Michigan Educational Assessment Program

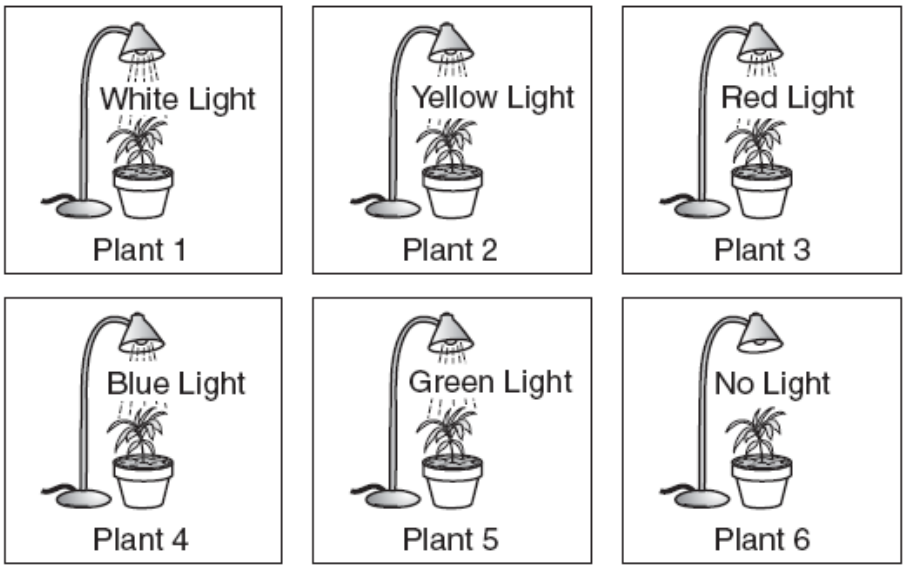
Science Grade 8
Scoring Guide for
Released Item 14
Plant Experiment
Fall 2007

MICHIGAN Department of Education

ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER DOCUMENT.

14

PLANT EXPERIMENT



Time of Experiment: 3 Weeks

Constructed Response (3 points)

A student sets up an experiment to determine the effect of light color on similar potted, green-leafed plants, as shown above.

Based on the diagrams:

- Why should all of the potted plants in the experiment be similar?
- Write a reasonable hypothesis based on the question being investigated.
- What is the purpose of Plant 6 receiving no light?

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

Science Rubric for Plant Experiment

Scoring Guide:

Bullet 1: (0 to 1 points)
We can expect the students to understand the importance of holding constant or controlling variables that could influence the results beyond the variable under investigation (the colored lights). Similar plants would mean same species, maturity (i.e., same days post germination), same size pots, same amounts of fertilizer, same amounts of water, etc. Such statements which indicate that the student recognizes that other plant variables need control so as not to effect, confound, or influence the growth of plants due to different colors of light and would suffice for point 1.

- You can only have one variable that changes (so only the light affects the plant; so the type of plant does not affect the experiment)
- You can only have one independent, manipulated variable
- So you can determine the effect of light color only on the plants
- So that the type of plant does not affect the results
- To insure accuracy of the experiment, results, or conclusions

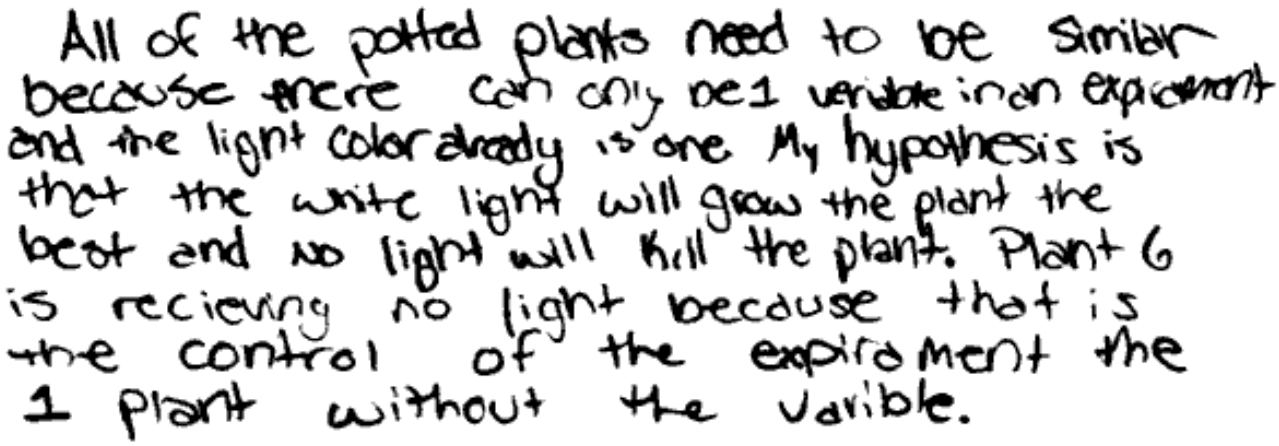
Bullet 2: (0 to 1 points)
Statements similar to the following:
Plants that receive different colors of light vary in number of leaves, color, height/growth, sugar content, or other relevant measurable variables.

