

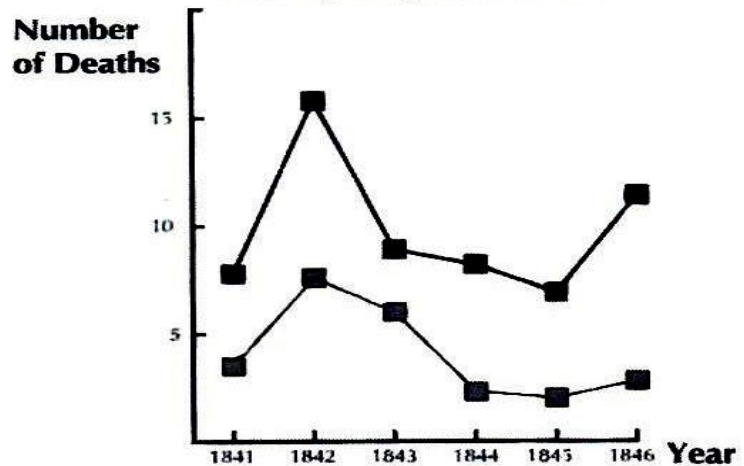
UNIT 1: SEMMELWEIS DIARY

Semmelweis’ Diary Text 1

‘July 1846. Next week I will take up a position as “Herr Doktor” at the First Ward of the maternity clinic of the Vienna General Hospital. I was frightened when I heard about the percentage of patients who die in this clinic. This month not less than 36 of the 208 mothers died there, all from puerperal fever. Giving birth to a child is as dangerous as first-degree pneumonia.’

Theseline from the diary of Ignaz Semmelweis (1818-1865) illustrate the devastating effects of puerperal fever, a contagious disease that killed many women after childbirth. Semmelweis collected data about the number of deaths from puerperal fever in both the First and the Second Wards (see diagram).

Number of Deaths per 100 deliveries from puerperal fever



Physicians, among them Semmelweis, were completely in the dark about the cause of puerperal fever. Semmelweis’ diary again:

‘December 1846. Why do so many women die from this fever after giving birth without any problems? For centuries science has told us that it is an invisible epidemic that kills mothers. Causes may be changes in the air or some extraterrestrial influence or a movement of the earth itself, an earthquake.’

Nowadays not many people would consider extraterrestrial influence or an earthquake as possible causes of fever. We now know it has to do with hygienic conditions. But in the time Semmelweis lived, many people, even scientists, did! However, Semmelweis knew that it was unlikely that fever could be caused by extraterrestrial influence or an earthquake. He pointed at the data he collected (see diagram) and used this to try to persuade his colleagues.

Question 1: Suppose you were Semmelweis. Give a reason (based on the data Semmelweis collected) why puerperal fever is unlikely to be caused by earthquakes.

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Semmelweis’ Diary Text 2

Part of the research in the hospital was dissection. The body of a deceased person was cut open to find a cause of death. Semmelweis recorded that the students working on the First ward usually took part in dissections on women who died the previous day, before they examined women who had just given birth. They did not pay much attention to cleaning themselves after the dissections. Some were even proud of the fact that you could tell by their smell that they had been working in the mortuary, as this showed how industrious they were! One of Semmelweis’ friends died after having cut himself during such a dissection. Dissection of this body showed he had the same symptoms as mothers who died from puerperal fever. This gave Semmelweis a new idea.

Question 2: Semmelweis’ new idea had to do with the high percentage of women dying in the maternity wards and the students’ behavior.

What was this idea?

- A. Having students clean themselves after dissections should lead to a decrease of puerperal fever.
- B. Students should not take part in dissections because they may cut themselves.
- C. Students smell because they do not clean themselves after a dissection.
- D. Students want to show that they are industrious, which makes them careless when they examine the women.

Question 3: Semmelweis succeeded in his attempts to reduce the number of deaths due to puerperal fever. But puerperal fever even today remains a disease that is difficult to eliminate.

Fevers that are difficult to cure are still a problem in hospitals. Many routine measures serve to control this problem. Among those measures are washing sheets at high temperatures.

Explain why high temperature (while washing sheets) helps to reduce the risk that patients will contract a fever.

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Question 4: Many diseases may be cured by using antibiotics. However, the success of some antibiotics against puerperal fever has diminished in recent years.

