Group no. \_\_\_\_\_

Group name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Group members:

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Quarter 4 – Matter and its Interaction

MODULE 1 – BEHAVIOR OF GASES

Activity 3 – Charles’ Law

Procedure:

1. Prepare 3 set-ups using beakers/basin.
   1. Set-up A (hot water)
   2. Set-up B (tap water)
   3. Set-up C (cold water)
2. Inflate a balloon (it must be spherical).
3. After inflating, draw a line around the widest (or middle portion)

of the balloon to be consistent with where to measure

the circumference.

(Note: The same balloon will be used throughout the experiment. Thus, do not overinflate the balloon.)

1. Predict first what will happen to the size of the balloon before submerging the balloons into the different set-ups. Write your predictions on Table 1.

|  |  |  |
| --- | --- | --- |
| **Set-up** | **Predictions** | **Observations** |
| Warm water |  |  |
| Tap water |  |  |
| Cold water |  |  |

1. Measure the circumference of the balloon.
2. Get the temperature of the water in the basin (Set up A).
3. Place inflated balloon in set-up A for 2-3 minutes.
4. Measure the circumference of the balloon once more.
5. Perform two more trials and get the average of the results.
6. Repeat step 5-9 using Set up B and C.
7. Record your observations on Table 2.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Set up / trials | | Temp (oC) | Average  Temp (oC) | Ave  Temp (K) | Circumference of the balloon (cm) | | | Volume of the balloon after placing in a set up. | Average volume |
|  |  |  |  |  | Before | after | diff |  |  |
| Warm | 1 |  |  |  |  |  |  |  |  |
|  | 2 |  |  |  |  |  |
|  | 3 |  |  |  |  |  |
| Tap water | 1 |  |  |  |  |  |  |  |  |
|  | 2 |  |  |  |  |  |
|  | 3 |  |  |  |  |  |
| Cold water | 1 |  |  |  |  |  |  |  |  |
|  | 2 |  |  |  |  |  |
|  | 3 |  |  |  |  |  |

Q1. What happens to the size of the balloon as the temperature decreases?

Q2. How does the temperature relate to the volume of gas in the balloon?

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Quarter 4 – Matter and its Interaction

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MODULE 2 – CHEMICAL REACTIONS

Activity 4 – How much Can You Take?

Part I. Laboratory Activity on Law of Conservation of Mass

Materials:

10% CuSO4 solution Test tube

Steel wool Test tube holder

Rubber/cork stopper Beaker

Alcohol burner Matches

Procedure:

1. Place a dry and clean test tube and a rubber/ cork stopper in a dry and clean 100mL-beaker.
2. Get the total mass of the dry and clean test tube and the stopper, and the 100mL-beaker. Record it in the tabulation below.
3. Place a small portion of steel wool in the test tube.
4. Add 1.0 mL (or ten drops) CuSO4 solution.
5. Cover the mouth of the test tube with the rubber / cork stopper.
6. Again, get the mass of the set-up.
7. Heat the lower part of the test tube gently for two minutes while moving it to and fro. Make sure that the rubber/cork stopper covers the mouth of the test tube and the test tube is held with a test tube holder in a slanted position.
8. Allow the test tube to cool completely, then get the mass of the set-up again.
9. Record and tabulate the results.

|  |  |
| --- | --- |
| Before heating | Mass (g) |
| 1. Mass of the test tube, stopper, and beaker |  |
| 1. Mass of the test tube, stopper, beaker and mass of steel wool and CuSO4 solution |  |
| 1. Mass of steel wool and CuSO4 solution |  |
| After heating |  |
| 1. Mass of the test tube, stopper, beaker and mass of steel wool and CuSO4 solution |  |
| 1. Mass of steel wool and CuSO4 solution |  |

**Q1**. Describe the appearance of the steel wool, before and after adding CuSO4

**Q2**. What is the evidence that a chemical change happened?

**Q3**. Why is it important for the test tube to be sealed?

**Q4**. How will you compare the total mass before and after the reaction?

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Quarter 4 – Matter and its Interaction

MODULE 2 – CHEMICAL REACTIONS

Activity 4 – How much Can You Take?

