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# Science

## *HiSET*® Exam Free Practice Test FPT – 6A

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Released 2016



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# Science

## Directions

Time – 40 minutes

25 Questions

This is a test of your skills in analyzing science information. Read each question and decide which of the four alternatives best answers the question. Then mark your choice on your answer sheet.

Sometimes several questions are based on the same material. You should carefully read this material and then answer the questions.

Work as quickly as you can without becoming careless. Do not spend too much time on any question that is difficult for you to answer. Instead, skip it and return to it later if you have time. Try to answer every question even if you have to guess.

Mark all your answers on the answer sheet. Give only one answer to each question.

If you decide to change one of your answers, be sure to erase the first mark completely.

Be sure that the number of the question you are answering matches the number of the row of answer choices you are marking on your answer sheet. The answer sheet may contain more rows than you need.

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**Questions 1 – 4 refer to the following information.**

A biology class was studying a certain species of bacteria the students called Bacteria X. The class knew the following facts about Bacteria X:

1. The normal strain of Bacteria X reproduces in a medium that contains *glucose* (sugar), *methionine* (an amino acid), and inorganic foods.
2. The mutant strain of Bacteria X has a different shape and size than the normal strain.
3. The mutant strain of Bacteria X reproduces in a medium that does not include methionine.

The class decided to investigate whether methionine is necessary for the survival of normal Bacteria X. The students placed Bacteria X cells into two petri dishes, as described below.



100 normal Bacteria X cells and 100 mutant Bacteria X cells in a medium of glucose and inorganic foods



100 normal Bacteria X cells and 100 mutant Bacteria X cells in a medium of glucose, inorganic foods, and methionine

After several days, the only living cells in Dish #1 were the mutant Bacteria X, and the only living cells in Dish #2 were the normal Bacteria X.

**1**

On the basis of these results, what can be concluded about Bacteria X's need for methionine?

- A. It is essential for both types of Bacteria X.
- B. It is not essential for either type of Bacteria X.
- C. It is essential only for normal Bacteria X.
- D. It is essential only for mutant Bacteria X.

**2**

The experiment was devised to test the necessity of methionine for the survival of normal Bacteria X. Why were mutant Bacteria X also used in the experiment?

- A. As a second dependent variable, to give the researcher data on two strains of bacteria
- B. As a second experimental variable, to give the researcher another factor to manipulate
- C. As a control, to show that not all organisms are dependent on methionine
- D. As a control, to show that normal Bacteria X died from lack of methionine and not from some other factor

**3**

At the beginning of this experiment, what assumption did the biology class make about the bacteria's food requirements?

- A. The amounts of glucose and inorganic foods in both dishes are sufficient to allow both bacteria to survive and reproduce.
- B. Both bacterial strains require amino acids other than methionine in their food or environment.
- C. Mutant Bacteria X require methionine in their food or environment, but normal Bacteria X do not.
- D. Normal Bacteria X reproduce at a faster rate than do mutant Bacteria X.

**4**

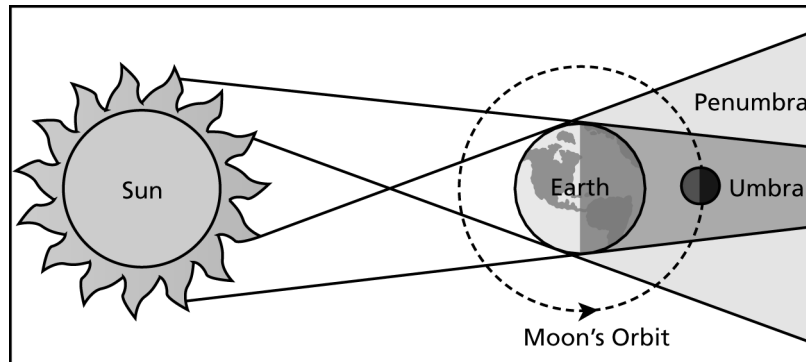
To determine how the amount of methionine in the medium affects the survival of normal Bacteria X, which of the following changes in the experimental design would be most appropriate?

- A. Add a series of dishes similar to Dish #2, with different concentrations of methionine in each
  - B. Add a series of dishes similar to Dish #2, with different concentrations of glucose, organic foods, and methionine in each
  - C. Prepare Dishes #1 and #2, except add only 100 normal Bacteria X to each dish
  - D. Prepare Dishes #1 and #2, except add different amounts of methionine to each dish
-

Questions 5 – 11 refer to the following information.

### Lunar Eclipse

A lunar eclipse occurs when a full Moon passes through some portion of Earth’s shadow. In the penumbra, the outer region of the shadow, some direct sunlight reaches the Moon. In the umbra, the inner region of the shadow, Earth prevents all direct sunlight from reaching the Moon. When the entire Moon is in Earth’s umbral shadow, the lunar eclipse is total.