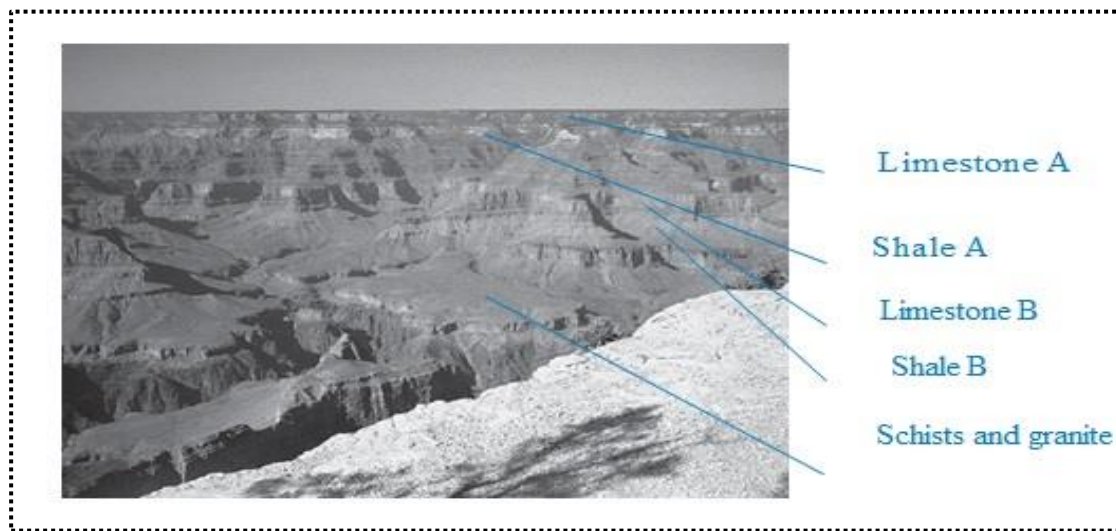
What is the reason for this?

- A. Once produced, antibiotics gradually lose their activity.
- B. Bacteria become resistant to antibiotics.
- C. These antibiotics only help against puerperal fever, but not against other diseases.
- D. The need for these antibiotics has been reduced because public health conditions have improved considerably in recent years.

UNIT 2: THE GRAND CANYON

The Grand Canyon is located in a desert in the USA. It is a very large and deep canyon containing many layers of rock. Sometime in the past, movements in the Earth's crust lifted these layers up. The Grand Canyon is now 1.6 km deep in parts. The Colorado River runs through the bottom of the canyon.

See the picture below of the Grand Canyon taken from its south rim. Several different layers of rock can be seen in the walls of the canyon.



Question 5: The temperature in the Grand Canyon ranges from below 0° C to over 40° C. Although it is a desert area, cracks in the rocks sometimes contain water. How do these temperature changes and the water in rock cracks help to speed up the breakdown of rocks?

- A. Freezing water dissolves warm rocks.
- B. Water cements rocks together.
- C. Ice smoothes the surface of rocks.
- D. Freezing water expands in the rock cracks.

Question 6: There are many fossils of marine animals, such as clams, fish and corals, in the Limestone A layer of the Grand Canyon. What happened millions of years ago that explains why such fossils are found there?

- A. In ancient times, people brought seafood to the area from the ocean.
- B. Oceans were once much rougher and sea life washed inland on giant waves.
- C. An ocean covered this area at that time and then receded later.
- D. Some sea animals once lived on land before migrating to the sea.

Question 7: About five million people visit the Grand Canyon national park every year. There is concern about the damage that is being caused to the park by so many visitors.

Can the following question be answered by scientific investigation? Circle “Yes” or “No” for each question.

Can this question be answered by scientific investigation?	Yes or No?
How much erosion is caused by use of the walking tracks?	Yes / No
Is the park area as beautiful as it was 100 years ago?	Yes / No

UNIT 3: ACID RAIN

Below is a photo of statues called Caryatids that were built on the Acropolis in Athens more than 2500 years ago. The statues are made of a type of rock called marble. Marble is composed of calcium carbonate.

In 1980, the original statues were transferred inside the museum of the Acropolis and were replaced by replicas. The original statues were being eaten away by acid rain.



Question 8: Normal rain is slightly acidic because it has absorbed some carbon dioxide from the air. Acid rain is more acidic than normal rain because it has absorbed gases like sulfur oxides and nitrogen oxides as well.

