PISA LIKE TEST ITEMS SCIENTIFIC LITERACY QUESTIONS

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CHAPTER 1) ANALYZING WEIGHT

Master Saheel while performing an experiment in his science lab unmindfully he went through the following steps.

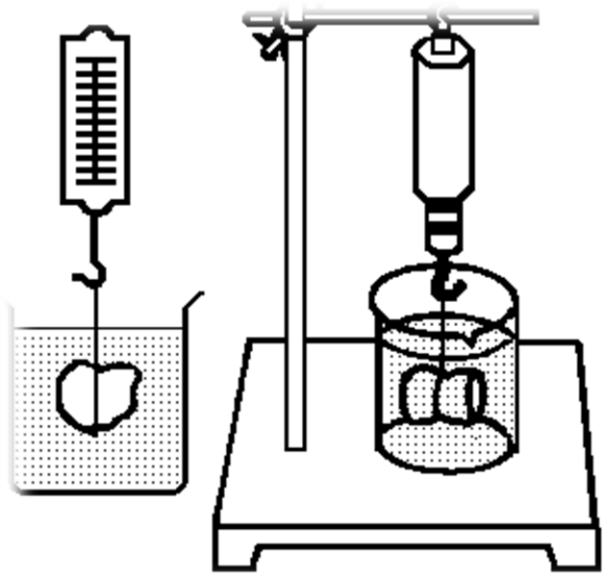
a) He placed a beaker partially filled with water on the weighing machine.

b) He added a stone on the weighing machine outside the beaker and noted down the weight.

c) He placed a stone tied with a fine thread inside the beaker without touching the bottom of beaker and noted the weight.

d) He tied the stone with a fine thread and weighed with a spring balance and found it is 150 gms.

e) Keeping suspended on the spring balance he immersed the stone without touching the bottom of the beaker which was placed on the weighing machine and noted the weight on the weighing machine.



After completing the experiment he went to wash his hand. He dipped the empty mug in the bucket with water. He tried to dip the mug straight. He observed a force is pushing it upward. Then he tilted it and filled it with some water. To his surprise he found that the upward force is somewhat reduced.

i) Do you think when we go to market we should check the weighing machine. YES/ NO

ii) If yes, what is the thing we should see in the kitchen weighing machine?

iii) What will happen to the weight of the beaker with stone dipped as in case ‘c’?

It will be same

It will be more

It will be less

iv) What will happen to the weight of the stone as in case ‘e’?

It will be same

It will be more

It will be less

v) Why is it difficult to push the mug in the bucket

CHAPTER 2) BLOOD GROUP INHERITANCE

1. We often read in some newspapers that some blood transfusions are successful and some are fatal. It is important that one should have a thorough knowledge about the principle behind blood transfusion.

1.1 What are the different types of blood group you know? (random sampling in the class room can also be done to elicit the answer)

1.2 Who discovered the blood group system?

2. Karl Landsteiner discovered the ABO blood group system by mixing the red cells and serum of each of his staff. He demonstrated that the serum of some people agglutinated the red cells of other. He named the blood types as A, B and C. Later he renamed C as O. The fourth less frequent blood group AB was discovered a year later. This blood grouping is done on the basis of presence or absence of antigens on red blood cells and antibodies in serum.

(Antigens- will trigger the formation of antibodies and antigen and antibody reaction will lead to clumping of blood cells)

ABO Blood Type	Antigen A	Antigen B	Antibody anti-A	Antibody Anti-B
A	yes	no	no	yes
B	no	yes	yes	no
O	no	no	yes	yes
AB	yes	yes	no	no

For example, type A blood group produces antibodies against B antigens. Hence a person with type A blood receiving a transfusion of type B or AB blood would have incompatibility reaction.

Based on your understanding of the above passage answer the following questions:

2.1 Why did the serum of some people agglutinate the red cells of other in the experiment performed by Landsteiner?

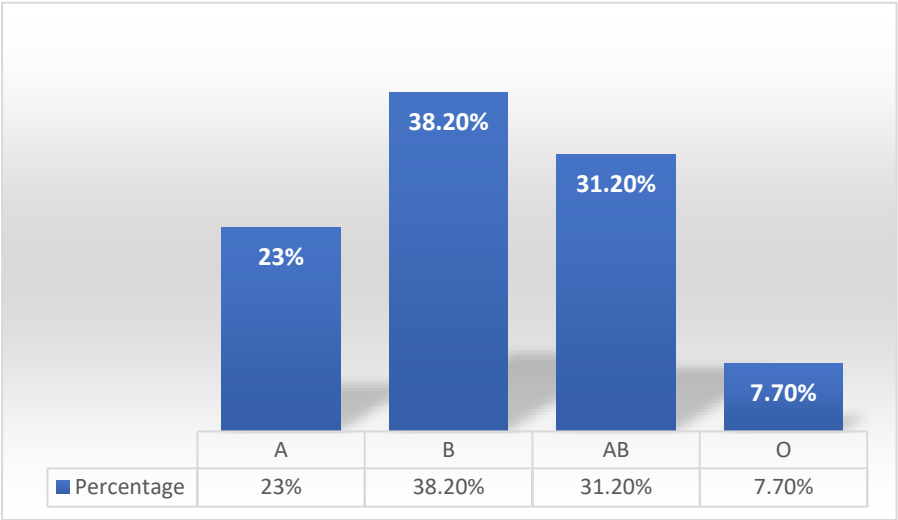
2.2 What do you conclude from Karl Landsteiner’s experiment?

2.3 study the table given above carefully and fill in the table given below:

If your blood type is:	You can give to:	You can receive from:
A	A, AB	
B		B,O
AB	AB Only	
O		O only

3. The gene regulating the blood group inheritance is on chromosome 9 and exist in three different allelic forms- I^A,I^B and i. I^A, I^B are dominant and ii is recessive. The study of blood group prevalence amongst Indian population has been carried out.

Analyse the given table and answer the questions that follow:



3.1 Which blood group is most prevalent in the given population?

3.2 Which of the statemet is true with reference to O blood group?

a) it is a dominant character and has more allelic frequencies in the population

b) It is a recessive character but has more allelic frequenciesin the population

4. Blood group inheritance in human beings:

Phenotype (Blood Type)	Genotype
A	I^AI^A or I^Ai
B	I^BI^B or I^Bi
AB	I^AI^B
O	ii

The table above shows the how the allelic combinations determine the ABO inheritance.

4.1 A man with ‘B’ blood group marries a woman with ‘O’ blood group. What will be percentage of his children would likely to be born with ‘O’ blood group?

a) 25%

b)50%

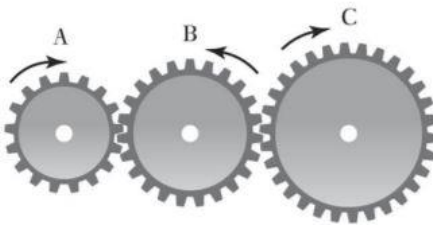
c) 75%

d) 100%

CHAPTER 3) COIN EXPERIMENT

On a hot summer day Rohan was returning from school he saw a vendor of sugar cane juice. The vendor was extracting the sugarcane juice of a machine in which the sugar cane is passed through the two rotating cylinders with the very narrow gap between them. Rohan moved to the side of the machine and saw, two wheels with teeth (gear) are rotating on one another and the vendor is moving the wheels by applying force on a big wheel fixed with one. Observing this he started thinking on motion of different size and with different number of teeth also with different orientation.

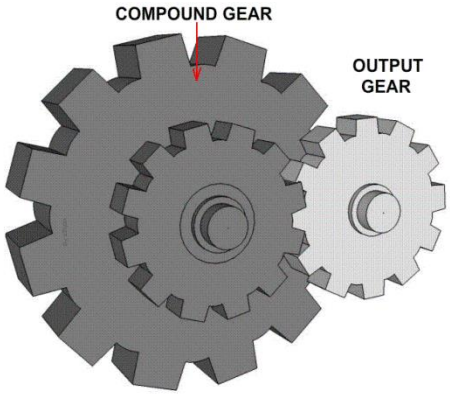
i) What is the direction of motion of B if A moves clockwise?
ii) If A has diameter of 6cm and B has diameter of 12cm, what is the no of rotation A makes by the time B complete one rotation?
iii) What is the number of complete rotation of A and Bby the time C completes one rotation?



Wheel	No. of teeth
A	12
B	36
C	72

iv) What is the ratio of the distance travelled if A B and C are allowed to roll on a horizontal surface, from same starting point, with equal number of rotations the gears A ,B and C rotate in case III.

v) A and B are fixed with the same axis if A completes two rotation in 8 seconds what is the time taken by B and C to complete one rotation.



A and B are fixed at same axle

Wheel	Circumference of the gear
A	20π
B	10π
C	5π

CHAPTER 4) THE DIAGNOSTICS TOOL

Rohan was asked to take an ultrasound of the kidneys when he complained about pain in his lower abdomen, by the doctor.

Ultrasound imaging is a technique for correct diagnosis by the doctors. It can scan any region of the body mostly the organs like kidneys, evaluation of the heart and diagnosis of cardiac problems, the presence of infection in a specific area of the body etc.

Ultrasound machine transmits high frequency sound pulses into a body using a probe the image is captured by the reflection of the sound which comes back from the organ on a computer screen. The velocity of reflected signal in blood and valves vary with each other.

