

1 In the laboratory, a student heated some copper powder in an open porcelain crucible. The substance she obtained after heating the copper powder was black and granular, and its mass had increased.

With regard to the substance she obtained after heating the copper powder, which of the following statements is correct?

- A) The substance obtained is an element because its colour has changed.
- B) The substance obtained is an element because its mass has increased.
- C) The substance obtained is a compound because its texture has changed.
- D) The substance obtained is a compound because its mass has increased.

• sign of CC  
• ↑ mass  
• cpd after = T

2 In the laboratory, you are given a bottle containing a clear, colourless and odourless liquid. The label on the bottle lists the following information:

- Freezes at 0°C and boils at 100°C
- Does not conduct electricity
- Dissolves sugar and salt

water characteristic properties mp & bp  
not charac

Given the information on the label, which of the following liquids is in this bottle?

- A) Limewater
- B)  Distilled water
- C) Ethanol
- D) Oil

3 In the laboratory, a student was given two unidentified solids of known shape and mass. She performed tests to determine the volume of each solid.

The following table gives the shape and mass of these solids, as well as her test results.

$$\frac{39.50\text{g}}{5.0\text{mL}} = d = 7.9\frac{\text{g}}{\text{mL}}$$

$$\frac{59.25\text{g}}{7.5\text{mL}} = d = 7.9\frac{\text{g}}{\text{mL}}$$

	Solid 1	Solid 2
Shape	Spherical	Cylindrical
Mass (g)	39.50	59.25
Initial volume of water in the graduated cylinder (mL)	50.0	50.0
Final volume of water (with the solid) in the graduated cylinder (mL)	55.0	57.5

water displacement method

$$55.0 - 50.0 = 5.0\text{ mL} = V$$

$$57.5 - 50.0 = 7.5\text{ mL} = V$$

Could these two solids be made of the same pure substance? Explain your answer. *yes because same characteristic property (physical) of density*

4 A liquid was tested in the laboratory. The following table shows the tests performed on this liquid and the test results.

Test	Result
Cobalt chloride (CoCl <sub>2</sub> ) paper	The paper turns pink.
Electrical conductivity	The light comes on.
Mass	63 g
Volume	50 mL

show all work

water ABOVE  $d = 1.26\frac{\text{g}}{\text{mL}}$

The following table shows how four students analyzed the above results.

Student	Presence of Water	Electrical Conductivity	Density
1	Yes ✓	Conducts electricity ✓	0.79 g/mL
2	Yes ✓	Conducts electricity ✓	1.26 g/mL ✓
3	Yes ✓	Does not conduct electricity ✗	0.79 g/mL
4	No ✗	Conducts electricity ✓	1.26 g/mL ✓

Which student analyzed the liquid correctly?

student 2

5 A student heated a pure substance in a crucible and made the following observations :

	Substance before Heating	Substance after Heating
State	Solid →	Liquid
Colour	White →	Pink
Mass	5.0 g →	7.2 g

colour change  
= sign  
of chem  
Δ

Given these observations, which of the following statements is TRUE?

mass ↑  
cpd after

- A) The substance ~~before~~ heating was definitely an element.
- B) The substance ~~before~~ heating was definitely a compound.
- C) The substance after heating was definitely an element.
- D) The substance after heating was definitely a compound.

6 A gray solid **exposed to air** was heated during a laboratory 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

colour change

↑ mass



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.

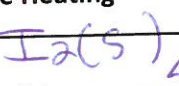
7 In the laboratory, you are to determine if a substance is a compound. After heating the substance in an open container, you observe that a **chemical reaction** is occurring and that the substance is undergoing certain changes.

Which of the following changes would definitely indicate that the substance was a compound before it was heated?

- A) Its colour changes. = chem change CC
- B) Its physical state changes.
- C) Its mass decreases.
- D) Its texture changes.

8 The state of four substances before and after having been heated in the laboratory is presented in the following table.

Substance	Before Heating	After Heating
1	Dark gray solid	Purple gas
2	White solid	Colourless liquid



probably subliming



melted probably

white → colourless

*cpd 1 thing* → *other stuff broken apart 2 things*

3	Red solid	→	Gray liquid and colourless gas
4	Brown liquid	→	Orange-brown gas

*probably vapourizing*

According to this information, which substance was a compound before being heated?

9 In the lab, you perform an experiment to identify a solid compound, X. You follow a given procedure, and after heating the solid X, you obtain a new solid and a gas.

The table below summarizes the results obtained.

*look at density difference btw a solid & a gas*

Properties	Solid	Gas
Mass	6.52 g = 8.93g	0.16 g = 0.0014g
Volume	0.73 mL	113 mL
Electrical Conductivity	very good <i>Cu or Ag?</i>	-----
Solubility in water	insoluble <i>like most metals</i>	-----
Magnetic Properties	none <i>not Fe Ni Co</i>	-----
Lime water test	<i>CO<sub>2</sub></i>	no reaction
Flame test	<i>H<sub>2</sub> or O<sub>2</sub> or CO<sub>2</sub></i>	flame burns more brightly <i>= O<sub>2</sub>!</i>

Using reference materials, identify both the solid and the gas obtained by heating substance X as well as the solid compound X.