Where do these sulfur oxides and nitrogen oxides in the air come from?

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The effect of acid rain on marble can be modelled by placing chips of marble in vinegar overnight. Vinegar and acid rain have about the same acidity level. When a marble chip is placed in vinegar, bubbles of gas form. The mass of the dry marble chip can be found before and after the experiment.

Question 9: A marble chip has a mass of 2.0 grams before being immersed in vinegar overnight. The chip is removed and dried the next day. What will the mass of the dried marble chip be?

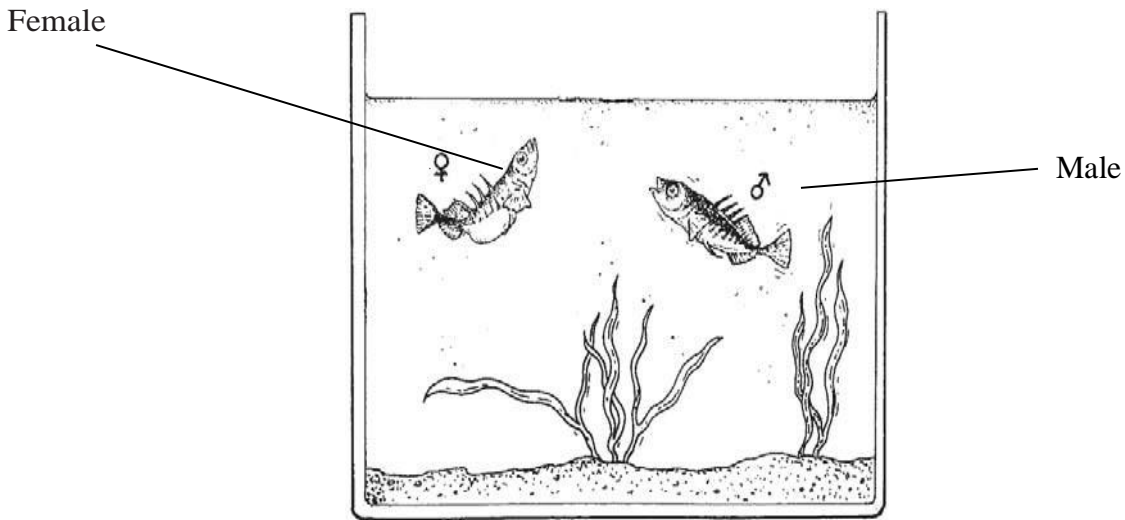
- A. Less than 2.0 grams
- B. Exactly 2.0 grams
- C. Between 2.0 and 2.4 grams
- D. More than 2.4 grams

Question 10: Students who did this experiment also placed marble chips in pure (distilled) water overnight. Explain why the students included this step in their experiment.

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UNIT 4: STICKLEBACK BEHAVIOUR

The stickleback is a fish that is easy to keep in an aquarium.



During the breeding season the male stickleback’s belly turns from silver-coloured to red.

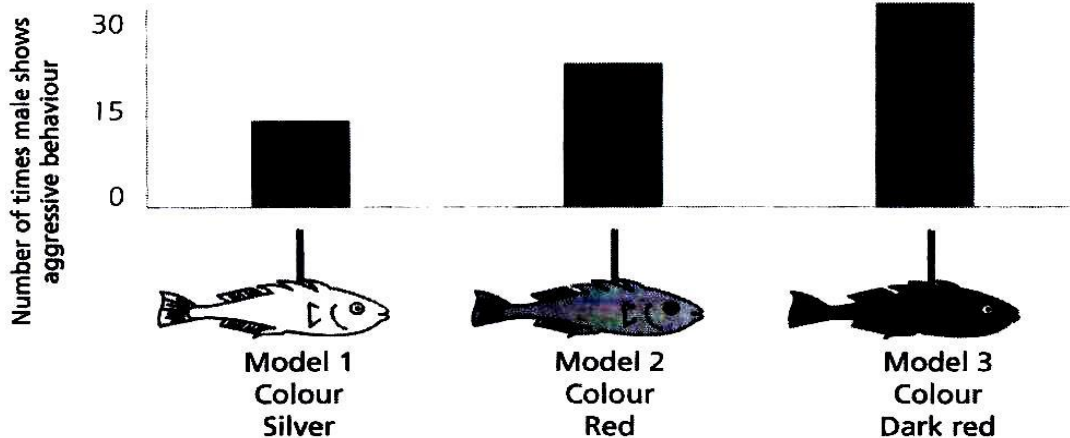
The male stickleback will attack any competing male that comes into his territory, and try to chase it away.