Note: The hypothesis must be a testable declarative statement.
Note: The null hypothesis (plants that receive different colors of light will have the same number of leaves, color, height/growth, sugar content, or other relevant measurable variables) is acceptable.

Bullet 3: (0 to 1 points)
Statements that indicate:
The “no light” condition functions as a control to demonstrate whether the different colors of light have the same effect as no light on the variable of interest regarding the plant’s growth.

Note: An implied comparison between the plant with no light (Plant 6) and plants with light is acceptable.

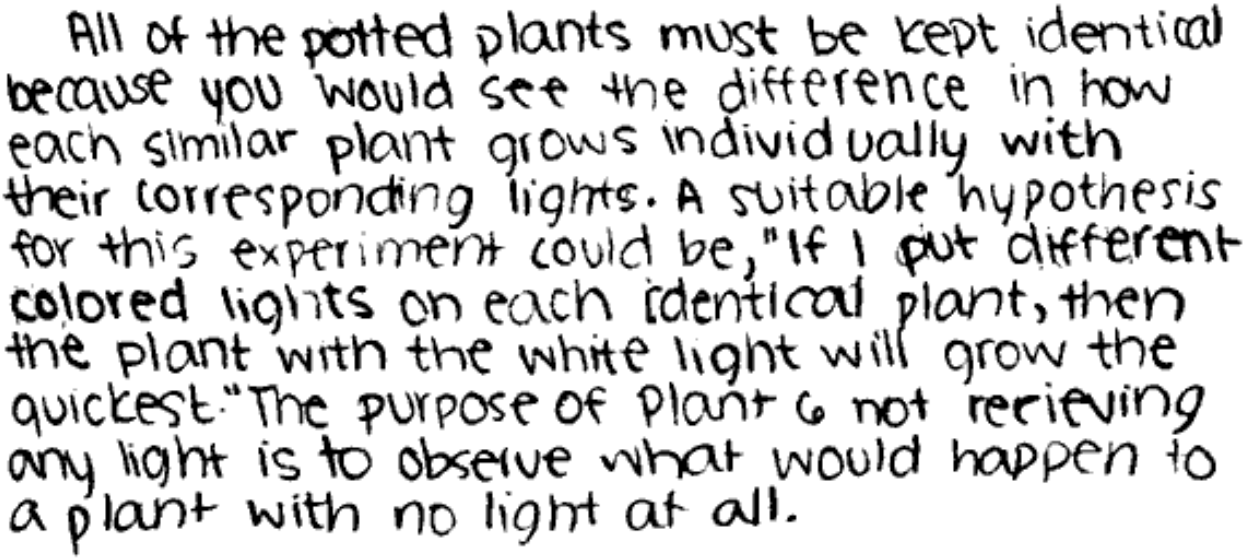
Anchor Paper 1 – Score Point 3


All of the potted plants need to be similar because there can only be 1 veriable in an expiament and the light color already is one. My hypothesis is that the write light will grow the plant the best and no light will kill the plant. Plant 6 is recieving no light because that is the control of the expiroment the 1 plant without the varible.

Anchor Paper 1
Score Point 3

The student correctly explains why all of the plants in the experiment should be similar *(because there can only be 1 veriable in an expirement and the light color already is one).* This shows understanding that there can only be one independent (manipulated) variable in this experiment – light – so only light will affect plant growth. All other variables are controlled (same plant species, maturity, pots, soil, water) so these variables don't influence the growth of the plants in any way, making the effect of light itself on plant growth clear. The student writes a reasonable hypothesis based on the question being investigated *(My hypothesis is that the white light will grow the plant the best…No light will kill the plant).* Per the prompt, the question being investigated is "the effect of light color on similar plants." This hypothesis speaks directly to the effect of (white) light color on plants (white light grows the plant the best) and compares the effect of light to the effect of no light (no light will kill the plant). The hypothesis is also a declarative statement that is testable (measurable) – "best growth" can be measured by "height" of the plants. The student provides a correct purpose for Plant 6 receiving no light *(because that is the control of the expirament the 1 plant without the varible).* This response recognizes that Plant 6 functions as a "control," the only plant without the manipulated (changed) variable of light. The purpose of this control is to compare the effect of light color (light) to no light on plant growth – to show whether different colors of light (or light alone) has any affect on plant growth at all.

