**5th Grade Worksheets**

Follow along with your VSVS team using these sheets and info!

Comets Worksheet

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What are comets? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Where are comets found? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is a comet made of? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is holding together the comet you made? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the temperature of outer space? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What caused the craters to form in your comet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What does the trail behind the piece of dry ice represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What happens when someone blows on the dry ice while it is moving?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What does this represent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How are asteroids and meteoroids different from comets? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Comets Worksheet – ANSWERS

1. What are comets?

*Comets are left over debris from the early formation of our solar system.*

1. Where are comets found?

*Comets are typically found near Neptune (in the Kuiper cloud) or out past Pluto (in the Oort cloud). Gravity can pull a comet closer to the Sun.*

1. What is a comet made of?

*Comets are dirty balls of ice. They are mainly made of frozen water, frozen carbon monoxide, dust, and rock. (There is also some frozen ammonia, carbon dioxide, and methane.)*

1. What is holding together the comet you made?

*The liquid water holds the comet together when it is frozen by the dry ice. The dry ice is cold enough (< -78°C) to freeze the water.*

1. What is the temperature of outer space?

*-270 °C (-454 °F)*

1. What caused the craters to form in your comet?

*The sublimation of dry ice. The carbon dioxide from the dry ice goes from solid to gas form. When the gas escapes, holes (craters) are left where there was once solid carbon dioxide.*

1. What does the trail behind the piece of dry ice represent?

*It represents the dust/gas cloud that is always behind the comet body.*

1. What happens when someone blows on the dry ice while it is moving?

*Another dust/gas cloud forms in a different direction.*

1. What does this represent?

*The ion cloud that can be seen when comets get nearer to the sun.*

1. How are asteroids and meteoroids different from comets?

*They do not have much ice and do not have tails. Meteoroids are smaller versions of asteroids. Asteroids have orbits much closer to Earth than comets.*

**ANSWER SHEET**

**Rates of Reaction**

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Vocabulary words: rate, concentration, chemical reaction, surface area**

**II. Effect of Temperature – Ice water vs. room temperature water**

Which was faster?  \_\_\_\_**Room Temperature**\_\_\_\_  How can you tell? \_**Bubbles come off faster**

Which one finished before the other? \_\_**Room Temperature**

How could we change the temperature to make the reaction occur even faster? **Heat the water to a higher temperature before adding the tablet.**  **The higher the temperature, the faster the reaction will occur.**

**III.  Effect of Surface Area**

1.  Demonstration of lycopodium “dust” powder (dried-up moss)

Why was there a flash of fire when a pipette of lycopodium powder was sprayed across a burning match, but only some charring occurred when a burning match was held close to a pile of lycopodium powder?

**More of the surface area of lycopodium powder was exposed to the oxygen in the air.**

**2.**Which tablet reacts faster – crushed or whole?  **The crushed tablet reacts faster**.  Why?

**The smaller particles in the crushed tablet expose more of the surface area to react with**

**the water.**

IV.**. Effect of Concentration – weak vs strong vinegar**

Which was faster? **Strong vinegar**.

How can you tell? **Bubbles come off faster**

**OBSERVATION SHEET – Rates of Reaction**

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Vocabulary words:  rate, concentration, chemical reaction, surface area**

**II. Effect of Temperature – Ice water vs. room temperature water**Which was faster?

Circle the correct answer:   **room temperature water** **ice water tempeature**

How can you tell? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How could we change the temperature to make the reaction occur even faster?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**III.  Effect of Surface Area**

1.  Demonstrations of lycopodium “dust” powder (dried-up moss)

Why was there a flash of fire when a pipette of lycopodium powder was sprayed across a burning match, but only some charring occurred when a burning match was held close to a pile of lycopodium powder?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.  Which tablet reacts faster? Circle the correct answer: – **crushed** **whole**

Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV. Effect of Concentration –weak vs. strong vinegar**

Which was faster? Circle the correct answer:  **weak vinegar** **strong vinegar**

How can you tell?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Rates of Chemical Reactions Instruction Sheet**



**II.** **EFFECT OF TEMPERATURE - IMPORTANT: Use different 10 oz cups for each experiment.**

1. Place the two 3.5 oz cups (one already contains ice) on the plate and fill both cups to the 50 mL line with water. (The ice cup will not require much water to reach the mark.
2. Use the scissors to carefully cut open one end of the packet of effervescent tablets.
3. Carefully remove the effervescent tablets from the packet and add a whole tablet to each of the 2 10 oz clear DRY cups.  Place the two cups with the tablets on the plate.



