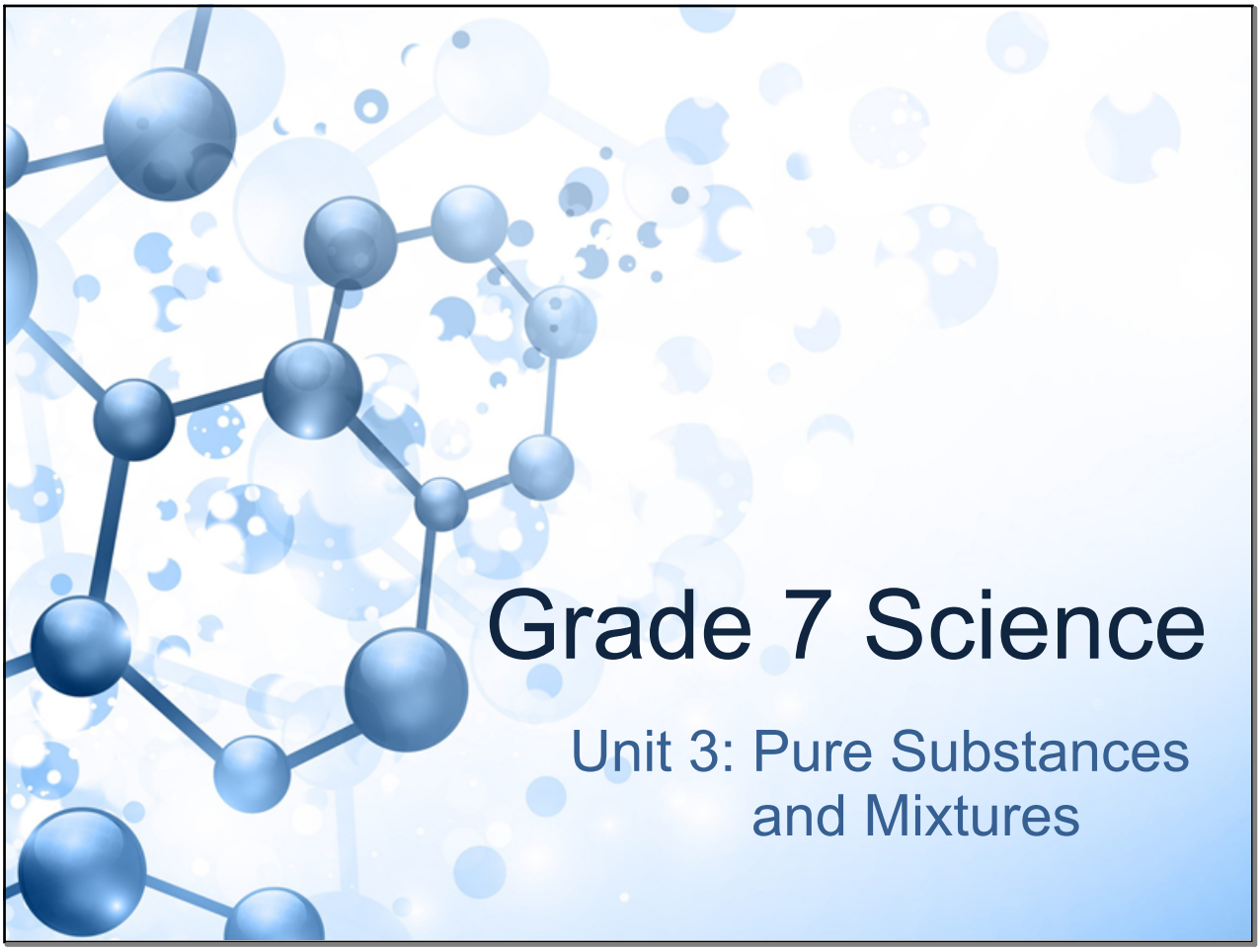

Grade 7 Science

Unit 3: Pure Substances and Mixtures

Determining Concentration

1. "Crystal Light on the Go Packets" are 54 grams. They are to be added to a standard 500 ml bottle of water. What is the concentration of Crystal Light in the water (3 marks)?

$m_{solute} = 54\ g$

$V_{solvent} = 500\ \text{mL}$

$C = ?$

$C = \frac{m_{solute}}{V_{solvent}}$

$C = \frac{54\ g}{500\ mL}$

$C = 0.108\ \frac{g}{mL}$

∴ The concentration of Crystal Light in the water is $0.108\ \frac{g}{mL}$.

2. Rachel and Caitlyn are having chocolate milk. Rachel has 400 ml of milk and adds 60 ml of chocolate sauce. Caitlyn has 250 ml and adds 40 ml of chocolate sauce. Whose chocolate milk is stronger (6 marks)?

Rachel

$V_{solute} = 60\ mL$

$V_{solvent} = 400\ mL$

$C_R = ?$

$C = \frac{V_{solute}}{V_{solvent}}$

$C_R = \frac{60\ mL}{400\ mL}$

$C_R = 0.15\ \frac{mL}{mL}$

∴ The concentration of Rachel's chocolate milk is $0.15\ \frac{mL}{mL}$.

