**Mystery Powder Lab**

**Purpose**  To identify the components of an unknown mixture, based on the results of individual tests of each unknown, and to identify chemical changes.

**Materials**

Unknowns

Water

Spot plates

Aluminum foil

Hot plate

Scoopula

Universal indicator

Vinegar

Iodine solution

Tongs

Stirring rod

**Procedure:**

Perform all tests on all of the unknowns including the mystery powders. Record your observations in both Chart 1: Qualitative Observations and Chart 2: Chemical/Physical Change on the back of this page.

1. Observe the physical properties of the unknown powders and record in the chart.
2. Mix a *very* small amount of each unknown in water. Observe whether the unknowns

dissolved in water (if the solution becomes clear). Record in the chart.

1. Place a small scoop of each unknown in a pre-made aluminum foil cup and heat on high

on a hot plate for 3 minutes. Record your observations in the chart.

1. Add two drops of Universal Indicator to a small sample or each unknown. Record.
2. Add two drop of iodine solution to a small sample of each unknown. Record.
3. Add a few drops of vinegar to a small sample of each unknown. Record.

**Questions** Record your answers in FULL SENTENCES on a separate piece of paper. Hand in this sheet

and your questions next day.

1. Explain the difference between a chemical and physical change.

The difference between a chemical and physical change is that a chemical change is practically impossible to reverse to what it was before while a physical change is typically possible to reverse as it was before. Another difference is that a chemical change means that a new substance was created by two different substances and a physical change may seem different, it did not create a new substance.

1. For unknown D, explain the results of each test, including what you saw and whether what you

saw was a chemical or physical change.

For unknown D’s appearance we could say that that it was powdery because there was some powder sticking on the sides of the glass. It had a slightly different color, like a little bit of beige and not as white compared to the others. It was clumped and had the resemblance of possibly being flour. When we slowly put the sample of unknown D into the water, it did not dissolve in the water, but most of the sample settled at the bottom of the container and the rest were floating in the water which is known as suspension. I would say that this would be a physical change because this is still reversible by filtering it. When we heated the flour in aluminum foil it had no apparent change as it was still the as before. So, there were no change during that process. In the Universal Indicator test, we saw that two drops of it into the sample turned into a yellow circular solid. So, we could safely say that it was a chemical change since it solidified as a yellow substance. When we inserted two drop of Iodine solution into our sample, it turned into a brown liquid. Therefore, it would also be a chemical change because a new substance occurred. For using vinegar into our sample, it became a sticky and softer solid. That we could say is a chemical change because it did not have the same stickiness as before and is unable to be reversed.

3. Based on your results identify which two powders make up Mystery Powder X and which two

powders make up Mystery Powder Z?

I believe that D and E are the two main powders to make up powder X and here is why. According to our data, both E and X both bubbled up and then settled as a liquid, however mystery powder X did not bubble as much as E when we added two drops on both powders. Another evidence that E may be half of X is that both E and X were the only powders that reacted to have a green colour when we used the Universal Indicator. However, Mystery X was a solid and E did not become a solid. The two suspects are C and D because they were the only other substances that became a solid. During the Iodine Solution process, we discovered that D became a brown liquid, E turned into a grey solid, and Mystery X happened to be a light brown solid. Considering if they were mixed, then this should have been the result and it was. I also knew what would happen if two different colours mixed and the outcome of what colour it would be. For universal indicator, if D yellow were to combine with E green, then you would technically still see green while if orange were to combine with green then it would turn brown. We saw in Mystery X that it was a green solid and if C was in mystery X then it should have turned into a brown solid. In conclusion, that is why I believe that my theory is correct.

My theory is that Powder D and Powder C created Mystery Z. The reason behind this theory is that D and Z were the only powders that turned into a yellow solid when we used the Universal Indicator. Mystery Z’s appearance also indicated that it was powdery which stick to the sides of the container. Powder D and Powder C had the same similarity to that of Mystery Z which is another clue. Powder C and D were both brown, but Powder C was the only solid when we used the Iodine Solution. When Mystery Z was also a brown solid, which makes me think that it’s possible that they mixed since they were both brown. During the vinegar experiment, C, D and Z were the only substances that solidified. In the end, that was the evidence of why these two powders fit into powder Z.

4. Explain any experimental sources of error from this lab (where could you have possibly made a

mistake?)

We could have possibly made a mistake during the heating in aluminum foil process by forgetting to check the bottom of every sample if there were any change.

***Chart 1:*** ***Qualitative Observations***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test** | **A** | **B** | **C** | **D** | **E** | **Mystery X** | **Mystery Z** |
| Appearance | White  Translucent  Grainy | Sparkly  Grainy bigger grains | Sticky, powdery,  Flat texture,  clumped | Flat texture, powdery, less powder stick to sides, clumped, little bit of beige, | Finer crystals, white, not translucent | Powdery, sticks to wall more than z, not as clumpy, | Powder stick to sides, powdery, clumpy, |
| Dissolves in Water | Yes | Yes | No(cornstarch) | No(flour) | No | Yes | No |
| Heated in Aluminum foil | Stayed same | Stayed same | Stayed same | Stayed same | Orangish at the bottom | Stayed same | Orangish top and bottom |
| Universal Indicator | No change other than it turned light orange | Turned into orange(no change) | Turned into solid but orange | Turned into yellow solid | The drop turned into green | Turned into green solid | Turned into yellow solid |
| Iodine Solution | Grey slush like, stayed clear | Grey slush like, stayed clear | Reddish brown solid | Brown liquid | Grey solid | Light brown jelly like solid | Light brown very solid |
| Vinegar | Absorbed it | Absorbed it | Solidified | Sticky softer solid | Bubbled up then back to liquid | Same as E but did not bubble as much. | Foamy but did not bubble |

***Chart 2: Identifying Chemical and Physical Changes***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test** | **A** | **B** | **C** | **D** | **E** | **Mystery X** | **Mystery Z** |
| Dissolves in Water | Physical Change | Physical Change | No change | No change | No change | Physical change | No change |
| Heated in Aluminum foil | No change | No change | No change | No change | Chemical Change | No change | Chemical change |
| Universal Indicator | Physical | Physical | Chemical | Chemical | Chemical | Chemical | Chemical |
| Iodine Solution | Physical | Physical | Chemical | Chemical | Chemical | Chemical | chemical |
| Vinegar | Physical | Physical | Chemical | Chemical | Chemical | Chemical | Chemical |