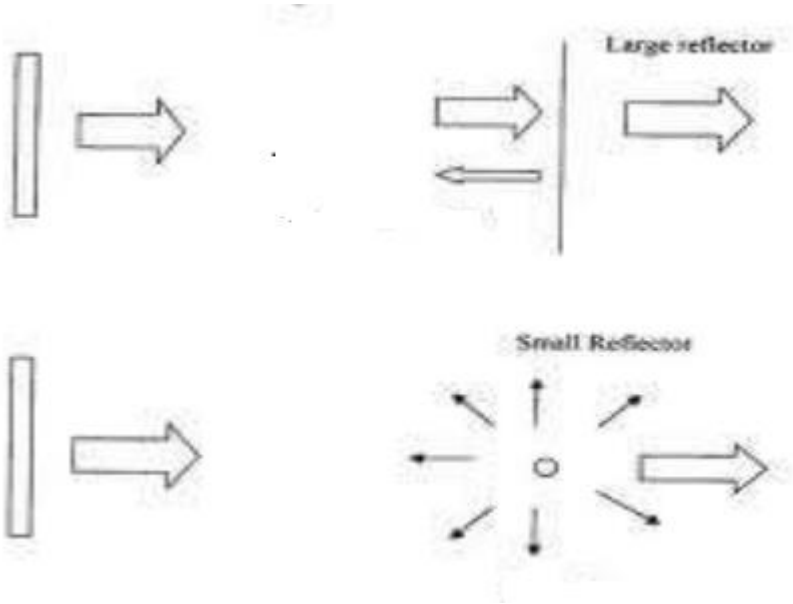
Answer the following questions -

1. What is the underlying principle in ultrasound imaging?

2. How do the sound waves propagate? Explain through the wave particle motion diagram.

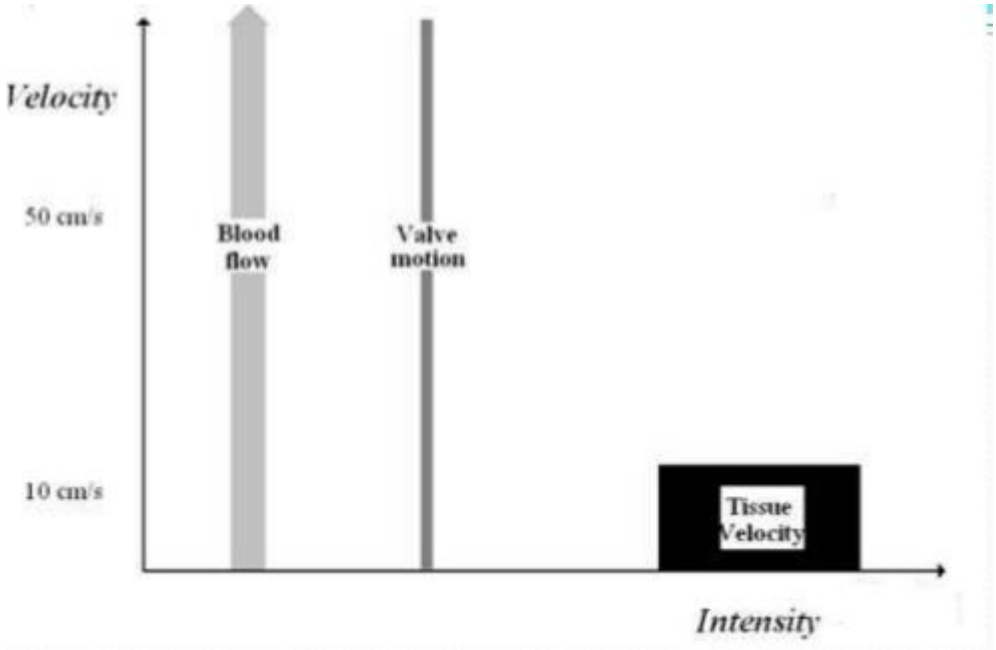
3. What is the range of frequency at which the ultrasound works?

4. What is the difference between the echo obtained from a large regular surface and small irregular surface?



Give your answer on the basis of above figure.

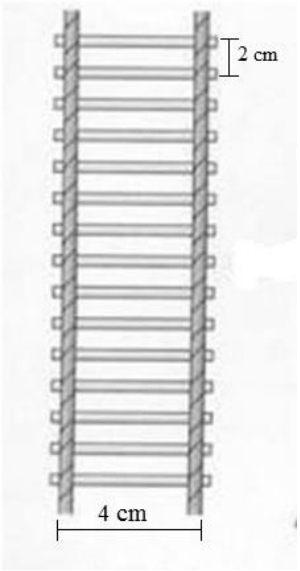
5. See the given graph which shows the reflected signals in case of blood and valves and tissues with respect to velocity and intensity. Answer the questions given below-



Blood has a velocity of 50m/s , valve has a velocity of20m/s and tissue has a velocity of 10m/s .Which one of them will show low intensity reflected signal during a ultrasound Why?

CHAPTER 5) ‘DNA’ ki kahani ‘LADDER’ ki zubani

Imagine a ladder which has 2 main parts: footsteps and handrail. The distance between the two handrail is 4 cm and the distane between each footstep is 2 cm.

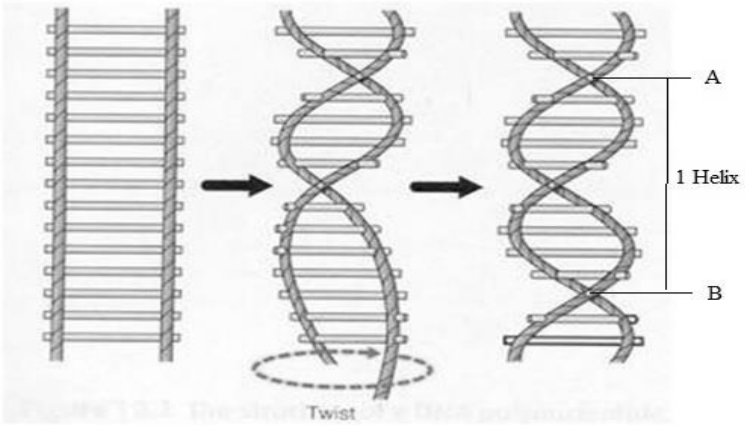


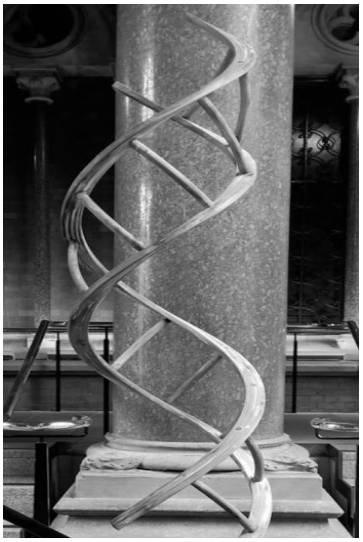
Q1. If the total length of the ladder is 2m, how many footsteps will it have?

_____

_____

Now imagine that this ladder twist in such a manner that the spiral staircse look.





Distance between point A and point B is known as 1 helical turn, when the ladder completes one single turn around its axis.

Q2. Now imagine that if one helical turn has 10 footsteps in it, what is the height of this helix?

_____

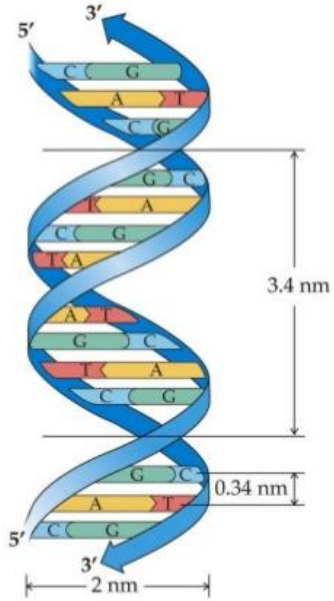
Q3. What would happen to the height of the helix if we increase the number of footsteps in one helical turn?

_____

Q4. What would happen to the height of the helix if we increase 5 footsteps in one helix but reduce the distance between each footstep to 1 cm from 2cm?

Q5. Now image you have been provided with one strand of DNA sequence. Based on above information can you write the sequence of complementary strand?

In living organism, the DNA has following dimensions:

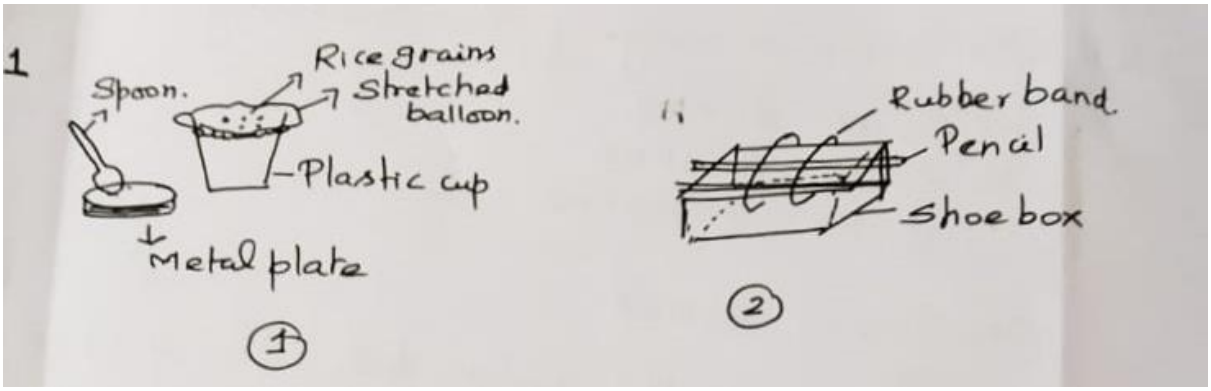


Q6. Calculate the number of bases present in one helix.

_____

CHAPTER 6) EAR - THE SOUND MACHINE

1.1



1. What does the first experiment demonstrate?

2. What do you understand from the second experiment?

1.2 Compare the stretched membrane of first experiment to any of our body part that gets vibrated when sounds are produced. Which is the body part?

