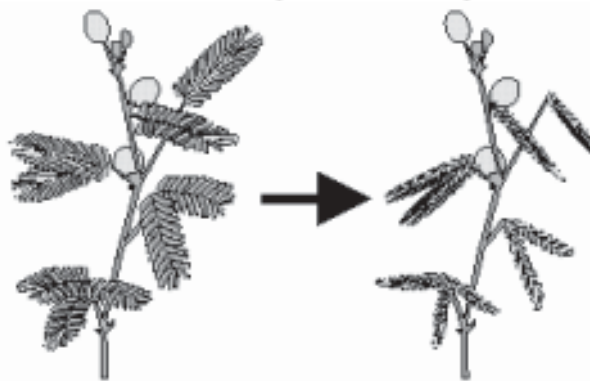


MEAP HIGH SCHOOL SCIENCE

- 4 How can radiation produce mutations in the offspring of an exposed organism?
- A It doubles the amount of DNA within egg or sperm cells.
 - B It changes recessive traits to dominant traits and vice versa.
 - C It allows non-DNA proteins to control the expression of various traits.
 - D It rearranges the genetic information in the DNA of an egg or sperm cell.
- 8 John scraped his knee. Predict what could happen if he had fewer white blood cells than normal.
- A His body could not get enough oxygen to damaged tissues.
 - B His tissues could not take advantage of glucose to produce energy.
 - C His body could not manufacture proteins to mend damaged tissues.
 - D His tissues could not resist infection from bacteria entering the scrape.

Use the following information to answer items 10 through 13.

Mimosa pudica plant



Mimosa pudica plant

The *Mimosa pudica* plant can fold and droop its small, divided leaves when stimulated by touch. At the base of each leaf stalk is a swollen region of motor tissue called a pulvinus. When the leaf is touched, potassium is pumped out of the cells in this region. This causes water to flow out of the cells, which in turn causes them to

lose their rigidity. Scientists have also noticed the transmission of electrical impulses between the cells during this process. The leaves usually reopen within minutes. Some scientists suspect that this response serves to discourage grazing animals and flying insects from eating the plants.

- 10** Which function of animal nerve cells is present in the *mimosa* plant?
- A** the ability to droop when stimulated
 - B** the ability to regulate photosynthesis
 - C** the ability to pump oxygen into blood
 - D** the ability to transmit electrical impulses
- 11** Which of the following represents an assumption made by biologists studying the mimosa plant?
- A** The swollen structure at the base of each leaf is called the pulvinus.
 - B** When the leaf is touched, the leaves suddenly fold together and droop.
 - C** The response discourages grazing animals and insects from eating the plants.
 - D** There are electrical pulses passing between cells during the reaction process.
- 12** Which of the following might explain why the drooping response of the mimosa plant might deter plant-eating insects?
- A** Insects would find it difficult to stay on the leaves.
 - B** Insects find potassium extremely distasteful within plant matter.
 - C** Insects would be shocked by the electric impulses in the plant's cells.
 - D** Insects would be washed away by the sudden flow of water in the leaves.

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

13 Constructed-Response (3 points) A friend claims that although drooping might be a defense mechanism for the mimosa plant, prolonged drooping might decrease the amount of photosynthesis the plant cells can perform.