Justify your answer using the observed results

10 A burning splint is used to test for hydrogen gas. Hydrogen gas, H<sub>2</sub>, reacts with oxygen gas, O<sub>2</sub>, to form water, H<sub>2</sub>O.

Which of the following statements is TRUE?

- A) This water is a pure substance consisting of elements that are chemically bonded. ✓
- B) This water is a pure substance consisting of compounds that are chemically bonded. ✗
- C) This water is a pure substance consisting of a mixture of two compounds that are chemically bonded. ✗
- D) This water is a pure substance consisting of a mixture of elements. ✗

11 A pure gray substance was placed in a open crucible and heated in the presence of air. The following observations were made.

	Before Heating	After Heating
State	Liquid	Solid
Colour	Gray →	Red CC
Mass	12.0 g →	13.2 g ↑ mass

Which of the following statements IS DEFINITELY FALSE?

- A) The substance before heating was an element. maybe
- B) The substance before heating was a compound. maybe
- F C) The substance after heating is an element. nope no way!
- D) The substance after heating is a compound. T

12 A student heated 10.0 g of a brown solid in an open container. When she finished heating the solid, she noticed it had become granular and turned black and that its mass had increased to 10.5 g.

Which change indicates that the resulting solid is a compound?

CC → ↑ mass = cpd after

- A) The change in temperature
- B) The change in colour
- C) The change in mass**
- D) The change in shape

14 In the laboratory, an orange solid was heated in an open container. The following observations were made:

- 1. The temperature of the solid increased.
- 2. The solid turned black.**
- 3. The solid became granular.
- 4. The mass of the solid increased.**

Which of these observations allow you to conclude that a chemical change took place?

- A) 1 and 3
- B) 1 and 4
- C) 2 and 3
- D) 2 and 4**

15 Activities involving physical or chemical changes are listed in the table below.

Activities	
1.	Lighting a campfire ✓
2.	Setting off fireworks ✓
3.	Inflating a bicycle tire ✗
4.	Mowing the lawn ✗

*trauma!  
grass → cut grass*

Which of these activities involve a chemical change?



A) 1 and 2

C) 2 and 4

B) 1 and 3

D) 3 and 4

16

A bottle contains a liquid that might be olive oil. You can find the density of olive oil in a reference book.

Explain the procedure you would use to determine whether this liquid is, in fact, olive oil.

Your explanation should include the following information:

- a list of materials used;
- a description of the steps in your procedure;
- a description of the work involved in analyzing the measurements, including any necessary formula.

• mass gc

• add oil = record vol = vol

• mass gc & oil

• subtract masses =

•  $d = m/v$  mass

• compare

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In the laboratory, a student heated 100 g of a white substance in an open crucible for five minutes. He obtained a yellow substance with a mass of 125 g.

Which of the following statements is FALSE?

A) The white substance could be an element.

B) The white substance could be a compound.

C) The yellow substance could be an element.

D) The yellow substance could be a compound.

cpd after

maybe white → yellow  
125g

maybe 100g

X nope

T

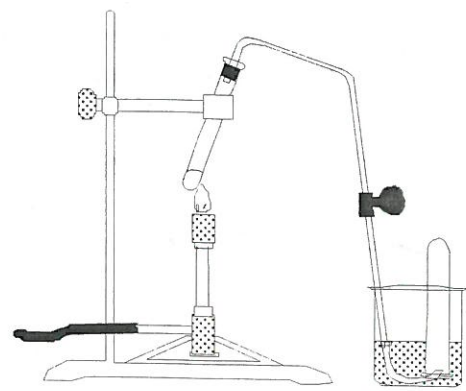
18

You are given a red powder and asked to determine its composition.

State the order in which you must carry out the activities below in order to solve your problem.



R → P



- 4 1. Find the characteristic properties of the products.
- 2 2. Heat the substance.
- 3 3. Collect the products.
- 1 4. Find the characteristic properties of the substance.
- 5 5. Identify the products.

