechanical energy to spin a turbine.

H) Thermal energy results from the agitation of the particles only.

- I) A higher temperature means more particle speed.
- J) If a sample of liquid has a low temperature, its molecule are not moving.

K) At the same temperature, a bigger object has more thermal energy than a smaller object.

L) Heat always passes from the cooler environment to the warmer environment.

3) Which of the following statements is TRUE?

- A) Thermal energy is energy transferred between two objects with different temperatures.
- B) Temperature takes into account only the speed of particles of a substance or their degree of agitation.
- C) Heat is the energy contained in matter due to the movement of particles that make it up.
- D) Temperature depends on the mass of the particles.

4) Which one of the following sentences is TRUE?

- A) A light bulb gives off more heat than a radiator because it is hotter.
- B) An ice cream gives off less heat than a glass of coke.
- C) A litre of hot milk gives off more heat than a litre of cold milk.
- D) A cup of boiling tea gives off more heat than a 10 L pot filled with water at 50°C.
- 7) Below are situations in which the concepts of *heat* and *temperature* are involved:
- 1) The degree of agitation of the molecules decreases when the substance is cooled.
- 2) Today it's 25°C outside.
- 3) Ice melts in the water.
- 4) The optimal temperature for making French fries is between 375°F and 400°F.
- 5) If a home is not properly insulated, the energy bill is higher.

Which of the following represents a correct description of the above concepts?

- A) 1 temperature; 2 temperature; 3 heat; 4 temperature; 5 heat
- B) 1 temperature; 2 heat; 3- heat; 4 temperature; 5 temperature
- C) 1 heat; 2 heat; 3- temperature; 4 heat; 5 temperature
- D) 1 heat; 2 -temperature; 3- heat; 4 heat; 5 temperature

5) Does each of the the following situations involve heat or temperature?

- a) Today it's 30°C outside.
- b) The degree of agitation of the molecules increases when the substance is warmed.
- c) The warmer substance heats up the cooler substance.
- d) An oven is turned on to 350°F.
- e) Human body temperature is about 37°C.
- 6) Complete the table below by indicating whether each of the variations in temperature or in the number of particles causes an increase or a decrease in thermal energy.

Variation	Increase or decrease in thermal energy
The temperature goes from 0°C to 10°C.	
The temperature goes from 5°C to –15°C.	
The number of particles goes from 15 g to 60 g.	
The number of particles goes from 40 g to 4 g.	

- 7) Which of the following objects gives off more heat and why?
- a) a 50 kg radiator at 50°C and burning candle at 15°C

b) a cup of drinkable coffee or a cup of boiling water?

c) a tub filled with water at 50°C or a cup of boiling water?

8) Explain what the difference between heat and temperature is.

Name___

Date_____

PRACTICE 2 - ENERGY EFFICIENCY

Mark____/____

 $Energy \ efficiency = \frac{amount \ of \ useful \ energy}{amount \ of \ energy \ consumed} \times 100\%$

1) To perform work equal to 3600 J, a machine consumes 14 000 J. What is the energy efficiency of this machine?

Solution:
Answer:
-

2) Calculate the amount of useful energy produced by a car if its energy efficiency is 70% and the amount of energy consumed is 350 kJ.

Given:	Solution:
Bemired.	Answer
requireu	

3) Calculate the amount of energy consumed by an electronic device that produces 4100 J of energy and has an efficiency of 75%.

Given	Solution
orven.	Solution.
Keguired:	Answer:
L 1	

4) It is well known that the dryers use an important amount of energy while drying clothes. A dryer consumes 780 kJ of electrical energy per drying cycle. About of 390 kJ of energy is actually used to evaporate the water contained in the clothes, the rest is dissipated in the environment as heat. What is the energy efficiency of the dryer?

Given:	Solution:
Required.	Answer
requireu.	

5) A heat furnace produces 68 kJ of useful energy to heat a house. The electrical efficiency of the furnace is 92%. *Calculate the amount of energy consumed*.