Information about six total lunar eclipses seen at the same location on different dates is presented in the following table. The time of day is divided into 24 hours. One day is from midnight to the following midnight. The Moon’s altitude in degrees is the angle of the Moon relative to the horizon.

Date	Beginning of Total Lunar Eclipse		Middle of Total Lunar Eclipse		End of Total Lunar Eclipse	
	Time of Day	Moon’s Altitude (in degrees)	Time of Day	Moon’s Altitude (in degrees)	Time of Day	Moon’s Altitude (in degrees)
1	23:19	+56	00:03	+56	00:48	+53
2	22:55	+60	01:47	+55	02:36	+47
3	06:09	–15	07:00	–24	07:51	–33
4	02:14	+50	02:55	+43	03:35	+36
5	23:09	+26	23:34	+26	23:59	+26
6	17:55	+16	18:21	+20	18:46	+25

5

Which statement about the positions of the Sun, Earth, and Moon during a total lunar eclipse is most accurate?

- A. The Moon is between Earth and the Sun.
- B. The Sun is between Earth and the Moon.
- C. Earth is between the Sun and the Moon.
- D. The positions of the Sun, Earth, and Moon are unknown.

6

On Date 3, for how long did the total lunar eclipse last?

- A. 51 min
- B. 42 min
- C. 1 hr 51 min
- D. 1 hr 42 min

7

Which statement about the Moon during a total lunar eclipse is true?

- A. It is in the penumbral shadow and is blocked from all sunlight.
- B. It is in the penumbral shadow and is blocked from some sunlight.
- C. It is in the umbral shadow and is blocked from all sunlight.
- D. It is in the umbral shadow and is blocked from some sunlight.

8

During a total lunar eclipse, when the Moon's altitude is negative, it most likely means that the Moon is

- A. above the horizon line.
- B. below the horizon line.
- C. in the penumbral region.
- D. in the umbral region.

9

On Date 6, at what time did the total lunar eclipse begin, according to the 12-hour clock?

- A. 5:55 AM
- B. 5:55 PM
- C. 6:21 AM
- D. 6:21 PM

10

Which statement best describes the altitude of the Moon during the total lunar eclipse on Date 4?

- A. The altitude of the Moon increased only.
- B. The altitude of the Moon decreased only.
- C. The altitude of the Moon first increased and then decreased.
- D. The altitude of the Moon first decreased and then increased.

11

At what time of day did the total lunar eclipse on Date 3 begin?

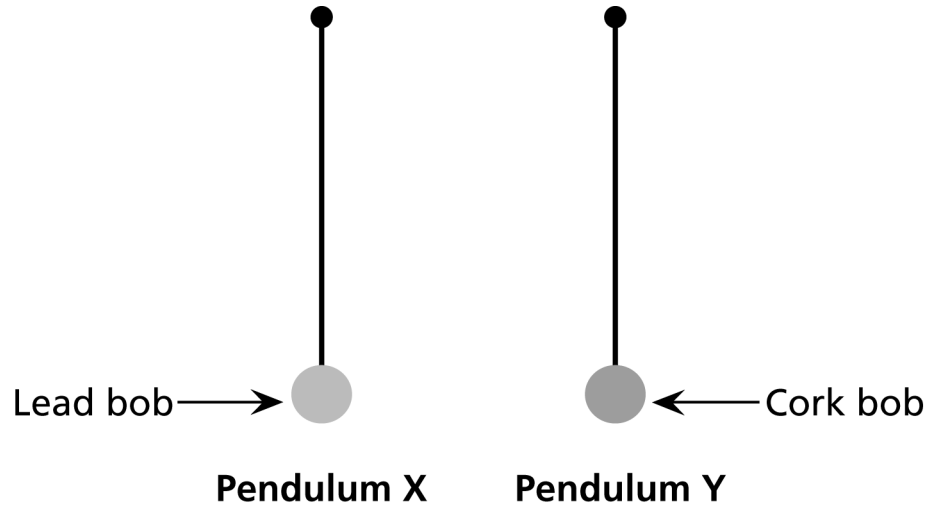
- A. Morning
  - B. Noon
  - C. Evening
  - D. Night
-



**NO TEST MATERIAL ON THIS PAGE**

**Questions 12 – 17 refer to the following information.**

A student performed two experiments using two pendulums. The weight of the bob was different in each pendulum; Pendulum X had a lead bob and Pendulum Y had a cork bob. The lead bob was heavier than the cork bob. The pendulums were otherwise identical and are shown in the following figure at rest at their equilibrium positions.



The release height of a pendulum refers to the angle at which the pendulum is held from its equilibrium position before being released. Once released, the pendulum swings back and forth (one back and forth = one cycle) about the equilibrium position until it comes to rest at the equilibrium position.