---

2. Human ear is designed in such a way that it can hear the sounds up to a certain frequency. The sound waves travelling through the ear are later carried to brain as electrical impulses to understand the type of sound. Sounds beyond certain frequencies can cause permanent damage to our ears. Sound below certain frequencies cannot be heard by us

2.1 The maximum range of human hearing lies between

a) 20 Hz and 20 KHz

b) 20 Hz and 200 KHz

c) 20 Hz and 20000 KHz

2.2 What do you call the sounds that fall below 20 Hz and above 20 KHz as?

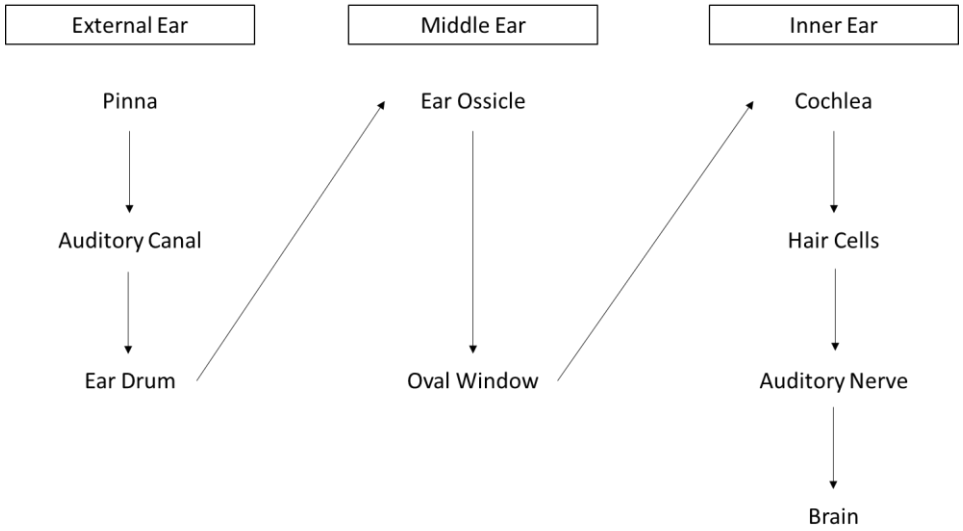
2.3 What will happen if ultrasound waves hit our ear drum? Choose the correct options from the list given below

a) Vibrations produced are large enough to damage our ear drum. Hence, we cannot hear the sound.

b) Vibrations occur in the ear drum, but we will not be able to recognize the sound

c) Vibrations will not occur in the ear drum

3. Path of sound waves in ear:



3.1 “Ear ossicles play a vital role in hearing” – Do you agree with the statement. Justify your answer.

3.2 Which one of the following is correct with reference to transmission of sound waves to brain.

a) Sound waves are transmitted as neutral impulses

b) Sound waves are transmitted as chemical impulses

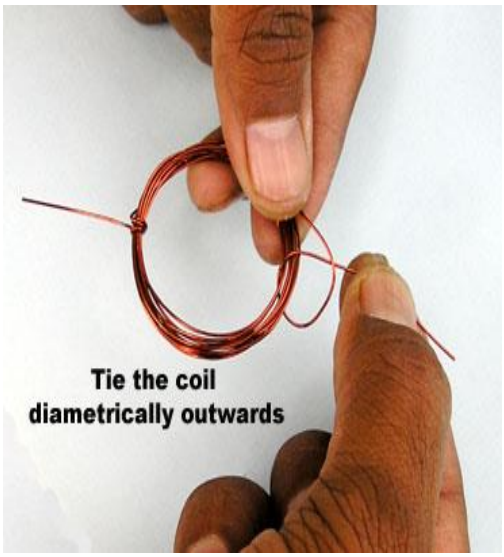
c) Sound waves are transmitted as electrical impulses

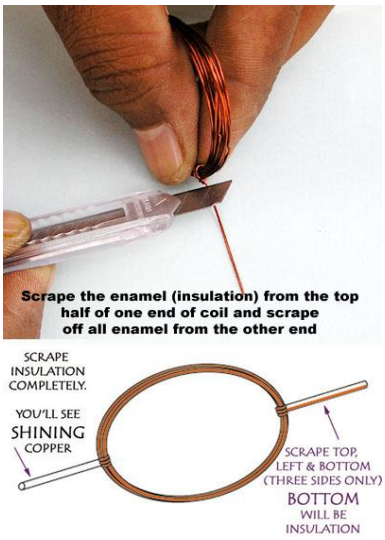
3.3 Can any perforation in our ear drum affect hearing ability?

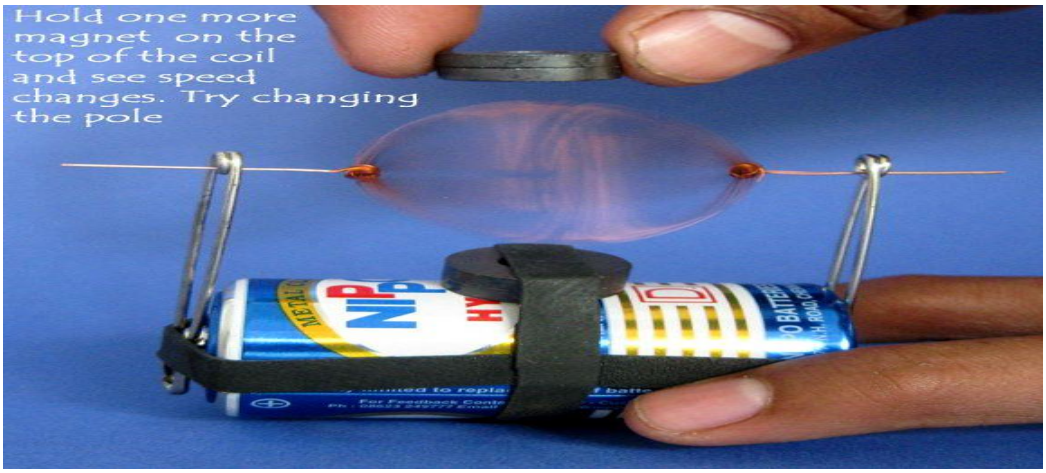
3.4 “Elephants have large ears and they flap their ears to collect sound waves”- correct the statement and give the correct explanation.

CHAPTER 7) HOW TO MAKE A SIMPLE ELECTRIC MOTOR

1. Wrap the wire tightly and neatly around your finger 30 times.
2. Wrap each loose end of the wire around the coil a few times to hold it together, then point the wires away from the loop,
3. Remove the wire insulation on all sides on one side of free end of the coil. Remove ¾th wire insulation of the other side of free end of the coil.
4. Lay the D battery sideways on a flat surface.
5. Take 2 safety pins upright next to the terminals of battery so that the side of each touches one terminal of the battery.
6. Use electrical tape to secure the needles to the ends of the battery. Your coil should be hanging above the battery.
7. Tap the small magnet to the side of the battery so that it is centred underneath the coil.
8. Give your coil a spin.







Question 1.1

What happens when you give THE coil a spin ?

Question 1.2

What happens when you spin the coil in the other direction?

Question 1.3

Why the motor will not spin when the initial push is in the opposite direction ?

Question 1.4

Why did we need to remove complete insulation from all sides of oneend of the wire and ¾th wire insulation of the other side of free end of the coil ?

Question 1.5

What do you think will happen if you increase the number of magnets used ?

Question 1.6

Why do you think half of the wire needs to remain insulated?

Question 1.7

What will happen if you increase the number of coils?

Question 1.8

What will happen if you use a bigger battery ?

Question 1.9

Name the principle depicted in the above model.

Question 1.10

What do you think would happen if you change the direction of the poles magnet?

Question 1.11

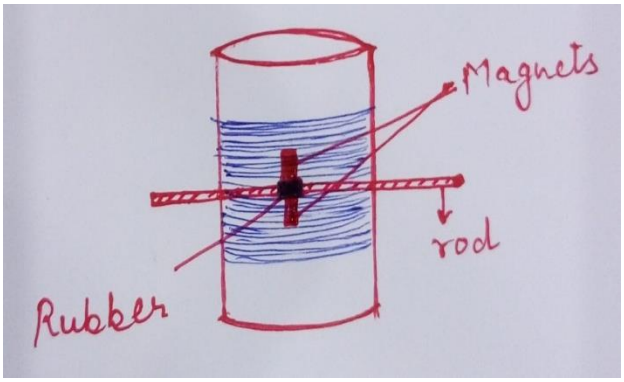
Have you tried to keep the magnet above the spinning coil? What do you observe?

Question 1.12

What happens when you change the direction of the battery?

CHAPTER 8) ELECTRIC ENERGY

Suppose we take a small, hollow, cylindrical, wooden piece and wound Cu wire around around it and connect LED with it. Now we pass a rod through this wooden piece and attach two magnets inside that wooded piece as shown.



Now as we rotate the rod, magnet also rotates and LED lights up. What do u think-

Q1- Which energy is converting into electrical energy here?

Q2- Will this rotating magnet affect any magnet placed outside but near to this apparatus?

Q3- If we connect a small fan in place of bulb, will it work?

Q4- Can we use silver wire in place of Cu wire, what will be the effect on intensity of LED now?

Q5- If we connect a battery across this wooden apparatus and make the current flow through it –

(i) Does it give reverse effect (magnet starts rotation)?

(ii) If we place a iron rod instead of magnet, does this iron rod show magnetic behavior?

(iii) Now if we place a magnet near this wooden apparatus, does it move?

Q6- What can be done to glow bulb brighter?