Given:	Solution:
Required:	Answer:

6) A television is designed to transform electrical energy into a variety of usable forms of energy such as light and sound. Over a certain period of time, the television consumes 450 kJ of electrical energy. The energy efficiency of this television is 94%. *How much energy is lost as heat?*

Given:	Solution:
Required:	Answer:

7. Identify the forms of energy being used in each of the following and explain how energy is being transformed or transferred in each.

a) Sarah uses a Blow-dryer to dry her hair in the morning. (2p)

b) Mr. Woody decides to grab an electric fence (he's not very bright) and receives a hefty shock.

(2p)

c) The Terminator (Arnold Schwarzenegger) detonates a grenade while fighting the T - 1000 (2p)

8. Identify 1 Energy Transformation and 1 energy Transfer in the following situations:

- a) Jake's house is powered by solar panels. He loves to blast music on his speakers and he is always re-charging the batteries on his iPod. (2p)
 - i. Transformation:
 - ii. Transfer: _____
- b) Gerald's power went out so he had to fire up his gas powered generator. He did not want to waste gas so he only powered his fridge and tried to keep the lights off. (2p)
 - i. Transformation:
 - ii. Transfer:

THE LAW OF CONSERVATION OF MASS- THE PARTICLE MODEL PRACTICE 1

Mark _____ / ____

A chemical reaction is a change in which the nature of a substance is altered. A chemical change, or chemical reaction, can be represented by a



The law of conservation of mass states that

Example: The combustion of acetylene:

A chemical reaction could also be represented using ______. By drawing the same number of each type of atoms on the ______ and ______ side, we can show that the law of conservation of mass is respected.

Chapter 4 CHANGES IN MATTER

PRACTICE

A) For the following reactions, prove the law of conservation of mass by:

- 1) drawing the law of conservation of mass using the particle model
- 2) finding the mass of the carbon dioxide

B) List the REACTANTS and the PRODUCTS for each of the reactions.

1)	Burning coal:		
Che	mical equation: ($C + O_2 \rightarrow CO_2 + energy$	
	e	bg 32g	
Α	Legend	Molecular drawing:	
	Mass of CO ₂	Calculations:	
D			D. L.
в		Keactants	Products

2)	2) Burning methane gas:		
Cher	Chemical equation: $CH_{4+}2O_2 \rightarrow CO_2 + 2 H_2O + energy$		
	- 1	.5g 8g 10g	
Α	Legend	Molecular drawing:	
Α	Mass of CO ₂	Calculations:	
В		Reactants	Products

3) Burning propane :				
	$C_3H_8 + 5 O_2 \rightarrow 3CO_2 + 4H_2O$			
		12 g 50g	29g	
	Legend	Molecular drawing:		
	Mass of CO ₂	Calculations:		
В		Reactants	Products	

4	4) Methane gas synthesis:		
	$CO_2 + 4 H_2 \rightarrow CH_4 + 2 H_2O$		
		50g $30g$	40g
A	Legend	Molecular drawing:	
A	Mass of CO ₂	Calculations:	
В		Reactants	Products

5)	Photosynthesis: (chemical reaction that takes place in the green cells of plants; it is the source of
	life on the earth; the energy provided by the sun is stored in the sugar molecules)

		$6 \text{ CO}_2 + 6 \text{ H}_2\text{O} + \text{light energy} \rightarrow$	$C_6H_{12}O_6 +$	+ 6 O ₂
		$50\mathrm{g}$	60g	$24\mathrm{g}$
A	Legend	Molecular drawing:		
	Mass of CO ₂	Calculations:		
В		Reactants	Products	3

(6) Cellular respira stored in the glu	ntion: (chemical acose molecule is	l reaction that takes pl released to the living o	ace in the cells of living animals; the energy organisms)
		$C_6H_{12}O_6$	$+ 6O_2 \rightarrow 6 CO_2 + 6 H$	$I_2O + energy$
		30g	50g	40g
A	Legend	Molecular dra	wing:	
A	Mass of CO ₂	Calculations:		
В		Reactants		Products

D .	
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THE LAW OF CONSERVATION OF MASS - PRACTICE 2

Solve the following problems:

1. Carbon burns in the presence of oxygen, O₂, to form carbon dioxide, CO₂. The carbon atom is represented by
 and the oxygen atom by
 . Which model represents this chemical reaction?