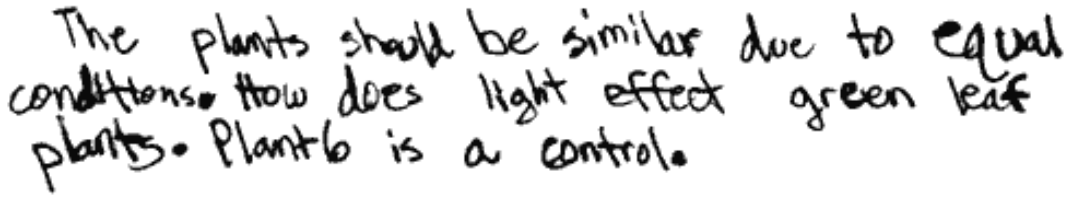
Anchor Paper 2 – Score Point 2


All of the potted plants must be kept identical because you would see the difference in how each similar plant grows individually with their corresponding lights. A suitable hypothesis for this experiment could be, "If I put different colored lights on each identical plant, then the plant with the white light will grow the quickest." The purpose of plant 6 not recieving any light is to observe what would happen to a plant with no light at all.

Anchor Paper 2
Score Point 2

The student correctly explains why all of the plants in the experiment should be similar *(because you would see the difference in how each similar plant grows individually with their corresponding lights).* This response implies understanding of the importance of controlling plant variables other than the manipulated variable (the colored lights). If all plant variables are kept constant with only light being changed or manipulated, it is clear how light/light color alone affects plant growth. The student writes a reasonable hypothesis based on the question being investigated *(If I put different colored lights on each identical plant, then the plant with the white light will grow the quickest).* This hypothesis speaks directly to the effect of (white) light color on plant growth rate; "Will grow the quickest" implies comparison to the other lights. The student provides an incorrect purpose for Plant 6 receiving no light *(to observe what would happen to a plant with no light at all).* This only addresses what would happen to a plant with no light. It makes no comparison between the effects of light vs. no light on plant growth.

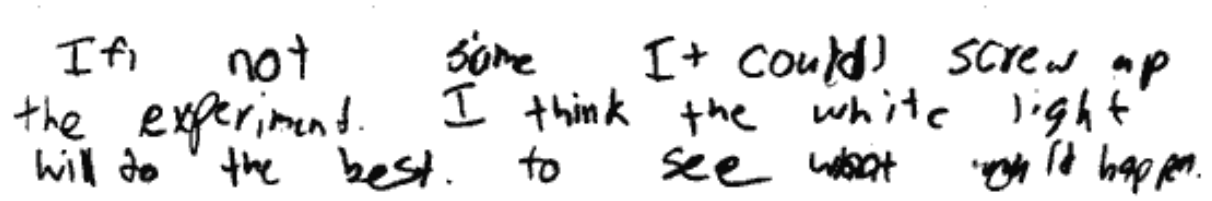
Anchor Paper 3 – Score Point 1



Anchor Paper 3
Score Point 1

The student incorrectly explains why all of the plants in the experiment should be similar *(The plants should be similar due to equal conditions).* This response suggests that the student misread the prompt "Why should (must) all of the plants in the experiment be similar?" (because they are a controlled variable) as "Why are all of the plants in the experiment similar?" (After 3 weeks, (per label in prompt diagram) they are similar because they all had equal conditions – same kind of plants, same soil, same pots, same light). This response shows no understanding of controlled variables. The student writes an incorrect hypothesis based on the question being investigated *(How does light effect green leaf plants).* This hypothesis is written in the form of a question rather than a declarative sentence. The student provides a correct purpose for Plant 6 receiving no light *(Plant 6 is a control).* "Control" is enough for credit.
Note for Bullet 1: "Same (kind of) plants", "same soil", "same pots", "same light" are not acceptable responses for Bullet 1.

Anchor Paper 4 – Score Point 0



Anchor Paper 4
Score Point 0

The student incorrectly explains why all of the plants in the experiment should be similar *(If not same It could screw up the experiment).* "Screw up the experiment" is too vague. It does not state that the outcome, data, or results of the experiment will alter, change, vary, or differ. The student writes an inadequate hypothesis based on the question being investigated *(I think the white light will do the best).* Stating that the white light plant will do the "best" is too vague and is not measurable (how will it do the best?); it does not state that the plant will do the best because it will "grow" the best, which is measurable by "height". (Compare to Anchor Paper A8; contrast with Anchor Papers A1, A3, A4, A6, and A10). The student provides an inadequate purpose for Plant 6 receiving no light *(to see what culd happen).* This response is too vague and general. It makes no comparison between the effects of light vs. no light on plant growth.