1. Two students from each group should hold a 3.5 oz cup with water or ice water in a “ready” position over a DRY cup containing a tablet.  Be ready to pour all the contents onto the tablet on the count of 1,2,3, Go. (It is important to make sure you add the water at the same time and from the same height just above the cup containing the tablet.)
2. When one of the VSVS team says "1,2,3, Go” on “Go” add all the water or ice from your cups to the tablets in the 10 oz cups.
3. Observe what happens and record your observations on your observation sheet.
4. **Save  the 3.5 oz measuring cups for Section III.**
5. Set aside the used cups with alka seltzer tablets for VSVS members to collect.

**III.** **EFFECT OF SURFACE AREA (PARTICLE SIZE) - TABLETS**

**Demonstration by VSVS team**  - Lycopodium Powder

**EXPERIMENT - IMPORTANT: Use 2 different DRY 10 oz cups for each experiment.**

A picture containing several

Description automatically generated

1. Place the two 3.5 oz measuring cups on the plate and fill the two cups to the 50 mL mark using the bottle of water from Section II.
2. Carefully cut open the packet of effervescent tablets and remove them from the packet.
3. Place one whole tablet in the bottom of one of the **DRY** 10 oz plastic cups
4. Place one of the tablets in a small ziploc bag, seal the bag, and crush the tablet by using the palm of your hand or water bottle.
5. Shake all the crushed tablet into one bottom corner and cut the other bottom corner off.  Then pour the crushed tablet through the bottom cut corner into the other DRY 10 oz plastic cup.
6. Observe the two tablets now and tell which tablet has more surface area.
7. VSVS team members will make sure groups are ready by asking two students from each group to hold a cup of water in a “ready” position over either the cup with a whole tablet or the crushed tablet.  Be ready to pour all the contents into the cup on the count of 1,2,3, Go.
8. Then when one of the VSVS team says "1,2,3, Go”, on “Go” add all the water from your cups.
9. Observe what happens and record your observations on your observation sheet.
10. Set aside the used cups with alka seltzer tablets for VSVS members to collect.

A picture containing indoor, counter, cluttered

Description automatically generated

**IV. EFFECT OF CONCENTRATION IN A SOLUTION** - **IMPORTANT: Use 2 different 10 oz cups for each experiment.**

1. Place the vinegar solutions beside the matching 10 oz cup.  (strong (20%), weak (5%))
2. Place a spoon of baking soda in each cup.
3. Two students from each group should remove the top from a 5% or 20% vinegar container and hold it in a “ready” position over a cup of baking soda.  They should be ready to pour **ALL** the contents into the cup on the count of 1,2,3, Go.
4. The rest of the group should be ready to observe closely to see the results.
5. When one of the VSVS team says "1,2,3, Go”, on “Go” the students should add **ALL**the vinegar solution from their containers to the cups of baking soda.
6. Observe what happens and record your observations on your observation sheet.

**DETERMINING THE PROPERTIES OF SLIME**

**Observation Sheet**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Vocabulary words:** solid, liquid, gas, polymer, non-Newtonian liquid, cross-linking

Follow the instruction sheet to perform observations on slime. After each observation, determine if it is more like a solid or liquid by putting an X in the correct column, and then write in the reason why (choose from the list below.)

Solid: Liquid:

has definite shape flows, can take the shape of the container

can bounce or break into pieces does not break into pieces

can be stretched

|  |  |  |  |
| --- | --- | --- | --- |
| **Observation #** | **Solid** | **Liquid** | **Why?** |
| 1-pull apart slowly |  |  |  |
| 2-pull apart quickly |  |  |  |
| 3-put into a cup |  |  |  |
| 4-drop it |  |  |  |
| 5-hit it |  |  |  |
| 6-2 colors added together |  |  |  |

What is the name given to a substance that has solid and liquid properties?

**Instructions for handling slime at home:**

* Do not put slime in the sink. It can plug up the drain.
* Slime will get stuck to clothes or carpet. If this happens, use vinegar to help remove it.
* The slime will keep about two weeks. When mold starts forming, discard the slime.
* Do not eat the slime and do not let little brothers or little sisters play with it (as they may eat it).
* Tell students to try to make impressions with coins or small objects at home. A solid will hold an imprint.
* Go to the VSVS web site ([**http://studentorg.vanderbilt.edu/vsvs**](http://studentorg.vanderbilt.edu/vsvs)**)** for other ways to make polymers.