2. Hematite is a mineral that contains iron oxide (Fe_2O_3) . In order to extract iron (Fe) from hematite, carbon monoxide (CO) is reacted with the mineral at a very high temperature. The balance equation for the reaction is:

 $Fe_2O_3 + 3 CO \rightarrow 3 CO_2 + 2 Fe$ Which of the models illustrated below represents this reaction?

3. A strip of magnesium (Mg) reacts with concentrated hydrochloric acid (HCl) to produce magnesium chloride (MgCl₂) and hydrogen gas (H₂). The balanced equation for this reaction is as follows:



If we refer to the legend above, which of the following models correctly represents this balanced equation?



: Magnesium

Legend

4. During a chemical reaction, two molecules of hydrogen gas, H₂, react with one molecule of oxygen gas, O₂, to produce two molecules of water, H₂O. The balanced chemical equation for this reaction is as follows:

$$2H_2 + O_2 \rightarrow 2H_2O$$

Below are four proposed models of the balanced chemical equation for this reaction. They were constructed using the following symbols:



Which of these models represents the balanced chemical equation for this reaction?



BALANCING CHEMICAL EQUATIONS – PRACTICE 1

1) Are the chemical equations below balanced or not? Explain your answer.

a)	$PO + 6HO \rightarrow 4HPO$			N ² 1	
a)		Numbe	er of atoms before the reaction	Numbe	r of atoms after the reaction
		Р		Р	
		0		0	
		Η		Η	
An	swer:				
b)	$4 N_a + 5 O_a \rightarrow 2 N_a O_c$	Num	ber of atoms before the reaction	Num	per of atoms after the reaction
		Ν		Ν	
		0		0	
An	swer:				
c)	$C_4H_9OH + 6 O_2 \rightarrow 4 CO_2 + 5 H_2O$		Number of atoms before the re	eaction	Number of atoms after the reaction
			$\frac{c}{c}$		
			0		0
			Н		Н
٨٠					
All	swer:				
			Number of atoms before the re	eaction	Number of atoms after the reaction
d) $C_3H_8 + O_2 \rightarrow 3CO_2 + 4H_2O$					

Answer:

e) C + Cl₂ + H₂ \rightarrow CHCl₃

Number of atoms before the reaction	Number of atoms after the reaction

2)	BALANCE '	THE FOLLOWING	CHEMICAL EC	DUATIONS:
H)		THE FOLLOWING	CHEMICAL EQ	

$C_2H_2 + H_2 \rightarrow C_2H_6$ Balanced equation:		
Balanced equation:		
Balanced equation:		
Balanced equation:		
$HCl + M\sigma \rightarrow M\sigma Cl_{2}$	+ Number of atoms before the react	tion Number of atoms after the reaction
H. Hig / Higel		
112		
Balanced equation:		
	Number of atoms before the reaction	Number of atoms after the reaction
$\mathbf{D} : \mathbf{U}_2 + 4 : \mathbf{n}_2 \to \mathbf{U} \mathbf{n}_4 + \mathbf{n}_2 \mathbf{U}$		
Balanced equation:		
1 <u> </u>		
$H_2 + N_2 \rightarrow NH_3$	Number of atoms before the reaction	Number of atoms after the reaction
	<u> </u>	
Balanced equation:		
1 <u> </u>		
	Number of atoms before the react	ion Number of atoms after the reacti
$Al + O_2 \rightarrow Al_2O_3$	Number of atoms before the react	tion Number of atoms after the reaction

Balanced equation: _____

BALANCING CHEMICAL EQUATIONS – PRACTICE 2

1. Complete the following sentences, using the words below. You may not need some words, and you may use others more than once: as small as possible, balance, coefficient, counting, check, equal, never, rules, whole numbers.