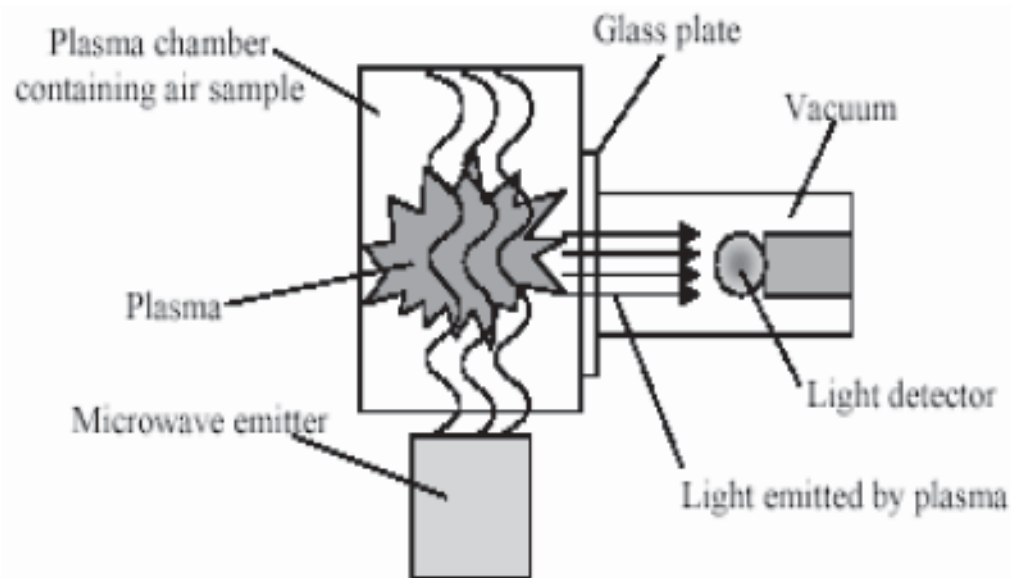
- Design a *three-step* procedure to test this claim.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

18 Vampire bats can detect heat from victims through their noses. What type of electromagnetic energy is detected by the bat's nose?

- A gamma
- B infrared
- C ultraviolet
- D microwave

Use the following information to answer items 21 through 24.



Simplified diagram of an 'Electric Canary'

An 'electric canary' is a device developed to detect pollutants in air. It uses microwaves to turn air samples into plasma. Plasma is a high temperature state of matter, hotter than the gaseous state, consisting of charged particles and electrons. This plasma emits light, and a vacuum-sealed light detector identifies the wavelengths of

this light. Different pollutants in the air sample cause the plasma to emit different wavelengths of light, and are thereby detected.

- 21 Which of the following properties of the glass plate is important for the detection of light by the light detector?
- A It emits visible light.
 - B It reflects visible light.
 - C It absorbs visible light.
 - D It transmits visible light.
- 22 The microwaves have longer wavelengths than those detected by the light detector. This means that microwaves, when compared to the waves detected by the detector, have which of the following?
- A higher pitch
 - B higher energy
 - C lower velocity
 - D lower frequencies
- 23 Which of the following best describes the situation when the air is first heated by the microwaves in the plasma chamber?
- A The molecules become nearly motionless.
 - B The molecules form densely-packed crystal patterns.
 - C The molecules move rapidly and exert pressure on the chamber walls.
 - D The molecules form globular masses and lower the pressure of the chamber.

