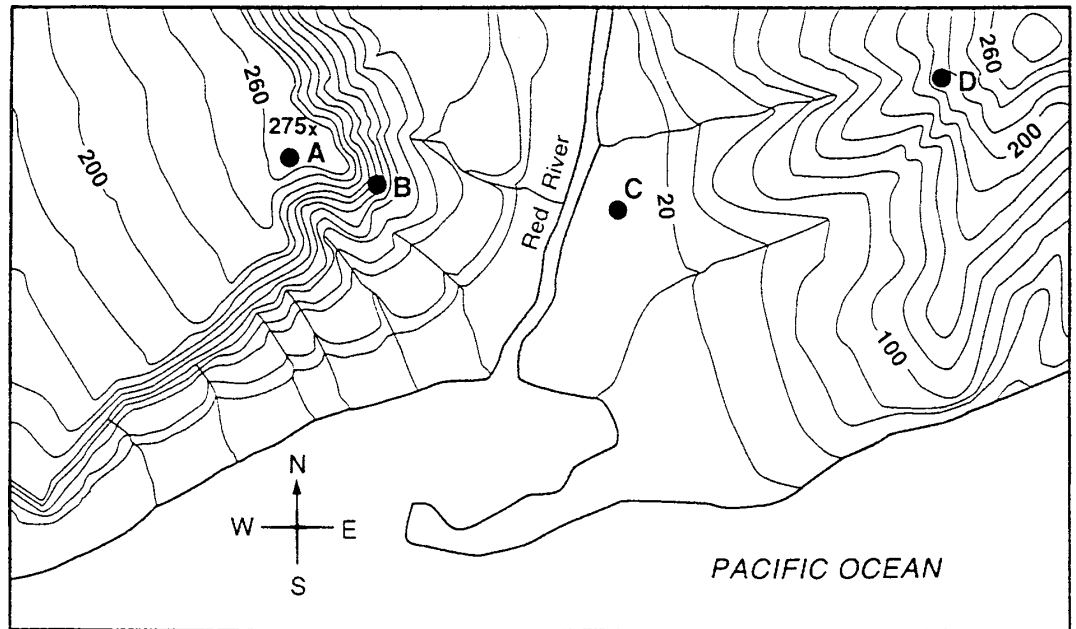

RELEASED MEAP 2002 ITEMS
High School Science

High School Science

- 1 Which of these has the LEAST influence on an area's climate?
 - A latitude
 - B elevation
 - C soil conditions
 - D adjacent large bodies of water

- 2 Which of these instruments would be used to analyze the probable composition of the surface of a star?
 - A a spectroscope
 - B an oscilloscope
 - C a radio telescope
 - D an optical telescope

- 3 At what point is the slope steepest?
 - A point A
 - B point B
 - C point C
 - D point D



Use the following information to answer items 7 through 10.

Long Valley Caldera

The Long Valley caldera is a 200 square mile crater in California that sometimes receives hundreds of earthquakes per day. The crater was formed when a volcano erupted hundreds of thousands of years ago.

These days, scientists are worried that the volcano might erupt again. A large dome in the center of the crater has grown 80 cm since 1979. Underground heat is released into hot springs, as well as through natural volcanic vents called fumaroles. Also, scientists think that these earthquakes, often too weak to detect without a seismograph, are caused by magma slowly forcing its way to the surface.

- 7 How are the earthquakes in the Long Valley caldera different from earthquakes that occur on fault lines?
- A They do not produce seismic waves.
 - B They are caused by sea floor spreading.
 - C They are too weak to detect without a seismograph.
 - D They are not caused by the motion of tectonic plates.
- 8 Which of the following can explain why pressure from magma is generally strong in California, and especially strong in the Long Valley caldera?
- A California contains very few hot spots.
 - B California contains many moraines and kettles.
 - C California is located on a very long plate boundary.
 - D California has higher temperatures than any other state.
9. Which of the following would be evidence AGAINST the claim that the Long Valley caldera will erupt soon?
- A live volcanoes located on fault lines
 - B non-volcanic areas located in craters
 - C non-volcanic areas having similar earthquakes
 - D live volcanoes having similar earthquakes before erupting

10 (3 Points)

When observing other volcanoes just before they erupt, identify two aspects of these volcanoes that scientists should study to determine if the Long Valley caldera is likely to erupt.

Explain one of your answers.