Caitlyn

$V_{solute} = 40\ mL$

$V_{solvent} = 250\ mL$

$C_C = ?$

$C = \frac{V_{solute}}{V_{solvent}}$

$C_C = \frac{40\ mL}{250\ mL}$

$C_C = 0.16\ \frac{mL}{mL}$

∴ The concentration of Caitlyn's chocolate milk is $0.16\ \frac{mL}{mL}$.

∴ Caitlyn`s chocolate milk is stronger than Rachel`s.

3. The concentration of sugar in coke is said to be 0.106 g/ml. How much sugar would be in a 375 ml can of Coke (3 marks)?

$m_{solute} = ?$

$V_{solvent} = 375\ ml$

$C = 0.10\bar{6}\ g/ml$

$C = \frac{m_{solute}}{V_{solvent}}$

$0.10\bar{6}\ g/ml = \frac{m_{solute}}{375\ ml}$

$m_{solute} = 0.10\bar{6}\ \frac{g}{mL} \times 375\ ml$

$m_{solute} = 40\ g$

∴ There is $40\ g$ of sugar in a $375\ ml$ can of Coke.

4. According to an online source, a 250 ml can of Red Bull contains 80 mg of caffeine. A 473 ml can of Monster Energy Drink contains 160 mg. How much more caffeine per ml is in the Monster? If these companies decided to make a 2 L bottle, how much more caffeine would be in a 2 L bottle of Monster than in a 2 L bottle of Red Bull – carry 3 decimal places for all concentration values (8 marks)?

Red Bull

$m_{solute} = 80\ mg$

$V_{solvent} = 250\ ml$

$C_{Red\ Bull} = ?$

$C = \frac{m_{solute}}{V_{solvent}}$

$C_{Red\ Bull} = \frac{80\ mg}{250\ ml}$

$C_{Red\ Bull} = 0.320\ \frac{mg}{ml}$

∴ The concentration of caffeine in the Red Bull is $0.320\ \frac{mg}{ml}$.

Monster

$m_{solute} = 160\ mg$

$V_{solvent} = 473\ ml$

$C_{Monster} = ?$

$C = \frac{m_{solute}}{V_{solvent}}$

$C_{Monster} = \frac{160\ mg}{473\ ml}$

$C_{Monster} = 0.338\ \frac{mg}{ml}$

∴ The concentration of caffeine in the Monster is $0.338\ \frac{mg}{ml}$.

4. According to an online source, a 250 ml can of Red Bull contains 80 mg of caffeine. A 473 ml can of Monster Energy Drink contains 160 mg. How much more caffeine per ml is in the Monster? If these companies decided to make a 2 L bottle, how much more caffeine would be in a 2 L bottle of Monster than in a 2 L bottle of Red Bull – carry 3 decimal places for all concentration values (8 marks)?

Difference

$0.338 - 0.320 = 0.018\ \frac{mg}{ml}$

∴ There is $0.018\ \frac{mg}{ml}$ more caffeine in Monster than there is in Red Bull.

2 L Bottles

$Difference\ in\ Concentration \times Volume$

$0.018\ \frac{mg}{ml} \times 2000\ ml = 36\ mg$

∴ There would be $36\ mg$ more caffeine in a 2 L bottle of Monster.

I have finished marking your Mix-it-Up labs. Unfortunately the general trend was that they were not done well. The biggest issue was a lack of detail and explanation in the discussion answers. Many students provided answers with very little information, which results in an inability to show knowledge. When answering questions, you should make sure to look at the following:

- Does my answer actually address what is being asked in the question?
- Have I provided proof to support my answer?
- Have I referenced the science that has been taught in class when composing my answer?
- Have I communicated everything I know about the topic?

The best way to think about it is to pretend that you are writing an answer for someone who knows nothing about the topic. You would need to tell them everything in order for them to understand.

Another key point to note is that the internet is a great tool, but it is your job to use information you may find there and alter it to answer the question being asked. Simply copying from online will not properly answer a question.

To help you understand, here is an example answer from your Mix-it-Up write-up:

Make a generalized statement about how the temperature of water affects how the solids react. Explain how it was different and why this happened. Provide a specific observation from the experiments to support your comment.

A solute will dissolve faster in a hot solvent (water) than they will in the same solvent when it is cold. There were two stations in which we used both hot water and cold water, station 6 with hot chocolate powder and station 7 with juice crystals. In both of these stations the solutes dissolved faster in the hot solvent than they did in the cold solvent. Station 6 provided a very clear example of this. When the hot chocolate powder was placed in cold water it clumped at the top and did not appear to mix at all, in the hot water the powder mixed immediately. The particle theory of matter states that particles are always moving, but they move faster when they are at a higher temperature. Therefore, the particles of the hot water are moving faster than the particles of the cold water. The faster moving solvent particles will make more contact with the solute particles (as they are moving more), meaning there is more opportunity to pull the powder apart, thus dissolving will occur faster. This is why the hot chocolate powder caused the hot water to turn brown much faster.