Experimental Design   *Key*

1. Fill out the following table by looking up each term and filling in the definition AND some notes.

Hypothesis	A tentative proposal made to explain certain observations or facts that requires further investigation to be verified. Uses "If … then …" format.
Experiment	A set of actions and observations, performed to verify or falsify a hypothesis or research a causal relationship between phenomena.
Procedure	The set of detailed instructions listing what the person doing the experiment is to do in order to verify the hypothesis.

Conclusion	A summary of the results of the project experimentation and a statement of how the results relate to the hypothesis. Reasons for experimental results that are contrary to the hypothesis are included. If applicable, the conclusion can end by giving ideas for further testing.
	
	If your results do not support your hypothesis:
	     DON'T change your hypothesis.
	     DON'T leave out experimental results that do not support your hypothesis.
	     DO give possible reasons for the difference between your hypothesis and the experimental results.
	     DO give ways that you can experiment further to find a solution.

Experimental group	The group that receives the treatment that an experiment is testing out. Opposite of the control group.
Control	Carefulness used in scientific experiments to prevent factors other than those being studied from affecting the outcome. Controls are needed to eliminate alternate explanations of experimental results. Control is the things you do to make sure that 'outside' influences aren't causing the results rather than the thing you're testing.
Control group	The group who *don't* get the experimental treatment. I.e. The group you <u>compare</u> your results to. E.g. If you are testing a cancer drug, you give 50% of your experimental group the drug and 50% get nothing. Then you compare which group had the most
Sample size	How many organisms/people you do the experiment on. You want as LARGE a sample as possible.
Dependent variable	The thing that "changes" or varies *depending on* something else. E.g. How long it takes you to get well … <u>*depends on*</u> … whether or not you take all your medicine.
Independent variable	The thing 'depended on'. E.g. whether or not you take your medicine.
Reliability	Yielding the same or compatible results in different clinical experiments or statistical trials.
Validity	How "true" your results are to real life. (Validity is impossible to tell, but scientists always strive to get as close as possible)
Theory	a scientific hypothesis that survives experimental testing becomes a scientific theory

1. a) **State a hypothesis** which could be used to design an experiment determining the effect of pH on the function of the digestive enzyme trypsin. **(1 mark)**

Response:

• If trypsin is more effective at hydrolyzing protein at a pH of 9.0 than at other pH levels then, over time, less protein will be found in the pH 9.0 solution than all other solutions. (1 mark)

b) Using any of the materials listed below, design an experimental procedure which could be used to test the hypothesis. **(3 marks)**
   • A bottle containing trypsin solution.
   • Five bottles, each containing solutions buffered to maintain the following pH levels (pH 3, 5,7, 9 and 11).
   • A bottle containing a protein solution of a known concentration.
   • Test tubes and test tube rack.
   • A device capable of measuring the concentration of protein in a solution.
   • A water bath capable of maintaining the bottles at a constant temperature.

Response:
   • Fill five of the test tubes with equal amounts of protein solution and trypsin.
   • Add one of the five buffered solutions to each of the test tubes.
   • Maintain the test tubes at 37 C ▢ for one hour (times may vary).
   • Measure the resulting concentration of protein in each of the tubes.

c) What could be used as a control for this experiment? **(1 mark)**

Response:
• Test a second set of test tubes with protein and pH solutions but without trypsin. (1 mark)

d) What is the purpose of the control? **(1 mark)**

Response:
• To make sure that no other variables are causing the digestion of the protein. (1 mark)

e) What new substances will be found in the test tubes? **(1 mark)**

Response:
• peptide molecules (1 mark)