Q7- If we make this apparatus but LED doesn't glow, what can be possible errors?

CHAPTER 9) "Utna lo Thali me Na jaye naali me"

Breakfast Plates

Lunch or dinner plates

Food wastage (in Kg)

Date	Break Fast	Lunch	Snacks	Dinner	Total
20/06/2019	5	18	5	15	43
21/06/2019	6	16	4	14	40
22/06/2019	5	18	4	13	40
23/06/2019	4.5	16	5	16	41.5
24/06/2019	5	18	4	14	41
25/06/2019	5	15	4	16	40

A group of 20 Students went to IIT Gandhinagar for summer Intern Programme. They stayed for 6 days in the campus. A table showing the amount of food wastage produced per day during the six days period.Along with the plates for breakfast and lunch or dinner is shown in the picture.

They were asked to give suggestions for reducing waste.

i. One student suggested that the size of serving plates of lunch or dinner session should be reduced to half as the size of breakfast plates is nearly one third of lunch or dinner plates. And the wastage of food during lunch is nearly triple of the amount of waste in breakfast.
ii. One among them suggested that food wastage should not be controlled as it would produce less biogas in the campus Biogas plant. So the production of electricity and gas would be reduced which will hamper the demand of energy of the campus.

Q1. Which two sets of the combinations produced less wastage during the six days stay?

a. All days Breakfast and all days Snacks
b. Food on 24 and 25 June
c. Food on Day 1 and 4
d. Total food wastage on day 2 and 4

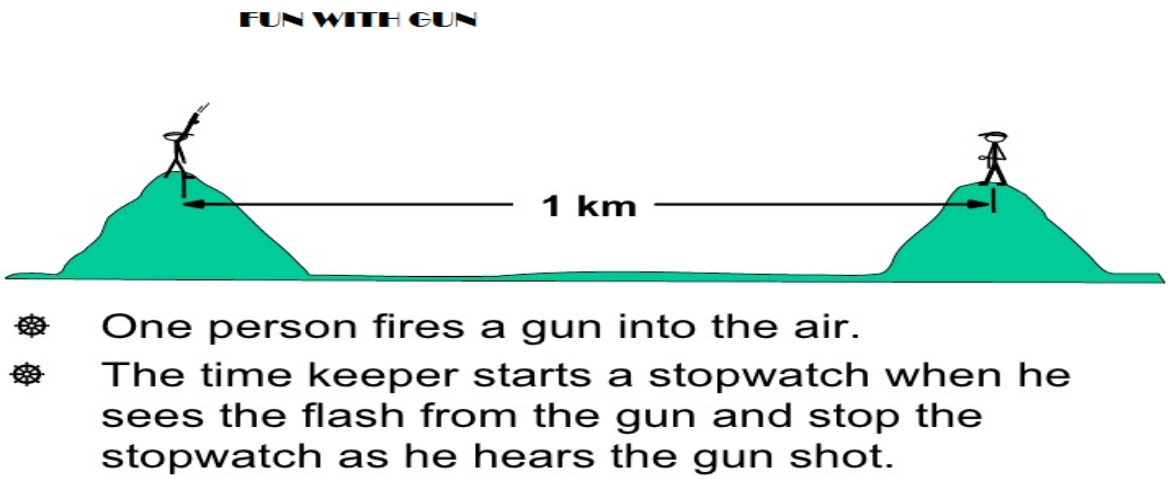
Q2. What is the average food waste per day for each meal? Also find the median food waste for morning breakfast and evening snacks.

Q3. If 1 kg of food wastage on decomposition produce 150ml of Biogas. Which contain 75% of methane. And there is loss of 10 % of Biogas during production and transportation. Then how much methane would be added to atmosphere if the entire food produced during 6 days was dumped in Bio-gas Plant?

a. 2.99 litres
b. 2761.8 ml
c. 27.78 litres
d. 36.82 litres

Q4. Can you deduce the relation between the size of plates used and the food wasted?

CHAPTER 10) FUN WITH GUN



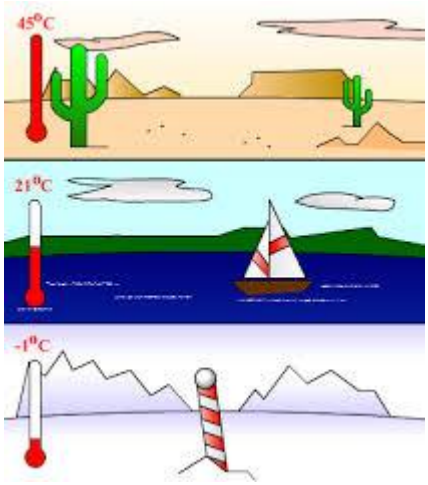
Question1. Two persons were having firing the gun competition in which maximum number of gun shots were to be fired in given interval of time. The reading of the stop watch was 3 secs. What would be the speed of sound using this time?

a. 340m/s
b. 333.3m/s
c. 330m/s
d. 178m/s

Question2. Find the ratio of speed of sound with the speed of light.

a. 1.11×10^{-6}
b. 1.11×10^{6}
c. 3×10^{8}
d. 333

Question3. On increasing the temperature the speed of sound increases. Arrange the following habitats in the increasing order of speed of sound. (Desert, lake and Polar region) also tell where echo of sound would be heard in shortest time.



CHAPTER 11) FUN WITH ONIONS

Children like playing games. For playing games we need energy. The energy we get from carbohydrate. So today we will play game with the help of onions. Tie all the onions one by one with the thread. Now tie all the thread on a piece of stick. Now start hitting one onion with another onion

Q1. Do all the onions move in the same way?

……
……

Q2. If we push two onions from one side whether any change you observe?

……
……

Now change the onions with few metallic bobs. Fix all the metallic bobs in the same way like onions. Start hitting the metallic bobs from one side. Sometime hit one metallic bob, and sometimes hit two metallic bobs , sometimes three metallic bobs all together.

Q3. Whether all the metallic bobs move at a same time?

……
……

Q4. If we hit two metallic bobs then two metallic bobs will come out from another side or not?

……
……

Q5. If we hit three metallic bobs from one side whether three metallic bobs will come out from another side?

……
……

Q6. Which law will it follow?

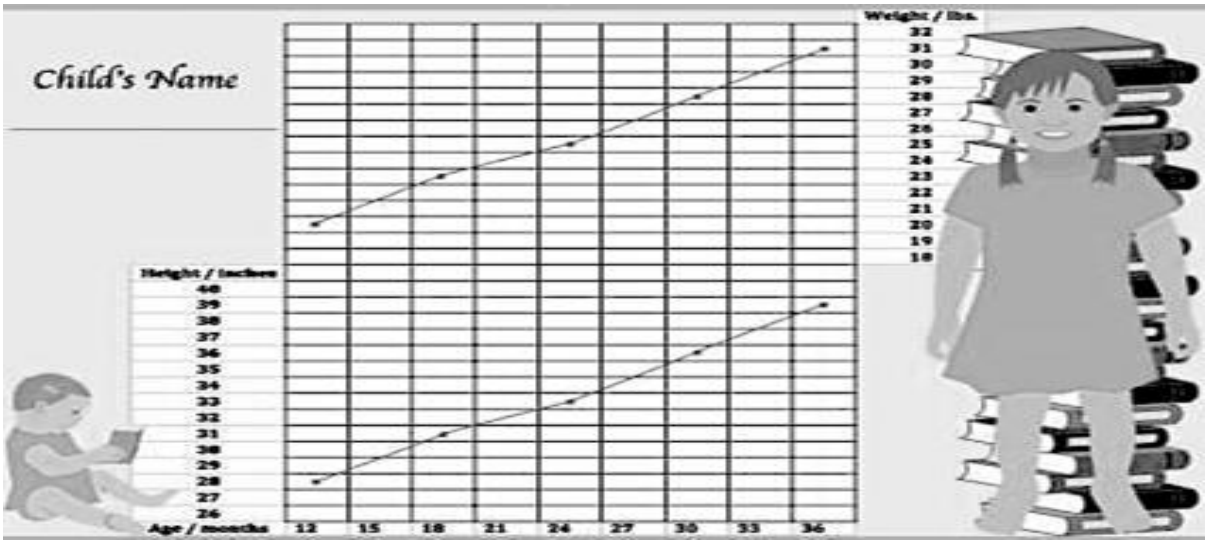
……
……

Q7. What is law of conservation of momentum?