If a silver-coloured female approaches, he will try to guide her to his nest so she will lay her eggs there.

In an experiment a student wants to investigate what will make the male stickleback show aggressive behavior.

A male stickleback is alone in the student’s aquarium. The student has made three wax models attached to pieces of wire. He hangs them separately in the aquarium for the same amount of time. Then the student counts the number of times the male stickleback reacts aggressively by pushing against the wax figure.

The results of this experiment are shown below.



Question 11: What is (are) the possible hypothesis(es) that this experiment is attempting to verify.

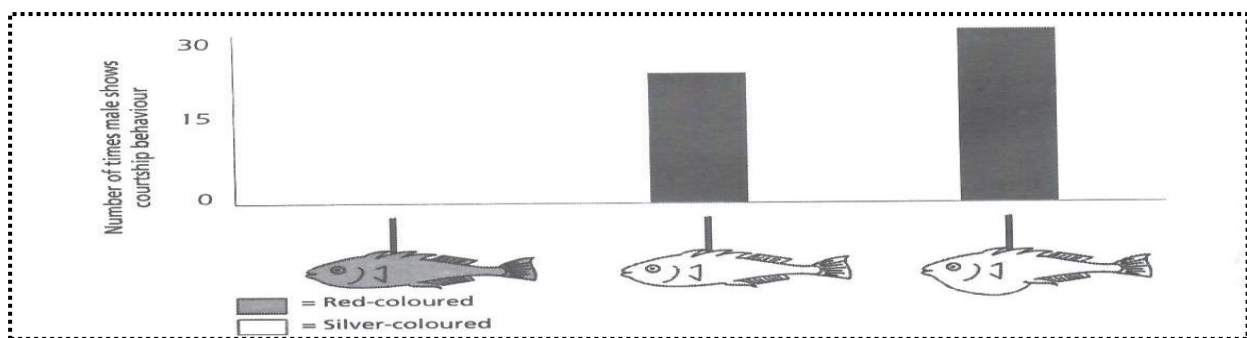
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Question 12: During breeding time, if the male stickleback sees a female he will try to attract the female with courtship behavior that looks like a little dance. In a second experiment, this courtship behavior is investigated.

Again, three wax models on a piece of wire are used. One is red-coloured; two are silver-coloured with one having a flat belly and the other a round belly. The student counts the number of times (in a given amount of time) that the male stickleback reacts to each model by showing courtship behavior.

The results of this experiment are shown below.



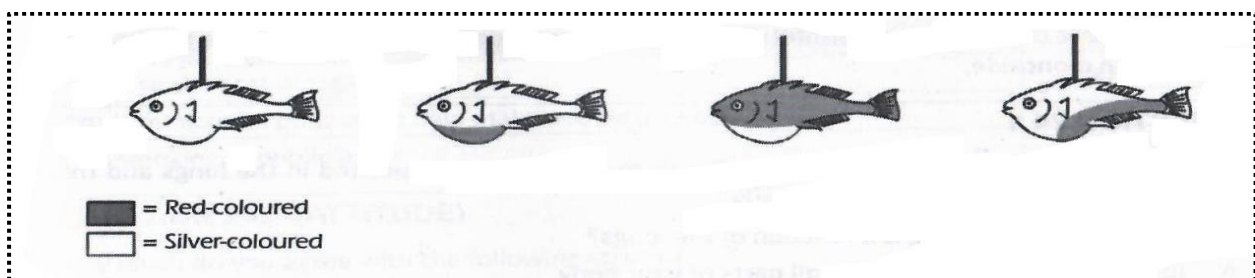
Three students each draw a conclusion based on the results of this second experiment.

Are their conclusions correct according to the information given in the graph? Circle “Yes” or “No” for each conclusion.