ANSWER THIS ITEM IN YOUR ANSWER BOOKLET.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED

-
- 14** The human embryo and the embryos of other animals with backbones have gill slits. According to modern evolutionary theory, this best supports the idea that
- A** fish are our closest relatives.
 - B** all embryos breathe through gills.
 - C** all animals with backbones are related by common ancestry.
 - D** all organisms have gill slits at an early stage in their development.
- 16** If scientists want to change the characteristics of a plant so that the new characteristics will be passed from generation to generation, they can do so by
- A** altering the hormones that regulate the growth of plants.
 - B** removing the flowers from the plant before pollination occurs.
 - C** altering the genetic message contained in the DNA of the parent plant.
 - D** adding scientifically designed fertilizers to the soil in which the parent plant is growing.

Use the following information to answer items 19 through 22

Edward Jenner

Edward Jenner (1749-1823) was a British physician whose research led to the elimination of the disease smallpox. Smallpox is a contagious viral disease that infects the bloodstream of its victims. Smallpox was not always deadly, but it often left scars on its victims, who afterward were immune to the disease. Jenner noticed that farm workers who had been infected with a similar, but more mild, disease known as cowpox never caught smallpox. He administered a small dose of cowpox to a child, who proved immune to smallpox when he was exposed to smallpox two months later.

- 19** Which of the following is a way to determine if the body has a bacterial infection?
- A** inoculate the patient with the disease
 - B** test for increased levels of cholesterol
 - C** look for antibodies in the bloodstream
 - D** determine if hormones are in the blood

20 By administering the less harmful cowpox virus to people who were in danger of catching smallpox, Jenner administered which of the following?

- A** bacteria
- B** antibodies
- C** a transplant
- D** an inoculation

21 Which of the following would be a control for Jenner's experiment?

- A** a person who had been infected with either cowpox or smallpox
- B** a person with cowpox who had already survived a smallpox epidemic
- C** a person who survived cowpox, but became infected with Lyme disease
- D** a person who had never had cowpox, but came in contact with smallpox

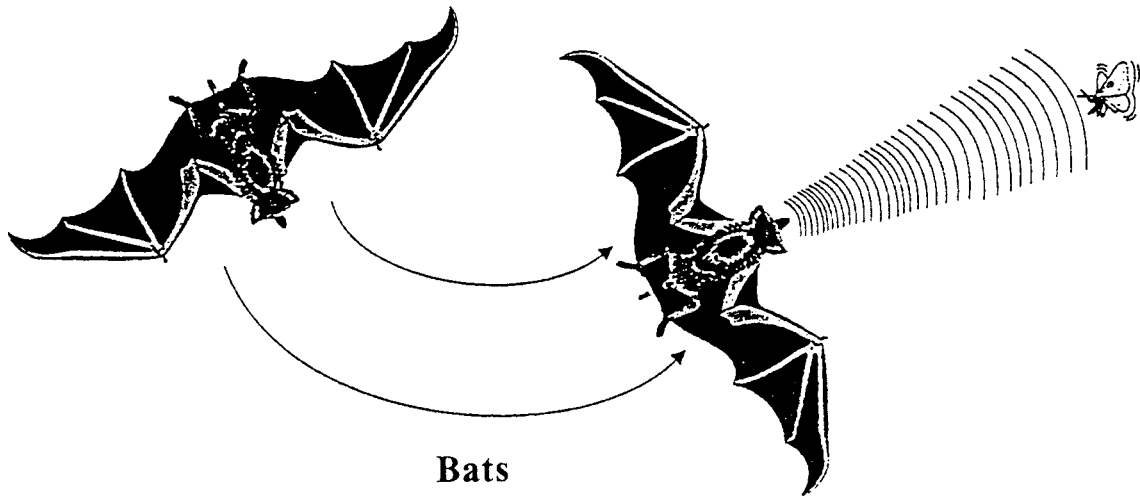
22 (3 Points)

In Edward Jenner's day, smallpox scars were often required for employment as a nurse. Give three reasons why this was so.

ANSWER THIS ITEM IN YOUR ANSWER BOOKLET.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

Use the following information to answer items 34 through 37



Bats are not blind. On the other hand, some species of bat use sound waves to hunt and navigate while flying, especially at night. Bats (which are mammals) produce pulses of sound at extremely high frequencies through their mouths. These pulses are separated by short periods of silence during which the bats listen for these sounds to bounce off objects and return. Bats have highly developed ears, which pinpoint objects and prey by detecting these echoes, even if these echoes are .1% as strong as the original sounds.