……
……

CHAPTER 12) HEIGHT VS AGE

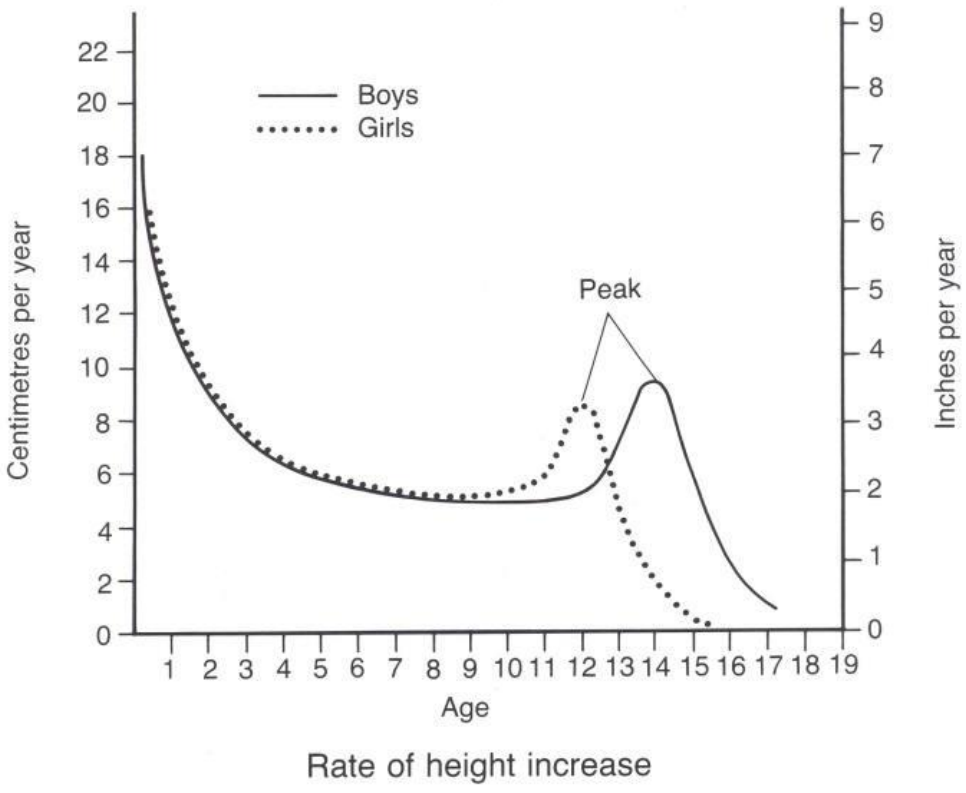
Look at the graph given below



The above graph depicts the growth chart. A **growth chart** is a tool used to assess whether the infant (toddler) is growing and developing as s/he should be. The growth chart is designed to track infant's growth w.r.t height for the given age and weight for the given age.
Each toddler is unique and meets milestones at his or her own pace. But most healthy babies follow a similar growth pattern. This does not mean that they have the same height and weight; but that they grow and put on weight, proportionately to their size and according to their gender, in a similar way.

Similarly growth charts can also be plotted for children above 2 years of age to study their growth pattern. Look at the chart (graph) given below.

Q1.



Rate of height increase

Describe the pattern of growth (increase in height) in:

a) Boys or males

_____

_____

b) Girls or females

_____

_____

Q2. When is the maximum height attained by:
a) Boys?

_____

b) Girls?

_____

Q3. During which stage of life does an individual usually attains maximum growth?

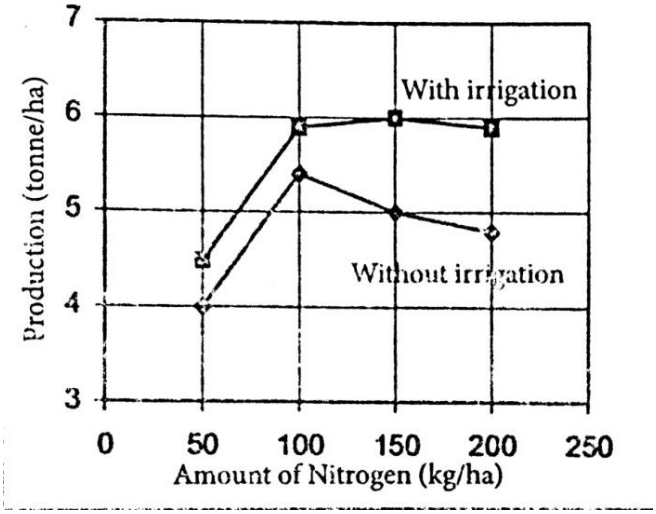
_____

_____

CHAPTER 13) EFFECT OF IRRIGATION ON CROP PRODUCTION

You know that plan absorb water from soil to perform photosynthesis i.e. carbon dioxide is converted to glucose in the presence of water, sunlight and chlorophyll. A chemical analysis shows that 100g of water reacts with 280g of carbon dioxide to form 180g of carbohydrate. 180g of oxygen is created in this process. But the plant does not use all the water it absorbs through its roots to produce carbohydrates. Most of this water evaporates in the air. It is estimated that a plant uses only 0.1% of the water it absorbs to form carbohydrate. That means, if plant absorbs 1 L of water only 1 mL will be used to produce carbohydrate. Remaining 999 mL evaporates from the leaves.

An experiment was conducted to find out how irrigation affected a crop. In the experiment crops were grown in two fields. One field ws irrigated while the other wasn't. The same amount of nutrients, like nitrogen, was applied to both the fields. The experiment was carried on like this by varying the amount of added nitrogen. The result of the experiment is illustrated in graph given below.



Q1. On the basis of graph given above, explain the importance of irrigation in increasing crop production.

_____

_____

_____

Q2. What difference is there in crop production when the same quantity of nitrogen is applied to both the irrigated and unirrigated fields?

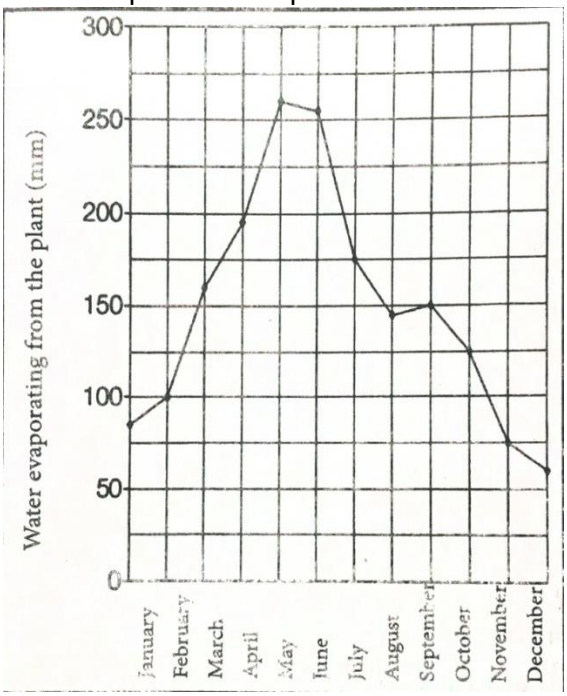
_____

_____

_____

The Relationship Between Water and Crop Yields

You may have wondered what difference would it make if water is scarce when only 0.1% is used to produce carbohydrate. Lets investigate this. Graph given below tells us how much water evaporats from plans in different seasons.



Q3. In which month most water evaporates from the plant?

_____

Q4. Are these the same months as the monsoon season when the rainfall is heavy?

_____

Q5. So what effect does the availability of more water have on plants?

_____

Let's now look at an interesting fact. Most of the water released by plants evaporates from the leaves through stomata. We know that most of the water evaporates when the weather is too hot. In such situation, the stomata begins to close. This reduces the amount of water that evaporates from the leaves. Also the carbon dioxide enters the plants through stomata.

Q6. When the weather is hot and the stomata close, what effect would this have on the absorption of carbon dioxide by the plant?

_____

Q7. What would be the effect on growth of plant if amount of carbon dioxide would decrease?

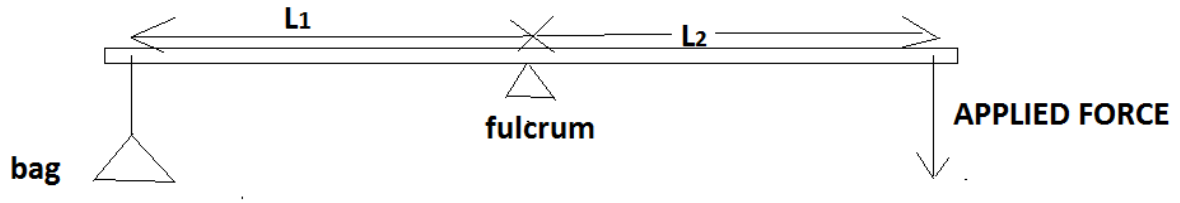
_____

Q8. If the plant does not get water at this time, what effect would this have on its growth? Explain with reasons.

_____

CHAPTER 14) JOSHIJI KI CHHADI

If we take one meter long stick of negligible mass and suspend a bag of weight 1 Newton from its one end and hold it near the bag .Now answer the following-



Q1- How much force we need to apply to hold the stick from a position near the bag?

Q2- how much is the distance between our index finger and the palm?

Q3- - Do you find any change in the force experienced if we increase the distance between the bag and our hand?

Q4 -At what position of our hand we are experience least force?

Q5-If we hold the stick at a distance 30 cm from our index finger. How much force we will need to apply?

Q6-Do we apply equal force in the above situation as we applied when we hold the stick from near the bag?

Q7-How does force vary when the distance between bag and hand is increasing?

Q8- What amount of force we will need to apply in downward direction when we hold the stick from the other end?

Q9 – What amount of total force we are applying when we are holding the stick from the other end?

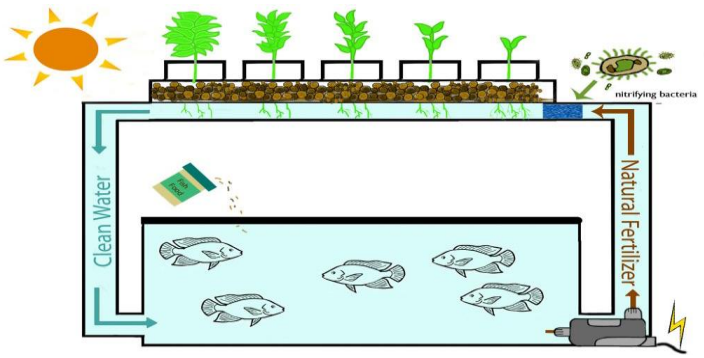
Q10- What should we do to apply the minimum force to lift the stick?

CHAPTER 15) MODERN AQUAPONICS

Modern aquaponics (note the combination of aquaculture and hydroponics) combines the two systems into one single, unified or integrated system. The plants are not grown in soil but grow in various types of rocks or gravel, though in some systems, grow freely in the water. The nutrients for the plants come from the fish below a **growbed**, the place where the plants grow.

