



BETA SESSION

All scientific experiments must contain a *CONTROL* group and at least one *EXPERIMENTAL* group.

EXPERIMENTAL group: A group where the variable under consideration is present and changed from experiment to experiment.

CONTROL group: A group where the variable under consideration is either absent or it is not changed from experiment to experiment. The *CONTROL* is necessary so we have a baseline to compare against our various experiments...

Note that it is critical that only ONE variable be present and changed in each experiment. If we want to test 10 different variables: we need at least 10 different experiments. If we want to test one variable, but change it 10 times: we need at least 10 different experiments.

TASK β -1: Recall the list of variables and hypotheses from your ALPHA Session. For EACH of your hypotheses, answer the following:

1) How do you propose we manipulate the variable being tested in the *EXPERIMENTAL* group?

- Example: If students decided *VISIBLE LIGHT* was the variable to be tested, and they had determined the variable should range from 490 W/m^2 to 720 W/m^2 , do they:
 - 1) Do one experiment which is always @ 490 W/m^2 , and another which is always @ 720 W/m^2 . Or,
 - 2) Do one experiment which is 0 W/m^2 (night) for half the Martian day, then instantly raise it to 720 W/m^2 for the other half? Or,
 - 3) Do one experiment which is 0 W/m^2 (night) for half the Martian day, then slowly raise it to 720 W/m^2 for the other half? Or,
 - 4) Do multiple experiments, each fixed at a different light intensity between 490 W/m^2 to 720 W/m^2 ?

2) How do you propose we construct the *CONTROL*?

- Example: In the hypothetical experiment above, *VISIBLE LIGHT* was the variable being tested. In the *CONTROL*, the variable (*LIGHT*) could be “absent” (only @ night), but that would NOT be realistic. Instead, the students would have to make sure *LIGHT* was not changed from experiment to experiment. But if we want to maintain a stable light intensity as our *CONTROL*, what should that stable light intensity be? 490 W/m^2 , 720 W/m^2 , or something in-between?

<http://pioneeringmars.org>