4 → 2 → 3 → 1 → 5

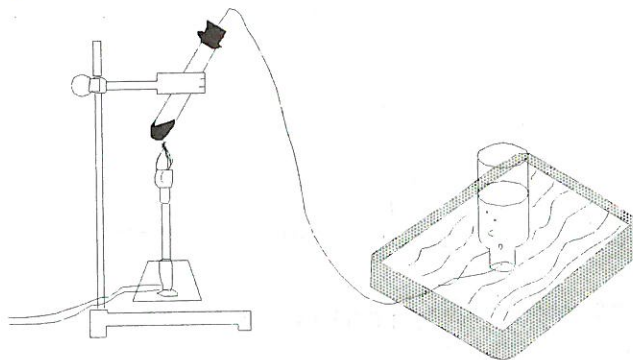
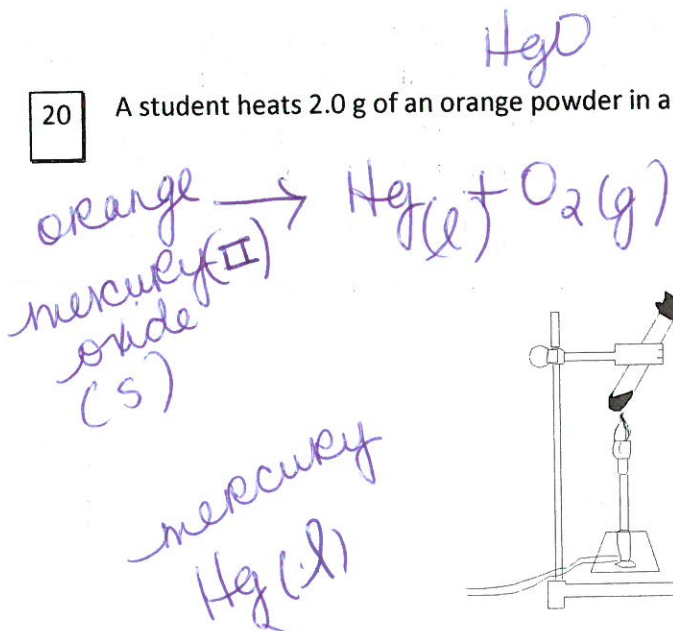
19 Matthew suggests the following steps as a method of obtaining water vapour.

- 1. He takes an ice cube from the freezer and lets it melt at room temperature. *phase Δ*
- 2. He carries out electrolysis of the water in order to produce hydrogen (H<sub>2</sub>) and oxygen (O<sub>2</sub>). *+ elec E* *chem Δ*
- 3. He mixes both gases together in a container. *phys Δ*
- 4. He uses an electric spark to make the gaseous mixture explode and thus obtain the water vapour. *chem Δ*

Which of Matthew's steps involve chemical changes and which involve physical changes?

- A) ~~Chemical changes : 1 and 2; physical changes : 3 and 4~~
- B) Chemical changes : 2 and 4; physical changes : 1 and 3
- C) ~~Chemical changes : 1 and 3; physical changes : 2 and 4~~
- D) ~~Chemical changes : 3 and 4; physical changes : 1 and 2~~

20 A student heats 2.0 g of an orange powder in a test tube placed as shown in the diagram below.



Droplets of a silver liquid form on the sides of the test tube and a gas is collected by the displacement of water in a bottle set up for this.

The gas is tested by inserting a glowing splint into the bottle. The glowing splint bursts into flames when it is inserted into the gas collecting bottle.

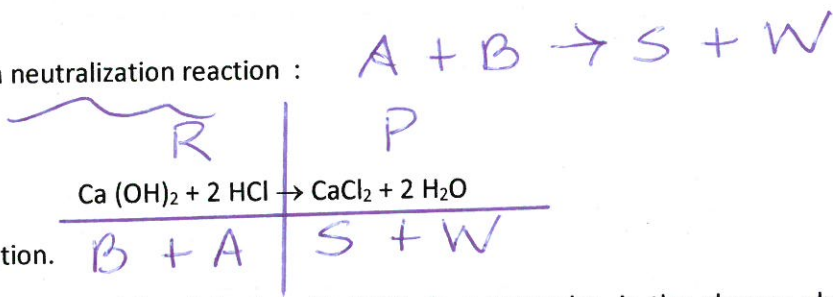
The mass of the orange powder after heating is 1.6 g.

Which of the following three substances is a compound: the orange powder, the silver droplets or the gas?

Justify your answer.

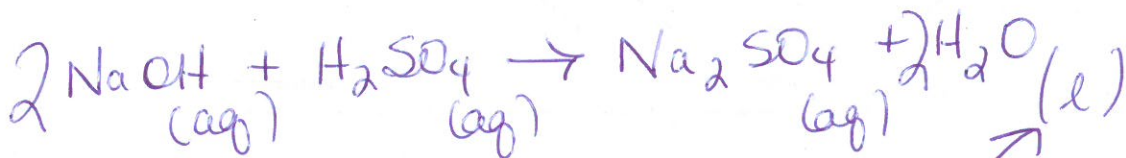
$O_2(g)$   
 = cpd = Hg element  
 = cpd before =  $O_2$  element

21 The equation below represents a neutralization reaction:



Identify the products in this reaction.

22 When sodium hydroxide NaOH reacts with sulphuric acid  $H_2SO_4$  in a test-tube, is the change physical or chemical?



Justify your answer

chemical change = new matter forms

water is liq NOT aq