The **nitrogen cycle** is a major part of the system. The waste from fish, food waste, and other plant/animal-based material in the water will produce ammonia. The ammonia is toxic to the fish and plants, but bacteria (microbes) in the water break down the ammonia and change it into nitrite. However, nitrite can kill the fish, but the bacteria then break down the nitrite into nitrate, also toxic to fish, but it is taken up by the plants in the growbed. The water becomes clean again. The cycle continues.

The four simple steps further explain how aquaponics works using a tank, pump, and growbed. First, the fish in a tank eat and they produce waste and ammonia is produced by the waste. The waste will eventually be used as food and nutrients for the plants. Next, through the nitrogen cycle, the waste is converted to fertilizer and nitrogen for the plants. The process is also called **nitrification**. Third, the nitrogen and solid fish waste are pumped to the plants in the growbed above the water. The plants use the nutrients for continued growth. Finally, the water pumped into the plants is then filtered and cycled back to the tank below. The oxygen-rich water has been cleaned and there is very little waste. The plants benefit because they receive nutrients. The fish benefit because the water is cleaned.



Question 1) Which of the following best defines aquaponics?

A: Combines the habitats of fish or other organisms that live in water with the growth or farming of plants.

B: It takes the world of water-living organisms and mixes it with plants growing in soil.

C: The breeding and rising of plants and animals in the water.

D: Growing plants without soil except when necessary.

Question 2) Which of the following is growing plants without soil?

A: Agriculture **B:** Aquaculture

C: Hydroponics **D:** All the above

Question 3) Which of the following is a major part of an aquaponics system?

A: Oxygen cycle **B:** Nitrogen cycle

C: Carbon cycle **D:** All the above

Question 4) Which of the following occurs during nitrification?

A: Waste is converted to fertilizer and nitrogen for plants

B: Waste is converted to fertilizer and nitrogen for fish

C: Fertilizer and nitrogen is converted to waste

D: Nitrogen is converted to fertilizer for plants

Question 5) which of the following will be produced from the waste from fish, food waste, and other plant/animal-based material in the water?

A: Oxygen **B:** Microbes

C: Ammonia **D:** Nitrates

Question 6) In Hydroponics system-

If there are 70 pipes and each pipe contains 80 plants. How many plants can be plotted in the system?

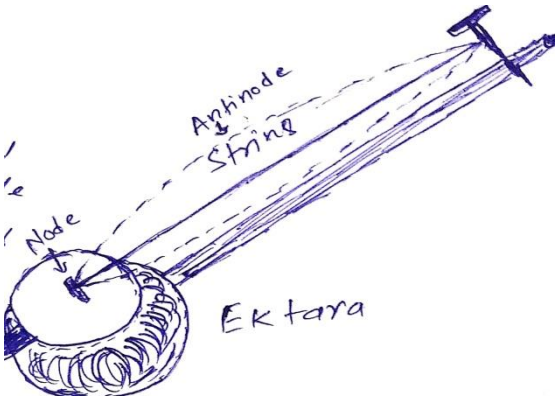
Question 7) Plants of brinjal, muskmelon and tomatoes are potted in the pipes with the ratio of 1:3:4 respectively. Find out how many plants of each are potted?

Question 8) If the dimensions of a tank in which fish will be kept are 40m x 30m x 4m.

a) Find the quantity of water, if the height of water in the tank is 3m.
b) Find the volume of the tank.
c) Find the volume of air in the tank.

CHAPTER 16) MODES OF VIBRATION IN STANDING WAVE-EKTARA

Raju liked to play Ektara musical instrument. One day he saw that while playing with Ektara loops are being created which seems to be stationary. So he surprised andasked his teacher about the loops. The teacher said that these loops are standing waves. If you apply more tension on the string then number of loops will increase.



After that the teacher also explains that if the string vibrates in one loop is called first harmonic (fundamental mode) similarly when it forms two loops is called second harmonic or first overtone and so on and the separation between node and antinode is ƛ/2 where ƛ is wavelength. Therefore Raju applied more tension on the string and found that 7 nodes are formed on the string one at each end.

(a) The wave pattern could be called –
(i) 5 Overtone (ii) 6 Overtone (iii) 7 Overtone (IV) 4 Overtone.

(b) If the string is 12 cm long. What is a wavelength ƛ in this resonance state?

(c) There are three wavelengths along the length of the string in this resonance state. (T/F)

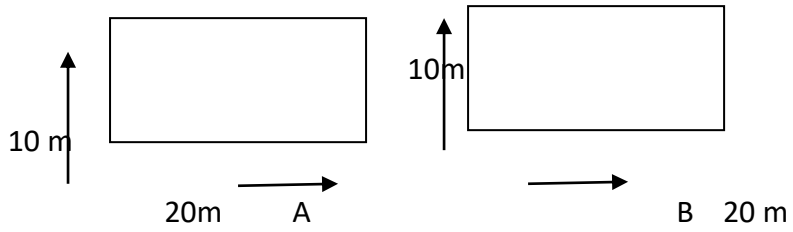
(d) If the fundamental frequency for this wave is 10 Hz. Then the frequency of this resonance state is-

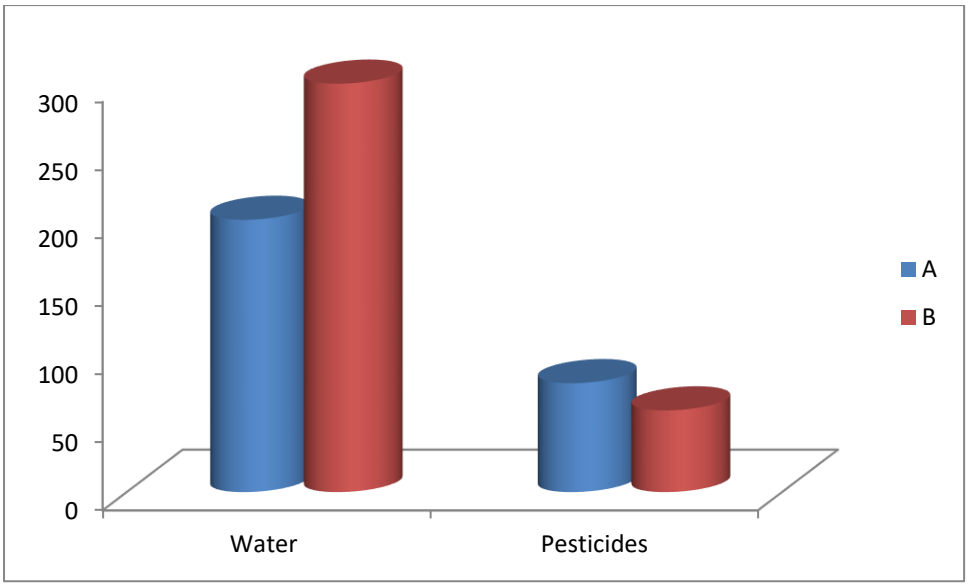
(e) What would be the wavelength of standing wave in the first mode of vibration? If the length of string is 12 cm.

(f) Frequency of standing wave in a string will increase/decrease in the first harmonic. If length of string reduced to half.

CHAPTER 17: MULCHING

In a study of Mulching practices in the fields of cardamom in Sikkim. A researcher found that Cardamom grown in the tracks with around 200 days rainfall about 3000-3500 mm/year in 2014. But now-a-days increasing in temperature up to 20^0C directly influences the productivity of this crop. Farmer of field A used used mulching but B didn't use this practice. Cardomom required watering at least once in 10 days during October to March. Farmer of field 'A' delayed irrigation for 15-20 days.





Q1. Did the practice in field 'A' has merit than practice in Field 'B' ?

Q2. Use of pesticides increased in field 'A' what are reason behind it ?

Q3 Farmer of the field A is using 200 liters of water how much water he will save in 40 days ?

Q4. Chances of weeds germination will increase in which field ?

Q5. Is there soil insulation in any field?

CHAPTER 18) THE NARROW ESCAPE:

Two villages Buddhipur(**A**) and Balwangram(**B**) was situated near bank of a river Jeevandhara. A strange disease affected the two villages and land s become infertile. The villagers also were caught with mysterious fever. The villagers decided to abandon their places and settle in new area on the other side of the River. The villagers agreed to cross the river which was 4.5 feet deep. It was decided that ladies,old people and small children will be sent through last boat but few young menfrom both the village each need to emergently walk through the river and they did not knew to swim. Somehow, they had narrow escape.

The data of men of both Village is given below:

Age in(Years)	Height in Feets
	Village A
16	3.3
16.5	3.7
17	4.7
17.5	4.6
18	4.7
18.5	3.4
18	5.2
18.5	5.5
19	4.1
19.5	5.6
20	3.3
20.5	5.1
21	4.7
21.5	4.6
22	4.7
22.5	5.7
23	5.5
23.5	5.3
24.5	4.8
25	5.6

Age in(Years)	Height in Feets
	Village B
16	4.4
16.25	5.2
16.5	5.8
17.25	5.3
17.75	3.9
18	4.1
18.25	4.3
18.5	5.1
19	5.6
19.75	5.8
20	5.5
20.25	6.4
20.5	6.4
21.25	6.6
22	5.7
22.5	5.5

Q.1 Do you think that taller people will have ease in crossing the river?

Q.2 Calculate the mean and median of Ages of individuals of both village in months?

Q.2 Calculate the Mean of the Village A and B.

