Organization of Matter Worksheet 2

1. In a lab the following information was given:

Liquid	Mass	Shape	Volume	
1	223 g	Cylindrical	82 mL	2.7
2	223 g	Cubic	25 mL	8.9
3	113 g	Round	25 mL	4.5
4	38g	Cubic	14 mL	2.7

$D = \frac{m}{V}$

Explain which of the two substances from the table above are the same.

1 + 4 same density

2. You have an unknown liquid you think is vinegar. You know the density of vinegar is 1.5 g/mL. You also know the mass of the unknown is 5.5 g and its volume is 2 mL. Explain if your unknown is vinegar?

$\frac{5.5}{2} = 2.75$ g/mL Density does not match, cannot be vinegar

3. Four students were given the task to identify an unknown substance. Each student thought of a different test they could use to identify the substance.

   Bob wanted to weigh the substance
   Carol wanted to take its temperature
   Fred wanted to find its melting point
   Sue wanted to smell it

Explain whose method would allow them to identify the substance. Fred char. property

4. Match each characteristic property with the corresponding example.

Characteristic chemical property	Example
a) Reaction to neutral litmus paper 2	1. Explosion in the presence of hydrogen gas
b) Reaction to limewater 3	2. Red in colour in the presence of a substance with a pH of 4
c) Reaction to a glowing wood splint 4	~~3.~~ Formation of precipitate when in contact with CO_2
d) Reaction to cobalt chloride paper 5	~~4.~~ Flame in the presence of oxygen
e) Reaction to a burning wood splint ~~1~~	5. Pink in colour in the presence of H_2O

5. During a chemical reaction two substances were produced. One was a gas and the other was a liquid. You performed several tests on the gas and the liquid. Using the table below determine the gas and the liquid and justify your answer.

	Flaming splint	Glowing splint	Density	Litmus paper	Cobalt chloride paper
Gas	No reaction	Relights	Not given	No reaction	No reaction
Liquid	No reaction	No reaction	1 g/mL	No reaction	Turns pink

↳ water ⇒ density is 1 g/mL

↳ O_2 ⇒ relights glowing splint

6. A technician is given a gas sample to identify. She performs a series of tests and compiles her results as follows:

PROPERTIES	RESULTS
Freezing point	−259°C
Density	0.000 09 g/mL
Colour	Colourless
Odour	Odourless
Reaction to limewater	No change
Reaction to open flame	An explosion

What is the unknown gas? What information allowed you to identify it?

H_2

7. During a lab experiment, a student heats 15 g of copper powder which has a red-brown colour. After several minutes the students notices that the copper powder has become a black powder. He takes the mass of the black powder after the reaction and the mass has increased to 18.3 g.
   A) What type of chemical reaction occurred during the experiment? Synthesis
   B) Why had the mass of copper increased? became a compound
   C) Is the copper powder an element or a compound?
   D) Is the black powder an element or a compound?

8. You wish to compare 3 filters to see which one provides the most chemically pure water. You are given the following table of information about the foltered water provided by each filter.

	Filter 1	Filter 2	Filter 3
Mass of the water (g)	112.75	133.95	143.54
Volume of the water (mL)	112.5	126.0	137
Conductivity	No	No	Yes

On the basis of the analysis, indicate which filter provides the most chemically pure water and justify your conclusion. 1 - density 1 g/mL

Multiple Choice

9. You would like to determine if a solution has a water present in it. Which is the appropriate test to use?

A) Litmus paper test
B) Conductivity meter test
C) Cobalt chloride paper test
D) Density test

10. In the laboratory, a student made the following observations about an unknown gaseous substance that was to be identified.

Observations	Result
Colour	Colourless
Odour	Odourless
Mass	0.16 g
Volume	128 mL
Burning splint test	No reaction
Glowing splint test	No reaction
Limewater test	No reaction

The student was also given a table with the following information :

Vade-mecum						
Gas	Observation					
	Colour	Odour	Density (g/mL)	Burning Splint Test	Glowing Splint Test	Limewater Test
Nitrogen gas	Colourless	Odourless	0.00125	No reaction	No reaction	No reaction
Hydrogen gas	Colourless	Odourless	0.00009	Popping Sound	No reaction	No reaction
Carbon dioxide	Colourless	Odourless	0.00198	No reaction	No reaction	Becomes cloudy
Helium	Colourless	Odourless	0.0018	No reaction	No reaction	No reaction

Using all the information, identify the unknown gas.

A) nitrogen (B) hydrogen C) carbon dioxide D) oxygen

11. A gray solid exposed to air was heated during a lab experiment. The following observations were noted.

	Before being heated	After being heated
State	Solid	Solid
Colour	Gray	Black
Texture	Smooth	Granular
Mass	12.0 g	13.8 g

Which of the following statements is necessarily true?

A) The solid was an element before being heated.

B) The solid was a compound before being heated.

C) The solid was an element after being heated.

(D) The solid was a compound after being heated.