*Experiment 1*

The student released each pendulum from the same height and recorded the time it took each pendulum to come to rest at its equilibrium position. The student conducted two more trials of the experiment. Each trial produced the same results with Pendulum Y coming to rest more quickly than Pendulum X.

*Experiment 2*

The student released Pendulum X from a certain height and recorded the time it took the pendulum to complete 10 cycles. The student then released Pendulum Y from the same height and recorded the number of cycles the pendulum completed in the time it took Pendulum X to complete 10 cycles. The student conducted four more trials of the experiment. In each trial, Pendulum Y also completed 10 cycles in the time it took Pendulum X to complete 10 cycles. The time a pendulum takes to complete one cycle is called the period of the pendulum.

**12**

The weight ( $W$ ) of a pendulum's bob is a measure of the force of gravity acting on the bob. Which mathematical expression for the weight of a pendulum's bob is correct if the mass of the bob is  $m$  and the standard acceleration of gravity is  $g$ ?

- A.  $W = \frac{m}{g}$
- B.  $W = m \times g$
- C.  $W = \frac{m^2}{g}$
- D.  $W = m \times g^2$

**13**

The results of Experiment 1 lead to which conclusion, if any?

- A. As the weight of the bob increases, the time it takes for a pendulum to come to rest after being released from the same height increases.
- B. As the weight of the bob increases, the time it takes for a pendulum to come to rest after being released from the same height decreases.
- C. The weight of the bob has no effect on the time it takes for a pendulum to come to rest after being released from the same height.
- D. The results of Experiment 1 are inconclusive.

**14**

Which of the following devices did the student most likely use in both experiments?

- A. A thermometer
- B. A light source
- C. A stopwatch
- D. A heat source

**15**

Consider a pendulum with a steel bob that is otherwise identical to Pendulums X and Y. How will the period of the pendulum with the steel bob compare with the periods of Pendulums X and Y if all the pendulums are released from the same height and allowed to complete 10 cycles? The period of the pendulum with the steel bob will be

- A. longer than Pendulum X's period and shorter than Pendulum Y's period.
- B. shorter than Pendulum X's period and longer than Pendulum Y's period.
- C. equal to Pendulum X's period and to Pendulum Y's period.
- D. longer than Pendulum X's period and longer than Pendulum Y's period.

**16**

Which statement about the numbers of trials of Experiments 1 and 2 is correct?

- A. There were fewer trials of Experiment 2 than of Experiment 1.
- B. There were fewer trials of Experiment 1 than of Experiment 2.
- C. In all, three trials of each experiment were conducted.
- D. In all, four trials of each experiment were conducted.

**17**

Consider a pendulum held stationary at a certain height before being released. What can be said about the potential and kinetic energies of this pendulum?

- A. The potential and kinetic energies are both equal to zero.
- B. The potential and kinetic energies are equal and have a nonzero value.
- C. The kinetic energy is greater than the potential energy.
- D. The potential energy is greater than the kinetic energy.

Questions 18 – 25 refer to the following information.

### Fluoride

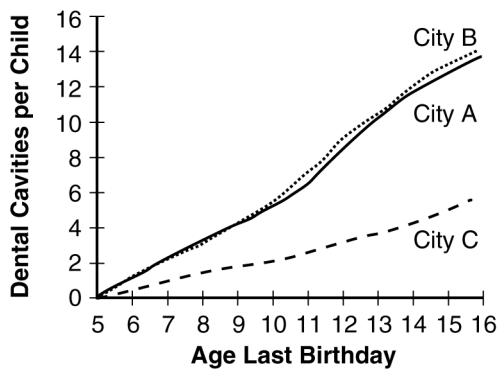
In the United States today, many people have fluoride added to their drinking water in order to help prevent tooth decay. One of the first research studies to investigate the effects of fluoridation took place from 1944 to 1951 in three U.S. cities. Some of the details of this investigation are given.

Cities A and B obtained their water supplies from the same large inland lake. The water was considered “fluoride free” because it contained less than two-tenths of one part fluoride for every million parts of water ( $< 0.2$  ppm F). City C, however, obtained its water from a spring it had used since 1895. This water contained 1.2 parts per million fluoride (1.2 ppm F).

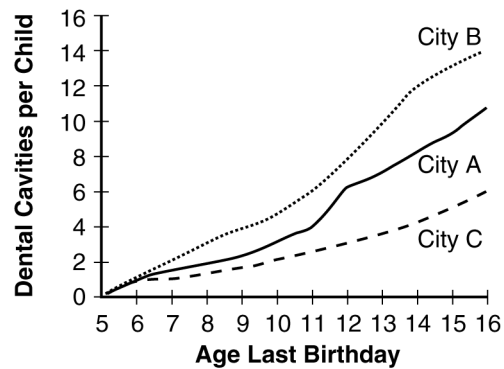
From 1944 to 1951, Cities A and B both continued to obtain their water from the same lake. In 1944, though, City A began adding 1 part per million fluoride (1 ppm F) to its water before it was pumped into the water mains. City B did not add any fluoride, so the fluoride content of its water remained under 0.2 ppm F.