Is this conclusion correct according to the information in the graph?	Yes or No?
The red colour causes courtship behaviour by the male stickleback.	Yes / No
A flat-bellied female stickleback causes most courtship behaviour from a stickleback male.	Yes / No
The male stickleback shows courtship behaviour more often to a round-bellied female than to a flat-bellied female.	Yes / No

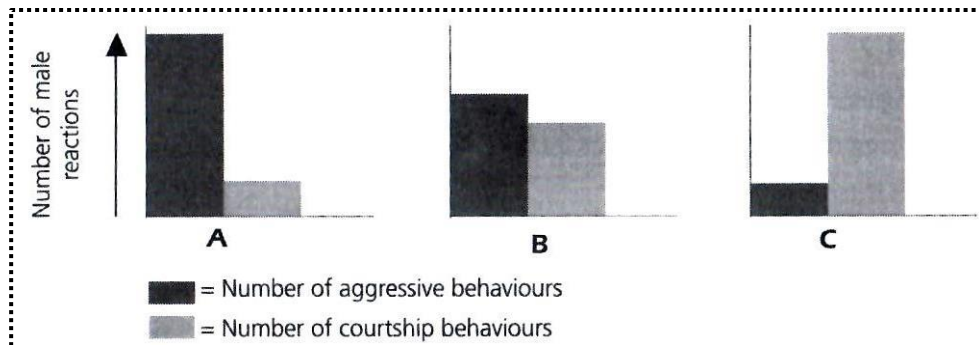
Question 13: Experiments have shown that male sticklebacks react with aggressive behavior to models with a red belly and with courtship behaviour to models with silver belly.

In a third experiment, the following four models were used in turn:



The three diagram below show possible reactions of a male stickleback to each of the above models.

Which one of these reactions would you predict for each of the four models?



Fill in either A, B or C as the result for each model.

	Reaction
Model 1	
Model 2	
Model 3	
Model 4	

UNIT 5: MAJOR SURGERY

Major surgery, performed in specially equipped operating theatres, is necessary to treat many diseases.



Question 14: While undergoing major surgery, patients are anaesthetised so they don't feel any pain. The anaesthetic is often administered as a gas through a face mask that covers the nose and mouth.

Are the following human systems involved in the action of anaesthetic gases? Circle “Yes” or “No” for each system.

Is this system involved in the action of anaesthetic gases?	Yes or No?
Digestive system	Yes / No
Nervous system	Yes / No
Respiratory system	Yes / No

Question 15: Explain why surgical instruments used in operating theatres are sterilised.

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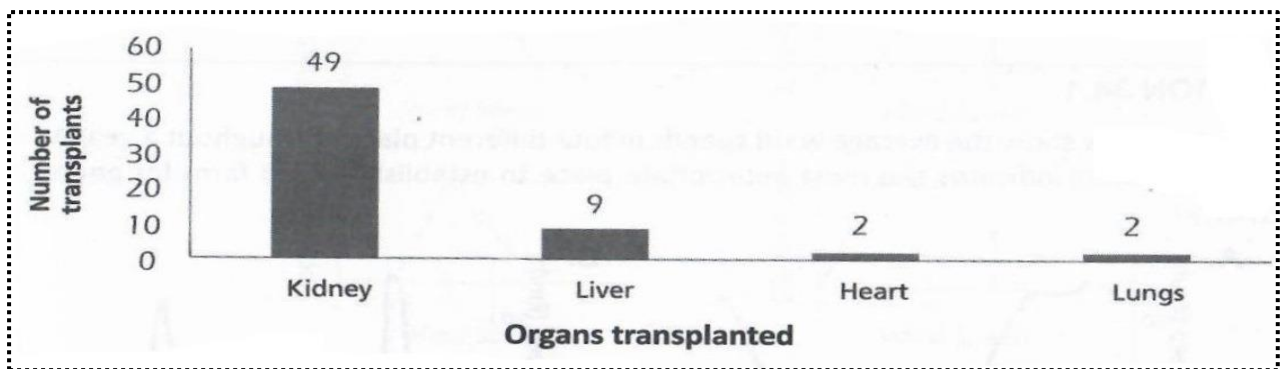
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Question 16: Patients may be unable to eat and drink after surgery and so they are put on a drip (infusion) that contains water, sugars and mineral salts. Sometimes antibiotics and tranquillisers are also added to the drip.

Why are the sugars that are added to the drip important for the post-operative patient?

