Please note – These are extracts from one student's response

Purpose: to investigate the effect of the concentration of sugar solutions on the mass of potato chips.

1

Hypothesis: when potato chips are placed in solutions with high concentrations of sugar (for example 0.8 mol L-1) then they will lose mass as the chip will lose water because of osmosis.

Raw Data for investigating the effect of the sugar solution concentration a potato piece is soaked in an osmosis.

2

Solution concentration		Initial mass (g)	Final mass (g)	% change in mass	Average % change in mass
0.0 mol L^{-1}	1	1.04	1.20	15.38	15.67%
	2	1.13	1.32	16.81	
	3	1.08	1.24	14.81	
0.2 mol L^{-1}	1	1.06	1.10	3.77	4.30%
	2	1.03	1.08	4.85	
	3	1.17	1.22	4.27	
0.4 mol L^{-1}	1	1.15	1.02	-11.30	-11.43%
	2	1.19	1.06	-10.92	
	3	1.16	1.02	-12.07	
0.6 mol L^{-1}	1	1.16	0.85	-26.72	-24.35%
	2	1.13	0.86	-23.89	
	3	1.07	0.83	-22.43	
0.8 mol L^{-1}	1	1.05	0.70	-33.33	-31.16%
	2	1.14	0.82	-28.07	
	3	1.06	0.72	-32.08	

3

Conclusion: my results showed that the chips gained mass in water and low sugar concentrations but lost mass in high concentrations of sugar. This is what I predicted in higher sugar concentrations because in these solutions the water will move out of the potato cells by osmosis.

4

When the chips were put in distilled water they gain mass because the chips gain water from the surrounding solution due to osmosis. The process of osmosis causes a net flow of water across the semi permeable membrane, from a solution with a high water concentration to one with a lower water concentration. The chips gain water because the distilled water has a higher water concentration than the chips.

As the concentration of the sugar solution increases from 0.2 to 0.4 mol L-1 the potato chip loses more and more mass because the difference in water concentration between the inside of the potato cells and the surrounding solution is increasingly different. This means that when the chips are placed in the higher concentration solutions more water will move out of the chips as the result of osmosis.

4

We looked at another finding the teacher gave us from a group that studied *Nereis* sp (worms). These worms live under large rocks near the high tide in the sea. The salt concentration of the worm's environment can change due to the weather (rain and sun) meaning that there is sometimes less salt in the surrounding water and sometimes more. 5

The group used three different beakers, each with 50 worms in different concentrations of salt solution instead of potato chips in sugar solutions. Their hypothesis was that worms could tolerate a wide range of salt concentrations within its habitat. They found that in the seawater + distilled water mixture the worms gained weight, but then dropped down to an average rate. When they were in the seawater + salt solution mixture they lost weight but then regained it. This weight loss showed similar pattern to our potato investigation when the chips were in high concentrations of sugar. The normal seawater had no effect on the worms. In the worms case the data shows that they have a mechanism to control the water balance – active transport. Our potatoes don't use a mechanism like the worms do, so the chips do not regain their normal weight. 5

The trend in the data from the kumera chips investigation was almost the same as mine for the potatoes. Even though they did not use distilled water, there was a point on the graph like mine at zero where the weight did not change, like mine. 5

My method is valid because I did things to make my investigation a fair test. For example I used a cork borer to make sure all the chips used were cut as close to exactly the same shape as possible. The repeats used showed similar results to each other. 6

A change made to my original method was to make the chips slightly smaller than planned.

The method was carried out in a way that variables that could have changed the rate of osmosis, such as evaporation and temperature, were controlled. 6

There were many things that could have been changed to make the method more valid and results more reliable. For example, making sure the temperature was kept constant and the volume of sugar solutions measured more accurately. 7