**Observation Preparations:**

|  |  |
| --- | --- |
| **Item** | **Observation** |
| 1 |   |
| 2 |   |
| 3 |   |
| 4 |   |
| 5 |   |

Take out a piece of paper and record a chart similar to the one below. Look up from this text and scan the room. Write down what you see around you in as much detail as you feel necessary to remember it after you walk away. Better still, you want to be able to show your chart to someone who can then be able to picture where in the room you were sitting. A chart is usually necessary to record these observations simply for organization

Science depends on keeping records of observations for later interpretations. These interpretations may lead to the development of theories or laws. Without accurate observations, scientists cannot make any interpretations and therefore cannot draw conclusions.

Here is a simple test for you. Pretend we're visiting a forensic scientist, hired to investigate the scene of a crime. You are only asked to analyze the observations gathered by the other scientists at the scene. You must try not to make too many assumptions yet try and make your decision based on the data at hand. One summer evening, Scott and Brenda came home from work to find their house in shambles. Neighbors, friends, and colleagues are baffled by the strange occurrence. The television was found on in the house. Food was on the table ready to be eaten. All of Scott's coin collections, his precious metals, and Brenda's prized possession – her statue of Galileo – were gone. Foul play is suspected. The lead investigator gives you the following observations gathered from the scene and suspects:

|  |  |  |  |
| --- | --- | --- | --- |
| **Observations at Scene** | **Suspect 1: 180 lb male** | **Suspect 2: 220 lb male** | **Suspect 3: 120 lb female** |
| Blood type = B | Blood type = B | Blood type = B | Would not comply |
| Fiber sample = polyester | Sweater = polyester | Blazer = wool knit | Pants = polyester |
| Powder found = white | Works in sugar factory | Pastry chef | Car sales woman |
| Shoe print found = work boot |

From the table, can you deduce who might have been involved in the alleged crime? Do you need more information? How good are the observations in order for you, the scientist, to make accurate conclusions? What will you base your decision on? What other information do you need? Remember someone will be charged for this crime. Observations are the key to science all around us and in our everyday lives.

Qualitative Observations

Science is full of observations but of two different types. What we see, smell, feel, and hear are observations that scientists depend on to determine whether chemical reactions have been occurring or have come to completion. This is one type of observation known as a ***qualitative* observation**. Qualitative observations give the descriptive properties of a substance or being and therefore are without numbers.

When you made your table above, what kind of observations did you make? Take a look at the table. Did you note any colors from the surroundings? Was there a window nearby? If so, was it open? Did you happen to hear any sounds from outside the window? Did you see a vehicle drive by? If so, what color was it? Take a look at the sample question below and see if you can determine the qualitative observations from each of the figures in the question.

List the qualitative observations to the right for each of the figures below.



Fog caused by dry ice



Tulips



Soda

**Possible Solutions for previous problems**:

*Fog caused by dry ice*: fog or smoke coming from top of the cup pouring over onto the tabletop

*Tulips*: purple tulips, sky with clouds in the background

*Soda*: bubbles, almost looks like effervescence from soda pop when you pour a glass of cola

Quantitative Observations

Sometimes qualitative measurements are enough to give an accurate representation of the events occurring. In other cases, scientists need more information than what the senses offer in order to make correct interpretations and then conclusions. Say, for example, there was a window in your classroom and outside the window you see a battleship gray car zoom by, speeding you suspect because behind him you hear the sirens of a police car. You make the interpretation that the car is speeding because of the police sirens. The police could, in fact, be on another call. The only real accurate qualitative observations you can make here are that you see a battleship gray car drive by, you hear the sirens of the police car, and you see the police car drive by with sirens on. Now if you say, happen to have a hand held radar gun, and could then measure that the car was traveling 50 mph in a 35 mph zone, then you could conclude the police were chasing the car.

Quantities are a useful strand of observations. When you have observations that involve the use of numbers, we refer to these as ***quantitative* observations** because they have amounts. In our car chase example above, the measurement of 50 mph and 35 mph are both quantitative measurements. If we said that it is 85 °F outside in British Columbia, the temperature of 85 °F is a quantitative observation. Now, if we said that it is 85 °F outside in sunny British Columbia, the temperature of 85 °F is a quantitative observation, and the "sunny" is a qualitative observation. See how it works? Now you try.

**Sample Question**

Pick out the quantitative and qualitative observations from each phrase:

1. 3 g of NaCl dissolves in 10 mL of H2O to make a clear solution.
2. The spider on the wall only has seven legs remaining but is still big and hairy.
3. When 0.5 mL of a solution is put into a flame, the flame turns a brilliant green.

**Solution**:

1. Quantitative: 3 g 10 mL; qualitative: clear.
2. Quantitative: seven; qualitative: big, hairy.
3. Quantitative: 0.5 mL; qualitative: brilliant green.

Review Questions – please complete and turn in during next session.

Indicate in the following chart whether the observation is qualitative or quantitative.

|  |
| --- |
|  |
| **Number** | **Observation** | **Qualitative or Quantitative** |
| 1 | The temperature of this room is 25 °C. |   |
| 2 | It is comfortably warm in this room. |   |
| 3 | Most people have removed their coats. |   |
| 4 | The building is 25 stories high. |   |
| 5 | It is a very tall building. |   |
| 6 | The building is taller than any nearby trees. |   |
| 7 | The bottle is green. |   |
| 8 | The bottle contains 250 mL of liquid. |   |
| 9 | Robert bought his son a small car. |   |
| 10 | The car is smaller than his hand. |   |
| 11 | The car is about three inches long. |   |
| 12 | The race is about 27 miles long. |   |