Part II. Paper Clip Reaction Model

Materials:

1 box of different colored paper clips

Periodic table (for reference)

Procedure:

1. Sort out your paper clips according to color for each element.

|  |  |
| --- | --- |
| Element | Color of Paper clip |
| Hydrogen (H) | White |
| Nitrogen (N) | Blue |
| Oxygen (O) | Red |

1. By connecting paper clips together (follow the color coding in number 1) make model representations for these molecules: a. O2 and H2 - Prepare 2 sets of each molecule

b. N2 and H2 – Prepare 4 sets of each molecule

1. You will be working on balancing 2 chemical equations:
   1. H2 + O2 🡪H2O
   2. N2 + H2 🡪NH3
2. Starting with the first equation:
   1. Break up one set of O2, since H2O has only 1 Oxygen.
   2. Connect this single O atom to the one set of H2 you have prepared to form 1 set of H2O.
   3. Get another set of H2 and connect to the single O atom left to form a new set of H2O.

**Q1**. How many set/s of H2 have you used?

**Q2**. How many set/s of O2 have you used?

**Q3**. How many set/s of H2O have you created?

These number of set/s are called coefficient, which is a whole number placed before the formula of the reactants and products.

**Q4**. Write the corresponding coefficients in the chemical equation. NOTE: If there is only one set, we do not write 1 anymore. \_\_\_\_\_H2 + \_\_\_\_\_O2 🡪\_\_\_\_\_H2O

1. Do the same with the second equation.

\_\_\_\_\_N2 + \_\_\_\_\_H2 🡪\_\_\_\_\_NH3

**Q5**. How many set/s of N2 have you used?

**Q6**. How many set/s of H2 have you used?

**Q7**. How many set/s of NH3 have you created?

**Q8**. Write the corresponding coefficients in the chemical equation.

\_\_\_\_\_N2 + \_\_\_\_\_H2 🡪\_\_\_\_\_NH3

1. Get the molar mass of N2 H2 and NH3, multiply their masses by their coefficients, then get the total mass of the reactants and compare to the total mass of the products. The first equation is already done for you. (LM p-418)

**Q9**. Write the corresponding coefficients in the chemical equation.

\_\_\_\_\_N2 + \_\_\_\_\_H2 🡪\_\_\_\_\_NH3

**Q10**. How will you .compare the total mass of the reactants and the total mass of the products?

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3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Quarter 4 – Matter and It’s Interaction

MODULE 3 – BIOMOLECULES

Activity 1 - Test for Carbohydrates:

Are all carbohydrates the same?

Materials:

Coffee stirrer/plastic spoon Spot plate/egg tray

Alcohol lamp/burner Tripod

Test tube Test tube rack

Tube holder Labels/markers

Wire gauze Mortar & Pestle (optional)

Match Beaker

Reagents:

Iodine solution

Benedict’s reagent

Food Samples:

Banana, Cracker, Milk, Noodles, Orange, Rice, Table sugar solution etc.

Procedure:

*Iodine Test for Starch*

1. Place a small amount of each food sample on the well of a spot plate. Use one well for one sample and make sure that different food samples do not mix in one well. Describe each sample and record record your observation in Table 1.
2. Add 3 drops of iodine solution on each food sample. Observe what happens and record.
3. The color of iodine solution changes to blue-black in the presence of starch. Indicate which of the food samples contain starch by placing a positive sign (+). And indicate which food samples do not contain starch by placing negative sign (-) in the fourth column of Table 1.

Table 1. Iodine Test Results

|  |  |  |  |
| --- | --- | --- | --- |
| Food Sample | Before adding Iodine  solution | After adding Iodine  solution | Presence of starch |
| Cracker |  |  |  |
| Cooked rice |  |  |  |
| Pineapple |  |  |  |
| Table sugar |  |  |  |
| Cooked pasta |  |  |  |
| Corn syrup |  |  |  |

Benedict’s Test for Reducing Sugars

1. Place a small amount of food samples in a test tube. Use one test tube for each sample. Label properly each test tube.
2. Add 1 dropper-full of Benedict’s reagent in each test tube. Gently shake each test tube. Describe each sample and record them in the second column of Table 2. You may use a white background for a clearer view of any color change.
3. In an empty test tube, place a dropper-full of Benedict’s reagent. Describe the solution and record it in the 2nd column of Table 2.

**Q1.** What is the purpose of preparing a test tube with only Benedict’s reagent in it?

1. Place all the test tubes in the hot water bath for 2-3 minutes. Observe what happens.
2. After heating, place the test tubes back to the test tube rack. Describe each sample and record you observation in Table 2.