"To follow the law of conservation of mass, we must	chemical
equations by the number of atoms of e	each element on the reactants side
and on the products side of the equation. The appropriate	must be
placed in front of each substance so that the number of atoms	on each side of the equation is
Certain	must be followed when balancing
a chemical equation. The coefficients must be	, and they must be
New substances must	be added, nor
existing substances removed. Subscripts in chemical formulas must	t be
changed. Finally, we must the equat	ion by comparing the number of
atoms of each element on either side."	

- 2. Give an example of a balanced chemical equation:
- 3. State the law of conservation of mass in a chemical reaction:
- 4. What are the chemicals on the left of a chemical equation called?_____
- 5. What are the chemicals on the right of a chemical equation called? _____
- 6. State (yes or no) whether or not the following chemical equations are balanced:
- a) $H_2 + O_2 \rightarrow H_2O$
- b) 2 Na + Cl₂ \rightarrow 2 NaCl
- c) 2 KClO₃ \rightarrow 3 O₂ + 2 KCl
- d) $\operatorname{Zn} + \operatorname{H}_2 \operatorname{SO}_4 \rightarrow 2 \operatorname{H}_2 + \operatorname{Zn} \operatorname{SO}_4$
- e) 2 HCl + 2 Mg \rightarrow MgCl₂ + H₂
- f) 2 FeCl₃ + 3 Zn \rightarrow 2 ZnCl₂ + 2 Fe _____
- g) $Cu + 2 AgNO_3 \rightarrow 2 Ag + Cu(NO_3)_2$ _____
- h) 2 Al + 3 H₂SO₄ \rightarrow Al₂(SO₄)₃ + 2 H₂
- i) 5 HNO₃ + P \rightarrow H₃PO₄ + 5 NO₂ + H₂O _____
- j) 3 Cu + 8 HNO₃ \rightarrow 3 Cu(NO₃)₂ + 2 NO + 3 H₂O _____

7. Balance the following chemical equations by writing the correct coefficient number in the given boxes:

a)
$$Cu + 4 HNO_3 \rightarrow Cu(NO_3)_2 + 2 H_2O +$$
 NO₂

b)
$$2 C_2 H_2 + \bigcirc O_2 \rightarrow 4 CO_2 + 2 H_2 O_2$$

c)
$$FeO + O_2 \rightarrow Fe_2O_3$$

d)
$$CaCO_3 +$$
 $NaCl \rightarrow Na_2CO_3 + CaCl_2$

e)
$$CH_4 + \square O_2 \rightarrow CO_2 + 2 H_2O$$

f) Zn + HCl
$$\rightarrow$$
 ZnCl₂ + H₂

g)
$$Al + O2 \rightarrow Al_2O_3$$

BALANCING CHEMICAL EQUATIONS - PRACTICE 3

1) Balance the following skeleton equations:

(a) $SO_2 + O_2 \rightarrow SO_3$ (e) $N_2 + H_2 \rightarrow NH_3$

(b)
$$Mg + O_2 \rightarrow MgO$$
 (f) $P + O_2 \rightarrow P_4O_{10}$

(d)
$$HgO \rightarrow Hg + O_2$$
 (h) $PbO_2 \rightarrow PbO + O_2$

(c) NO +
$$O_2 \rightarrow NO_2$$
 (g) KClO₄ \rightarrow KCl + O_2

2) When sulphur trioxide (SO₃), which is present in smoggy air in trace concentrations, reacts with water, sulphuric acid (H₂SO₄), a very corrosive acid, forms as the only product. Write a balanced equation for this reaction.

3) Write the equation that expresses in acceptable chemical shorthand the information given in the statement, "Iron can be made to react with molecular oxygen to give iron oxide having the formula Fe_2O_3 ."