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

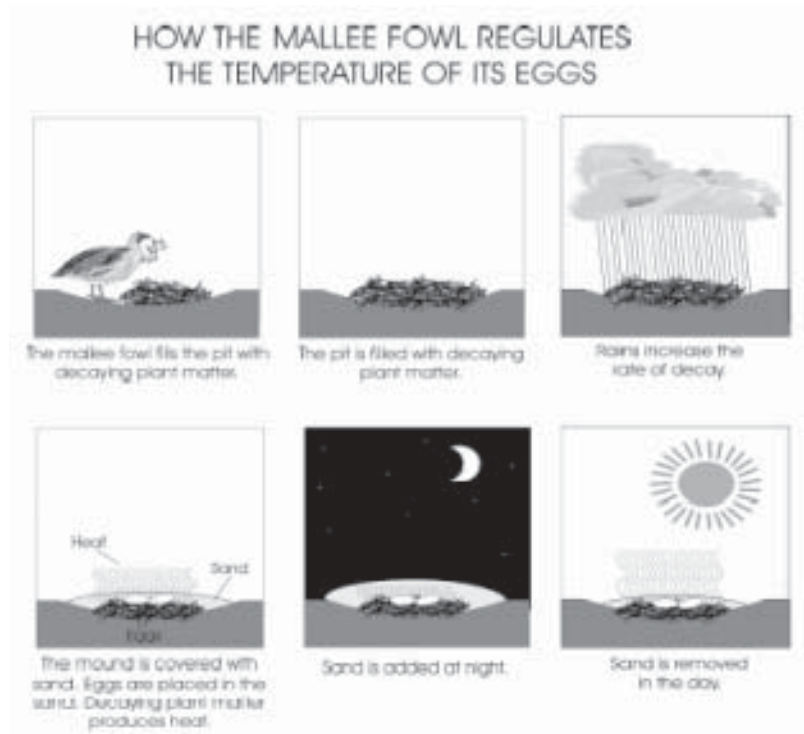
**24 Constructed-Response
(3 points)**

An investigator places different pollutants in air samples to test what pollutants can be detected by the electric canary.

- What would be the investigator's control group and experimental group?
- Explain why the investigation would need a control group.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

Use the following information to answer items 36 through 39.



In the desert, where the nights can often be very cold, birds must keep their eggs warm at night. Some desert birds, such as the mallee fowl of Australia, incubate their eggs in mounds of decaying plants. They dig a pit and fill it partially with bark and decaying plant matter. The mallee then waits for rain to speed up the decaying process. Shortly after, it fills the rest of the pit with sand and lays its eggs in the sand, which is heated by the decaying plant matter. The mallee removes sand to cool the eggs during the day.

36 Mallee eggs are warmed at night by which of the following?

- A nuclear changes
- B ultraviolet waves
- C chemical changes
- D gravitational potential energy

-
- 37** The mallee eggs are heated in the sand because heat moves in which of the following ways?
- A** from a cold region to a warm region by convection
 - B** from a warm region to a cold region by convection
 - C** from a warm region to a cold region by conduction
 - D** from a cold region to a warm region by conduction
- 38** Some scientists claim that the mallee fowl has evolved large feet in order to build these incubation mounds. What question, if answered “yes,” would help you believe this claim?
- A** Do all birds in the desert lay eggs?
 - B** Do the feet of mallee fowls grow as they construct these mounds?
 - C** Do non-inheritable traits acquired by parents pass on to young mallee?
 - D** Do genetically similar birds that do not build mounds have smaller feet?

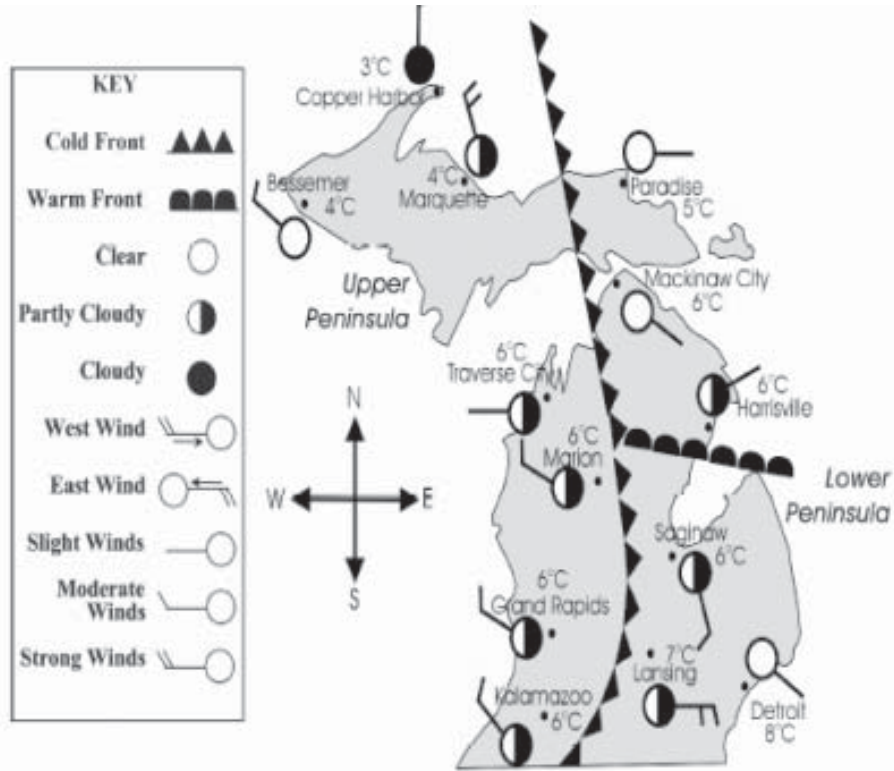
ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.