The color of Benedict’s reagent changes to green, yellow or orange/red, depending on the amount of reducing sugar present. Indicate which of the food samples contain reducing sugar and their relative amounts by placing a positive (+) sign for green, 2 positive signs (++) for yellow, and three positive signs (+++) for orange/red, in the 4th column of Table 2.

Table 2. Benedict ’s test Results

|  |  |  |  |
| --- | --- | --- | --- |
| Food Sample | Before heating | After heating | Presence of reducing sugar |
| Cracker+ Benedict’s reagent |  |  |  |
| Cooked rice+ Benedict’s reagent |  |  |  |
| Pineapple+ Benedict’s reagent |  |  |  |
| Table sugar+ Benedict’s reagent |  |  |  |
| Cooked pasta+ Benedict’s reagent |  |  |  |
| Corn syrup+ Benedict’s reagent |  |  |  |
| Benedict’s reagent only |  |  |  |

Refer to Tables 1 and 2 to answer the following questions:

**Q2.** Are starch and reducing sugars the same kind of carbohydrate? What made you say so? Use your results to support your answer.

**Q3.** Which food sample (s) has/have reducing sugars?

**Q4.** Can one type of food contain different kinds of carbohydrates? Use your results to support your answer.

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Quarter 4 – Matter and its Interaction

Group no. \_\_\_\_\_ Group name: \_\_\_\_\_\_\_\_\_\_\_\_

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3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MODULE 3 – BIOMOLECULES

Activity 2 – The Denaturation of Proteins:

*How do proteins behave in different conditions?*

Materials:

Dilute egg white solution

0.1M CuSO4 solution

Concentrated HCl (Muriatic Acid)

70% Ethanol

Test tubes

Dropper

Alcohol burner

Procedure:

1. Label five test tubes with A, B, C, D, and E. Place about 2 dropper-full of egg white in each test tube. Leave test tube A as your control test tube.
2. Add 2-3 drops of each of the following solutions

B: 0.1 M CuSO4 solution

C: concentrated HCl

D: 70% ethanol

1. Apply heat to test tube E
2. Describe what you observed in each test tube and record them in the table below.

Table 1. Observations on the denaturation of protein

|  |  |  |
| --- | --- | --- |
| Test tubes with egg white solution | Before adding reagent solution/applying heat | After adding reagent solution/applying heat |
| A |  |  |
| B |  |  |
| C |  |  |
| D |  |  |
| E |  |  |

**Q1**. Describe the resulting product. Compare the products in each test tube.

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Note 1: (Charles' Law) We agreed that to justify the used of the formula V=4/3(pi) r^3, the Balloon must be spherical (or at least near spherical)

 Note 2: (Charles' Law) that the balloon must be submerged (by any means), to justify the assumption that the temperature of the water is the same as the temperature of the gas inside the balloon.

Note 3: (Charles'Law) the data from the activity will lead the students the concept that indeed, as the temperature increases, the volume also increase; and vice versa. However, with this kind of activity (with lots of possible sources of error, hehe!) it will be near impossible to get a straight line, when you plot the results in a graph. Thus, give our students a set of data (that will show a constant k=V/T) for graphing.

 Note 4: (Chemical Reactions) Go microscale! drops of reactants will show the same result, nakatipid pa tayo ng resources and chemicals

Note 5: if we will use the coffee stirrer (the one like a small spoon) as "improvised spatula" dont allow to use it as stirrer anymore, give our student a stick or a plastic stirrer (the straight one). (Good Laboratory practice, a spatula for dispensing solid, stirring rod for stirring)

 Note 6: (How much can you take) use only 1.0mL, approx 10 drops of Copper sulfate solution, or just enough to completely submerge the crumpled steel wool. -- that's microscale experiment

Note 7: (How much can you take) the laboratory activity is to compare the mass of the reactant and the mass of the product, thus, if reaction occurs upon addition of copper sulfate already (it will surely), then you dont have to heat the testtube. Just let our students observe for 2-3 minutes (for evidences of change) before weighing again. you can repeat the same reaction later with addition of heat when you tackle the factors affecting reaction.

Note 8: (how much can you take) but if you really wish to have the test tube heated, but you dont want to use the alcohol lamp, hot-waterbath may do. (this way our students will not hold the test tube while heating, less chances of breakage)