4) Balance the following chemical equations(some are already balanced) :

- a) Sn + O₂ \rightarrow SnO k) Na + O₂ \rightarrow Na₂ c) H₂ + P \rightarrow PH₃ d) O₂ \rightarrow O₃ e) P₄ + Cl₂ \rightarrow PCl₅ f) As + O₂ \rightarrow As₂O₃ g) C + O₂ \rightarrow CO₂ h) As + H₂ \rightarrow AsH₃ i) Zn + S \rightarrow ZnS j) H₂ + S \rightarrow H₂S
- 5) Write the balanced equation for the formation of table salt, NaCl (sodium chloride), from sodium (Na), and gaseous chlorine (Cl₂).

6) Although bright and shiny, aluminum objects are covered with a tight, invisible coating of aluminum oxide, (Al₂O₃) that forms when freshly exposed aluminum (Al) reacts with oxygen. Write the balanced equation for this reaction

BALANCING CHEMICAL EQUATIONS – PRACTICE 4

Balance the equations below:

1)	$\underline{\qquad} N_2 + \underline{\qquad} H_2 NH_3$
2)	$\underline{\qquad} \operatorname{KClO}_3 \underline{\qquad} \operatorname{KCl} + \underline{\qquad} \operatorname{O}_2$
3)	$\underline{\qquad} NaCl + \underline{\qquad} F_2 \underline{\qquad} NaF + \underline{\qquad} Cl_2$
4)	$\underline{\qquad} H_2 + \underline{\qquad} O_2 H_2 O$
5)	$\underline{\qquad} Pb(OH)_2 + \underline{\qquad} HCl \rightarrow \underline{\qquad} H_2O + \underline{\qquad} PbCl_2$
6)	$\underline{\qquad} AlBr_3 + \underline{\qquad} K_2SO_4 \xrightarrow{} KBr + \underline{\qquad} Al_2(SO_4)_3$
7)	$\underline{\qquad} CH_4 + \underline{\qquad} O_2 \underline{\qquad} CO_2 + \underline{\qquad} H_2O$
8)	$\underline{\qquad} C_3H_8 + \underline{\qquad} O_2 CO_2 + \underline{\qquad} H_2O$
9)	$\underline{\qquad} C_8H_{18} + \underline{\qquad} O_2 \rightarrow \underline{\qquad} CO_2 + \underline{\qquad} H_2O$
10)	$\underline{\qquad} FeCl_3 + \underline{\qquad} NaOH \rightarrow \underline{\qquad} Fe(OH)_3 + \underline{\qquad} NaCl$
11)	$\underline{\qquad} P + \underline{\qquad} O_2 \rightarrow \underline{\qquad} P_2 O_5$
12)	$\underline{\qquad Na + \underline{\qquad H_2O \rightarrow } \underline{\qquad NaOH + \underline{\qquad H_2}}$
13)	$_\Ag_2O \rightarrow _\Ag + _\O_2$
14)	$_\S_8 + _\O_2 \rightarrow _\SO_3$
15)	$\underline{\qquad} CO_2 + \underline{\qquad} H_2O \rightarrow \underline{\qquad} C_6H_{12}O_6 + \underline{\qquad} O_2$
16)	$\underline{\qquad} K + \underline{\qquad} MgBr \rightarrow \underline{\qquad} KBr + \underline{\qquad} Mg$
17)	$\underline{\qquad} HCl + \underline{\qquad} CaCO_3 \rightarrow \underline{\qquad} CaCl_2 + \underline{\qquad} H_2O + \underline{\qquad} CO_2$
18)	$\underline{\qquad} HNO_3 + \underline{\qquad} NaHCO_3 \Rightarrow \underline{\qquad} NaNO_3 + \underline{\qquad} H_2O + \underline{\qquad} CO_2$
19)	$\underline{\qquad} H_2O + \underline{\qquad} O_2 \not \rightarrow \underline{\qquad} H_2O_2$
20)	$\underline{\qquad NaBr + \underline{\qquad CaF_2 \rightarrow \underline{\qquad NaF + \underline{\qquad CaBr_2}}}$
21)	$\underline{\qquad} H_2SO_4 + \underline{\qquad} NaNO_2 \rightarrow \underline{\qquad} HNO_2 + \underline{\qquad} Na_2SO_4$