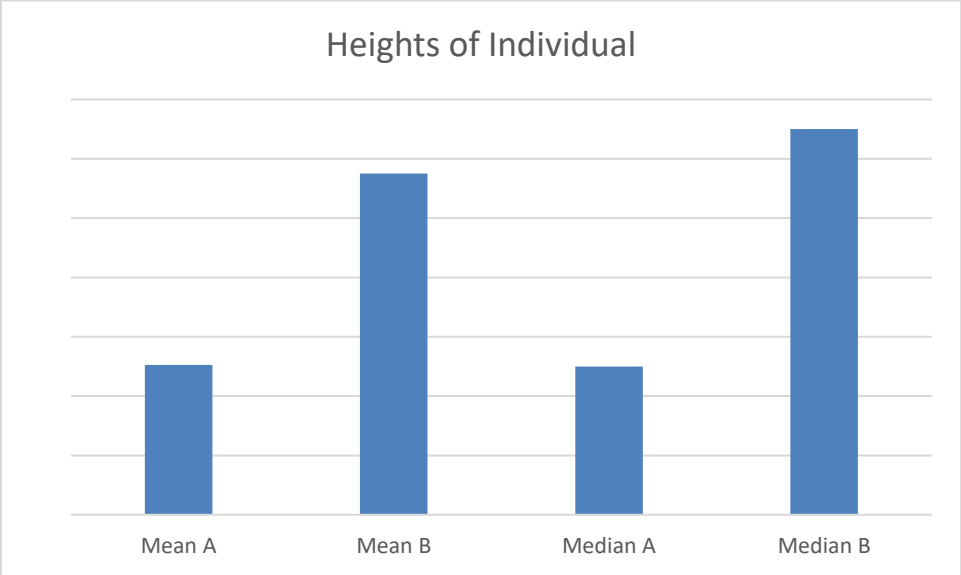
Mean of Vill A	Mean of Vill B

Q.3 Will the sum of means of both village will be equal to the means of all individual taken together. Justify

Q.4 Calculate the median of men of both village.

Median of Vill A	Median of Vill B

Study the Graph carefully



Question 2: True or False

a. Most men of Village A crossed River with Ease but was difficult for group of village B (T/F)

b. Most men of Village B could cross the river easily than the members of Village A. (T/F)

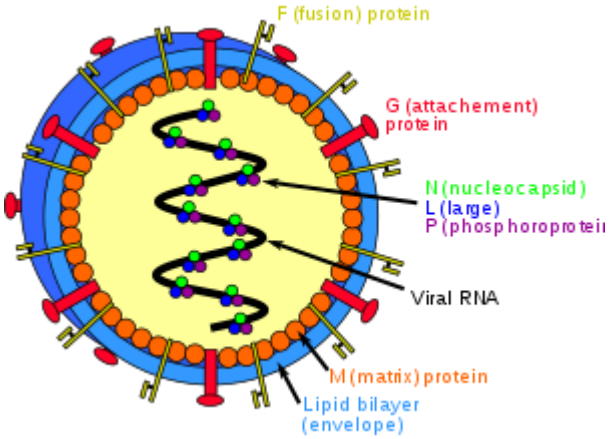
Question 3:

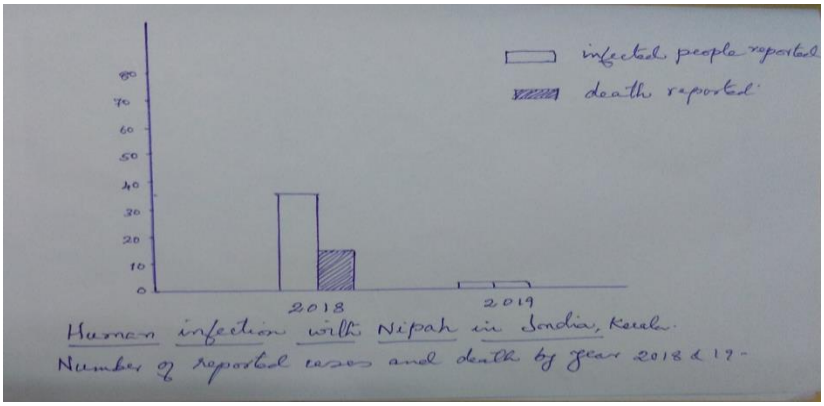
a) What does the graphical representation tells about the distribution of Height in Both villages ?
b) Which central measure tendency will give a better representation of fact.

CHAPTER 19) NIPAH

According to WHO NIPAH virus is an emerging disease that can be transmitted from its reservoir (natural wild life host), the flying foxes (fruit bats) to both animals and humans when they consume infected fruits. Symptoms range from asymptomatic infection, acute respiratory infection-fever, head ache, sore throat and encephalitis. Like other common infectious diseases the administration of antibiotics was not effective in this case. Since there is no cure for this disease appropriate symptomatic treatment at the right time found effective. The outburst of Nipah disease in Kerala was alarming 2018. Whereas the infection rate was comparatively less with a high survival rate in
2019.

NIPAH VIRUS





Answer the following questions:

1. Suggest one measure to protect yourself from NIPAH.
2. What could be the reason for the high survival rate of and less rate of infection in 2019 compared to the statistics of 2018 in Kerala?
3. Administration of antibiotic is not effective in the case of NIPAH Virus. Why?
4. It was found that some areas of malappuram district were affected by the same symptoms like Nipah and the people of that area were panic. The blood samples of the affected people of that area were tested negative for Nipah. What could be the reason?

CHAPTER 20) QUALITY OF WATER

According to district ground water booklet of Satna district, ground WATER QUALITY of satna in different areas shows presence of Chemical constituent as follows

A. Ca^{2+} less than 60 mg/literis recorded at Kirpalpur, Rampur, Kotar, Amarpatan and Amdara.

B. Ca^{2+} more than 180 mg/liter is recorded at Maihar, Chhijwar, Unchehara, Jura, Satna, Chorhata etc.

1 .Which of above water is fit for drinking?

a) A-because It contains appreciable quantity of dissolved minerals like Ca^{2+} and Mg^{2+}
b) A-because It contains Less amount of Ca^{2+} and Mg^{2+}
c) B-It contains appreciable quantity of dissolved minerals like Ca^{2+} and Mg^{2+}
d) B-because It contains Less amount of Ca^{2+} and Mg^{2+}

2- Which of the following is considered as soft water?

a) amount of Ca^{2+} is more than 180 mg/L
b) amount of Ca^{2+} is120-180 mg/L
c) amount of Ca^{2+} is60-120 mg/L
d) amount of Ca^{2+} is less than 60 mg/L

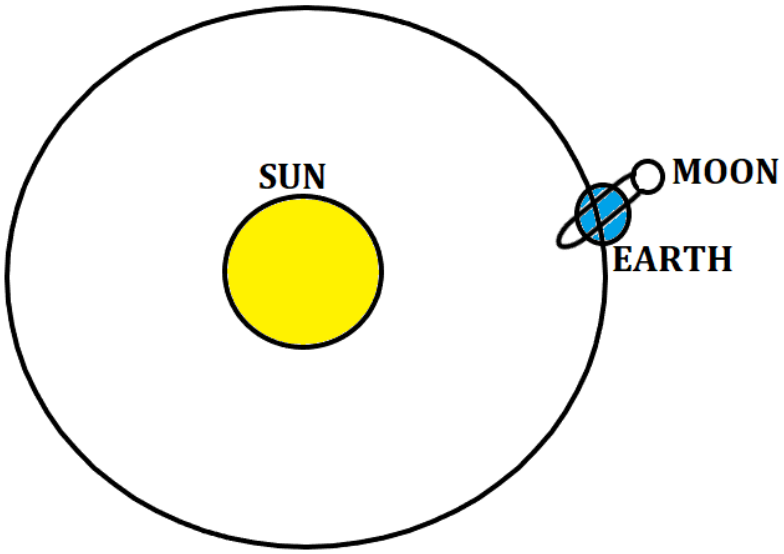
3- Select the incorrect statement from the following option.

a) Water which does not form lather with soap and forms white scum is called hard water
b) Hard water contains dissolved calcium and magnesium salts in it
c) In hard water, cleansing quality of soap is depressed
d) Due to the presence of dissolved hardness-producing salts, the boiling point of water is depressed

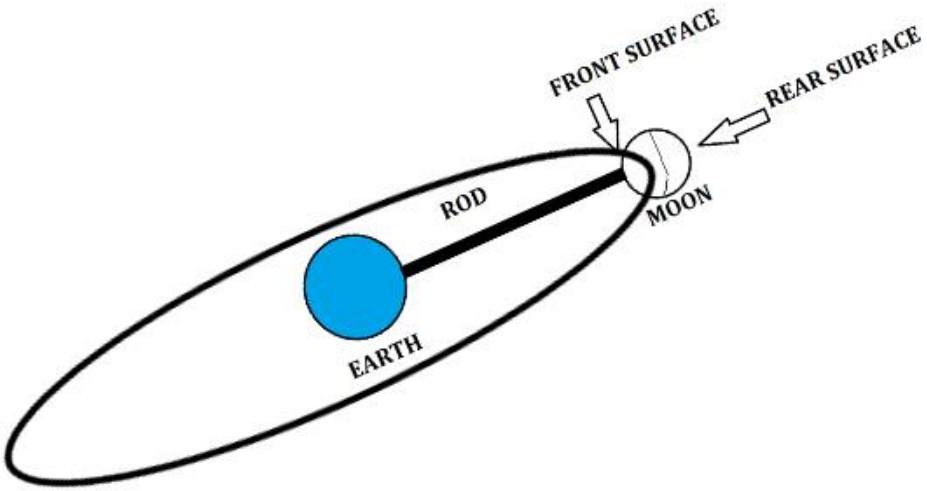
4- Select the incorrect statement from the following option.

a) The taste of hard water is better than soft water
b) The dissolved calcium in hard water can help to produce strong teeth
c) Hard water coats the lead piping with a layer of insoluble calcium carbonate which prevents poisonous lead dissolving in water
d) Boiler feed water should also be hard in nature

CHAPTER 21) THE REVOLUTION OF MOON



As we know, earth revolve around the sun and spin on its axis. Same condition happen with the moon. Because moon is a satellite of the earth so moon revolve around the sun but does not spin on its axis. Path of the moon revolution is elliptical. Time period of that revolution is about 27 days. So we see some time lunar eclipse. Lunar eclipse is experienced at least two time in a year.