Each year for the next seven years (1944 – 1951), all schoolchildren in Cities A, B, and C were examined by dentists. They kept a continuous record of all the cavities that developed in the teeth of each child who remained in the same city for the entire seven-year period. Children who moved into or out of the cities were examined, but their records were not included in the results. Some of the data from this investigation are shown.

**Figure 1:** Average number of cavities per child (permanent teeth only) at each age level in 1944 in Cities A, B, and C



**Figure 2:** Average number of cavities per child (permanent teeth only) at each age level in 1951 in Cities A, B, and C



18

Which of the following questions were the researchers investigating?

- A. Does drinking fluoride-enriched water affect the number of cavities in children’s teeth?
- B. Does fluoride in drinking water enter tooth enamel?
- C. What amount of fluoride in a city’s water supply is required to affect the number of cavities in children’s teeth?
- D. Does adding fluoride to a city’s water supply change the dental habits of its citizens?

19

Which of the following was assumed to be true in this investigation?

- A. The eating and tooth-brushing habits of children in the three cities were similar.
- B. The fluoride levels of the water in Cities A and B remained equal to each other throughout the experiment.
- C. The children in the three cities would voluntarily limit their intake of sweets.
- D. The children in the three cities would brush their teeth after eating.

20

Consider Figure 2. For children 6 and 7 years old, the curve for City A is closer to the curve for City C than to the curve for City B. Which of the following is probably the best explanation of this result?

- A. The dental care in Cities A and C in 1951 was probably better than the care in City B.
- B. The experiment had been carried on for a longer period of time in Cities A and C than in City B.
- C. The children in Cities A and C probably drank more milk than the children in City B.
- D. The children under age 7 in Cities A and C had been exposed to fluoride all of their lives, while those in City B had not.

21

Why were the 1944 data for Cities A and B probably gathered?

- A. To show that children over 12 years old in City B had better teeth than children of the same age in City A
- B. To show that any later differences were not due to differences that existed before the experiment
- C. To show that the level of dental care in Cities A and B was approximately the same
- D. To show that the number of cavities increases as age increases

22

Consider the curve for City A in 1951. Between which of the following ages did the largest increase in the number of dental cavities occur?

- A. 5 and 6
- B. 9 and 10
- C. 11 and 12
- D. 14 and 15

23

For Cities B and C, the 1951 results were essentially the same as the 1944 results. What is the most likely explanation of this?

- A. The experimental conditions remained unchanged in these cities.
- B. The experimental treatment had no effect in these cities.
- C. Only data on permanent teeth were recorded for these cities.
- D. Only data on children attending school were recorded for these cities.

24

Given the information in Figures 1 and 2, which of the following pairs of curves provides the best data for assessing the effects of fluoride in drinking water?

- A. The 1944 curves for Cities A and B
- B. The 1951 curves for Cities A and B
- C. The 1944 curves for Cities B and C
- D. The 1951 curves for Cities B and C

25

Which of the following is the most valid conclusion that can be made from the results of this investigation?

- A. Fluoride in a city's water supply prevents decay in children's permanent teeth more effectively than in baby teeth.
- B. Naturally occurring fluoride in a city's water better prevents dental cavities than fluoride added by humans.
- C. A level of under 0.2 ppm fluoride in water does nothing to prevent dental cavities.
- D. Fluoride in a city's water supply reduces the number of dental cavities in school-age children.



## Answer Key

<b>Sequence Number</b>	<b>Correct Response</b>	<b>Content Category</b>	<b>Question Difficulty</b>
1	C	I. Life Science	Medium
2	D	I. Life Science	Hard
3	A	I. Life Science	Medium
4	A	I. Life Science	Medium
5	C	III. Earth Science	Easy
6	D	III. Earth Science	Easy
7	C	III. Earth Science	Medium
8	B	III. Earth Science	Medium
9	B	III. Earth Science	Medium
10	B	III. Earth Science	Medium
11	A	III. Earth Science	Easy
12	B	II. Physical Science	Medium
13	A	II. Physical Science	Medium
14	C	II. Physical Science	Easy
15	C	II. Physical Science	Hard
16	B	II. Physical Science	Medium
17	D	II. Physical Science	Medium
18	A	I. Life Science	Medium
19	A	I. Life Science	Medium
20	D	I. Life Science	Medium
21	B	I. Life Science	Medium
22	C	I. Life Science	Medium
23	A	I. Life Science	Medium
24	B	I. Life Science	Medium
25	D	I. Life Science	Medium