39 Constructed-Response
(3 points)

- What role do bacteria play in this incubation process?
- Identify one of the nutrients bacteria release during this process.
- Why is this important for the ecosystem in which the mallee fowl lives?

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

Use the following information to answer items 40 through 43.



- 40 According to the weather map, in which location would a rain gauge most likely have the highest measurements?
- A Marion
 - B Marquette
 - C Copper Harbor
 - D Mackinaw City
- 41 Which of the following would you most likely find just south of Harrisville?
- A a cold air mass absorbing a warm air mass
 - B a warm air mass trapped by a cold air mass
 - C a cold air mass rising over a warm air mass
 - D a warm air mass rising over a cold air mass

-
- 42** How are the winds shown in this map different from winds caused directly by Earth's rotation (called global winds)?
- A** The winds on the map depend on convection; global winds do not.
 - B** Warm air rises in the winds on the map, but sinks in global winds.
 - C** The winds on the map do not move in regular motions like global winds.
 - D** The winds on the map move in a more circular direction than global winds.

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

- 43 Constructed-Response** Provide three predictions of how the weather in Lansing will change after the cold front passes.
(3 points)

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

- 45** Pure iron is a valuable element. In natural deposits, iron is often found bonded with other elements as iron ore. Therefore, which of the following is true?
- A** Iron ore is a renewable resource, but pure iron is non-renewable.
 - B** It is impossible to obtain pure iron from natural iron deposits.
 - C** It is possible to obtain more iron per gram of ore than from a gram of pure iron.
 - D** It is more reasonable to recycle used iron rather than to rely on new deposits of iron ore.

MEAP KEY

HIGH SCHOOL KEY

<u>Item</u>	<u>Answer</u>	<u>Benchmark</u>
4	D	III.3.h.3
8	D	III.2.h.4
10	D	III.1.h.2
11	C	II.1.h.1
12	A	II.1.h.1
13	Constructed Response	I.1.h.2
18	B	IV.2.h.5
21	D	IV.4.h.4
22	D	IV.4.h.3
23	C	IV.4.h.4
24	Constructed Response	I.1.h.2
36	C	IV.2.h.4
37	C	IV.2.h.5
38	D	III.3.h.2
39	Constructed Response	II.1.h.1
40	C	I.1.h.4
41	D	V.3.h.3
42	C	V.3.h.2
43	Constructed Response	V.3.h.3
45	D	V.1.h.3

MIDDLE SCHOOL KEY

<u>Item</u>	<u>Answer</u>	<u>Benchmark</u>
4	A	IV.3.m.2
5	D	IV.4.m.4
13	C	III.3.m.1
24	B	III.2.m.1
25	B	II.1.m.1
26	D	III.4.m.1
27	Constructed Response	I.1.m.5
40	D	V.3.m.3
41	A	V.3.m.1
42	B	V.3.m.1
43	Constructed Response	I.1.m.5

ELEMENTARY SCHOOL KEY

<u>Item</u>	<u>Answer</u>	<u>Benchmark</u>
5	B	III.4.e.2
6	D	III.5.e.1
7	A	III.2.e.2
17	C	IV.3.e.3
18	D	IV.3.e.3
19	D	IV.3.e.3
20	Constructed Response	IV.1.e.1
29	D	V.1.e.5
30	D	IV.1.e.4 (this item was not scored on the 2003 test due to a printing error)
31	D	IV.1.e.5
32	Constructed Response	IV.2.e.3
38	B	V.1.e.5