- A. To avoid dehydration
- B. To control post-operative pain
- C. To cure post-operative infections
- D. To provide necessary nutrition

Question 17: Organ transplants involve major surgery and are becoming more and more common. In the graph below, the numbers of transplants carried out in a particular hospital during 2003 are given.



Can the following conclusions be drawn from the graph above? Circle “Yes” or “No” for each conclusion.

Can this conclusion be drawn from the graph?	Yes or No?
If the lungs are transplanted, the heart must be transplanted too.	Yes/No
Kidneys are the most important organs in the human body.	Yes/No
Most of the patients that have a transplant have suffered from a kidney disease	Yes/No

UNIT 6: BMI

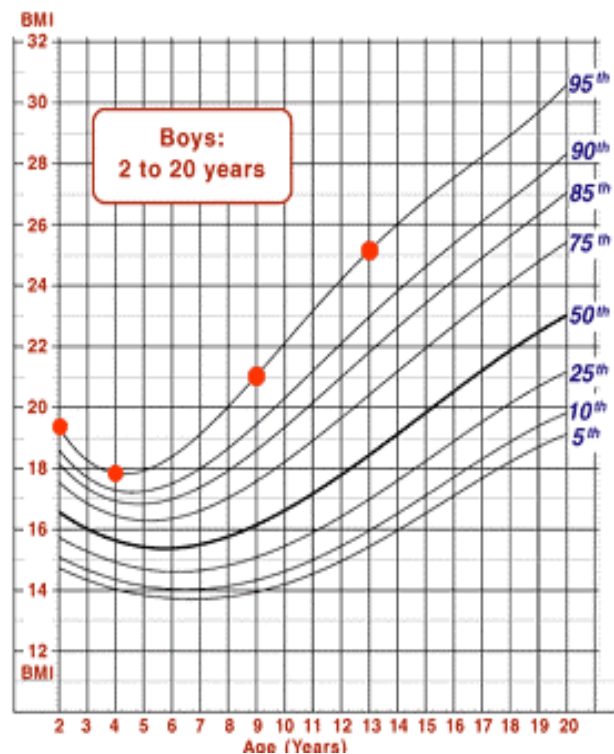
Body Mass Index (BMI), is defined as weight (in kilograms) divided by height (in metres) squared. As an individual's height and weight can be readily and inexpensively measured, BMI has become a popular risk indicator of disease- as BMI increases, so does the risk for some diseases. Some common conditions related to overweight and obesity include: premature death, cardiovascular diseases, high blood pressure, osteoarthritis, some cancers and diabetes.

Question 18: Calculate the BMI of an adult who weighs 64 kg and whose height is 5 feet 4 inches. (1 inch = 2.5 cm)

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BMI is age and gender specific. The Chart shows BMI-for-age plots for boys of age between 2 and 20 years. BMI-for-age $\geq 95\%$ means overweight, BMI-for-age between 85% and 95% indicates risk of overweight, BMI-for-age between 85% and 5% is considered normal and BMI-for-age $< 5\%$ is underweight. Arun's BMI at 2, 4, 9 and 13 years are marked in the plot. Since the dots are on the 95th percentile line, it means that out of 100 boys of his age, less than 5% have BMI lower than him. You can also consider Arun as overweight.



Question 19: Pankaj's BMI at the age of 07 years is 16. Which of the following statement is correct?

- He is underweight for his age.
- He is normal for his age
- He is overweight for his age.
- Data is insufficient to conclude any of the three above statements

Question 20: Which of the following practice/s should Arun adopt to stay healthy?

- He should eat more vegetables and fruits
- He should play games that involve running movements.
- He should exercise regularly.
- He should drink fruit juice
- He should play indoor games like chess.

- (i), (ii) and (iii)
- (ii), (iii) and (iv)
- (iii), (iv) and (v)
- (i), (iii) and (iv)

Question 21: You want to investigate the relationship between BMI and Diabetes. What would be the hypothesis you would make when you plan this research. What are the 02 key variables of the study? Select the correct option which depicts the correct hypothesis and variables.

	Hypothesis	Variables
A	There is a positive relationship between Age and Diabetes	BMI and Age
B	There is no relationship between BMI and Diabetes	BMI and Diabetes
C	There is no relationship between Gender and BMI	Gender and BMI
D	There is a positive relationship between BMI, Diabetes, Gender and Age.	BMI and Diabetes