- 34 In 1794, scientists performed investigations in which they covered parts of a bat's body and let it loose in a darkened, cluttered room. Which result would have helped demonstrate that bats use their ears to navigate?
- A Bats with covered eyes collided into objects.
 - B Bats with covered wings collided into objects.
 - C Bats with covered mouths collided into objects.
 - D Bats with nothing covered collided into objects.
- 35 Bats can detect echoes from moving objects which are a fraction of a centimeter thick. This is evidence that bats produce high frequency sounds and NOT low frequency sounds because low frequency sounds
- A move too slowly to reflect off objects that small.
 - B lack the gravitational potential energy to reflect off objects that small.
 - C do not carry enough electromagnetic energy to reflect off objects that small.
 - D have long wavelengths that are too broad to pinpoint motion in objects that small.

-
- 36** A bat species can hunt perfectly well without its eyes, and yet it still can see. What does this tell us about sight as an evolutionary variation in this species of bat?
- A** Sight is an unfavorable trait.
 - B** Sight is a non-inheritable trait.
 - C** Sight may be an unfavorable trait for hunting.
 - D** Sight may be a favorable trait, but not for hunting.

37 (3 Points)

Few animals can hear the high frequency sounds of bats. A certain species of moth, which bats prey upon, has evolved to hear these sounds.

- A** How does the ability to hear the bats' sounds help the moth survive?
- B** Explain how, through natural selection, this species of moth evolved to be able to hear the bats.

ANSWER THIS ITEM IN YOUR ANSWER BOOKLET.

NOTHING IN THIS TEST BOOKLET WILL BE SCORED.

Use the following information to answer items 38 through 41.

Lord Rayleigh

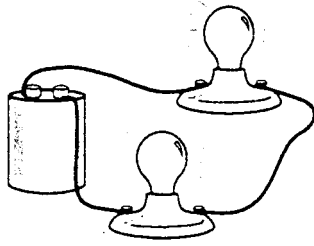
In 1893, Lord Rayleigh wanted to determine the properties of nitrogen gas (N_2). He obtained the nitrogen using two different methods:

- (1) He isolated nitrogen gas by heating solid ammonium nitrite (NH_4NO_2) to produce water vapor (H_2O) and nitrogen gas (N_2).
- (2) He removed water vapor (H_2O), carbon dioxide (CO_2), and oxygen (O_2) from air. The remainder was taken to be pure nitrogen.

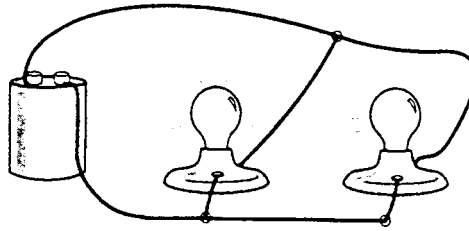
The gases were held under constant temperature and pressure. After the experiments, he filled identical flasks with the gases. The flask from method 2 had slightly more mass than the flask from method 1.

- 38** Could Lord Rayleigh have simply weighed an individual nitrogen molecule to determine its weight?
- A** No, it is impossible to weigh a gas.
 - B** Yes, if it had been cooled to liquid form.
 - C** Yes, if it had been held in place by a solid surface.
 - D** No, it would not have been possible to weigh something that small.

43



Circuit X



Circuit Y

In the diagrams above, all four light bulbs are lit. If one light bulb is unscrewed in each circuit, the other light bulb will

- A remain lit in both circuits
 - B not be lit in either circuit
 - C remain lit only in circuit X
 - D remain lit only in circuit Y
- 44 If you were building a house and wanted to position the heating and cooling air ducts for maximum efficiency, where would you position them?
- A Place the heating and cooling ducts in the ceiling.
 - B Place the heating and cooling ducts in the floor.
 - C Place the heating ducts in the floor and the cooling ducts in the ceiling.
 - D Place the heating ducts in the ceiling and the cooling ducts in the floor.

Key to MEAP High School on next page

Key to MEAP High School

Item	Benchmark	Answer
1	V.3.h.1	C
2	V.4.h.2	A
3	V.1.h.1	B
7	V.1.h.2	D
8	V.1.h.2	C
9	II.1.h.1	C
10	I.1.h.1	constructed
14	III.4.h.1	C
16	III.3.h.3	C
19	III.2h.4	C
20	III.2.h.5	D
21	I.1.h.2	D
22	II.1.h.1	constructed
34	I.1.h.2	C
35	IV.4.h.3	D
36	III.4.h.2	D
37	III.4.h.2	constructed
38.	IV.1.h.3	D
39	I.1.h.2	C
40	IV.2.h.1	C
41	IV.1.h.2	constructed
43	IV.1.h.4	D
44	II.1.h.1	C