Now, if we connected to two spherical balls with a rod and assume one is earth and keep earth at origin and assume second moon, make it to revolve around the earth. Then the face of jointing is always in the direction to earth. By the reference of earth we cannot see the rear surface of the moon. This is happen in real moon revolution.

Level 1. what is the path and time period of moon revolution?

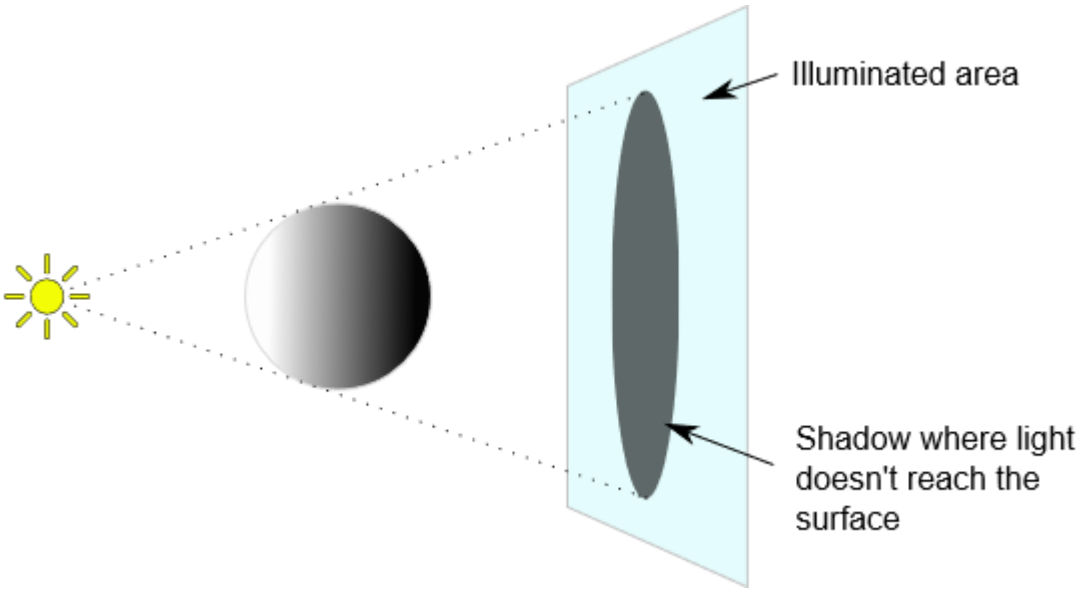
……

Level 2. After how much time, moon complete its half revolution?

……

Level 3. In any condition can we see the rear surface of the moon?

……..



Level 4. when we put obstacle in light then we got shadow of that obstacle, what happen when sun earth moon is in straight line and earth comes between sun and moon as an obstacle?

……

Level 5. what happen, when moon will do both thing revolve around earth and spin on its axis?

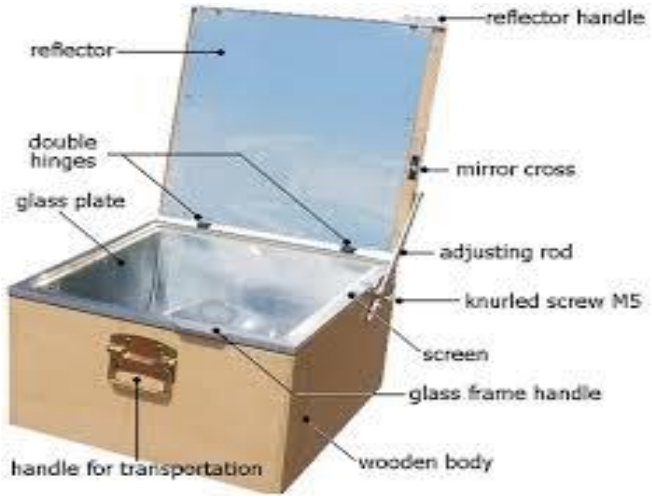
……

Level 6. If moon decreases its radius of revolution then what happen about time period, and lunar eclipse?

……

CHAPTER 22) SOLAR COOKER

Mrs Suchana has setup a solar cooker in a box by using a black printed Aluminum sheet , a black cooking vessel, some glass wool, a glass cover and a mirror plate.(as per the setup given below). Solar energy is most powerful renewable source of energy so Most of the time she uses it for her cooking purpose.



Question 1. Why did she use black surfaces in her setup?
Question 2. Will the set up work properly if glass cover is replaced by plastic sheet?
Question 3. Is there any substitute for the glass wool? If yes then name the substance.
Question 4. Justify that Mrs Suchanais more conscious about the environment as well as energy source.
Question 5. What are the advantages of using solar cooker.
Question 6. What is the maximum temperature attained in a concave reflector type solar cooker?

CHAPTER 23) THE SOLAR GENERATOR & CHARKA GENERATOR

THE SOLAR GENERATOR

Surekha teaches Science in class-X. One day she brought a long thin insulated copper coil, a magnet and an LED with her into the class. She asked a student-Rajeev to remove the insulation on both ends of the coil then wrap it around ashort PVC pipe into a cylindrical form and connect the LED across the coil. Then she asked another student Geeta to insert the magnet into the pipe and shake. The students observed that the LED blinked several times. She asked other students one by one to repeat the same and observe carefully. She explained that such process of generation of electricity is known as electro-magnetic induction.

Questions-

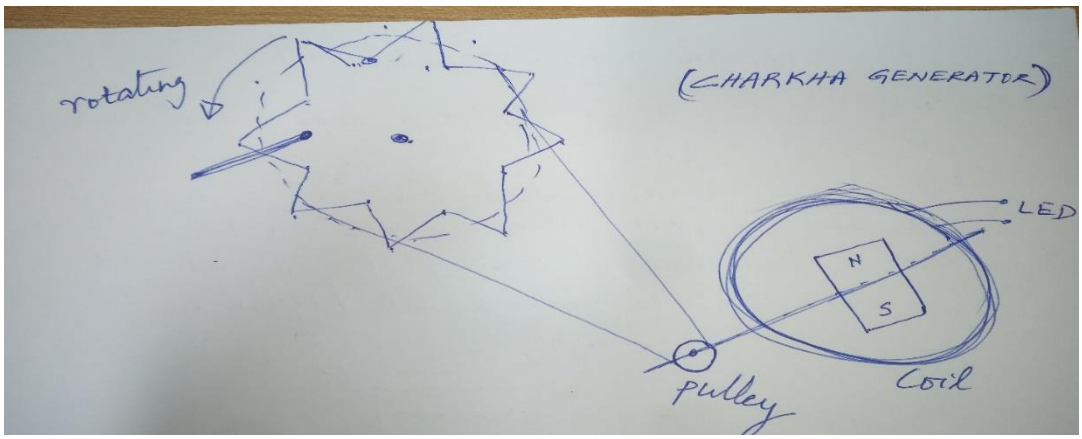
(i) Where does the energy come from in this activity?

(ii) Does the LED glow brighter when the pipe is shaken faster?

(iii) Does the LED glow when the magnet is kept stationary inside the pipe?

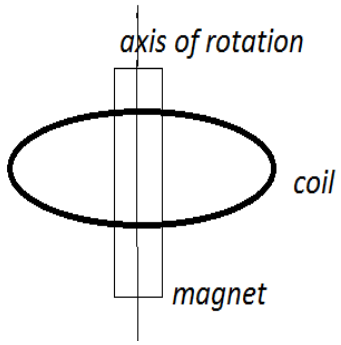
CHARKHA GENERATOR

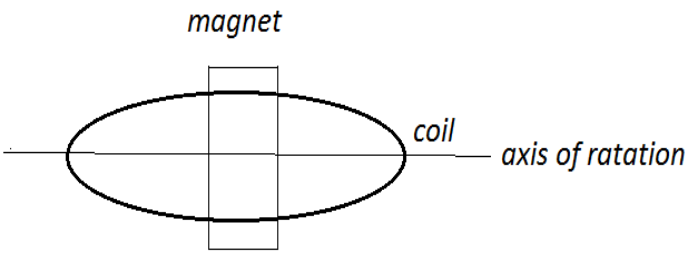
A simple electric generator can be constructed by using a charkha as shown in the diagram. The charkha connected with the pulley rotates the magnet inside the coil. This results LED to blink.



Questions-

(i) Which of the following arrangements would result LED to blink when the magnet is rotated?





(ii) The teacher explained that the voltage generated in the coil is similar to that of a sine graph. Do you agree?

(iii) Given that the radius of charkha and that of pulley as 5cm and 0.5cm respectively, how many times does the magnet rotate when the charkha wheel is rotated once?

(iv) How many times does the LED glow when the charkha wheel is rotated once?

CHAPTER 24) TOPIC SPRINKLER SYSTEM

Imagine Rahul has two fields of same area. In one field he has tube well for irrigation whose water pipe has a pipe of diameter10 cm and speed of water i.e coming out is 20m/s. In other field he has installed sprinkler system which has five nozzles. If dimensions of one nozzle are diameter 5 mm and speed of water is100 m/s.

Q1-Calculate the amount of water released in field A if it is watered for on hour .

Q2- Figure out the amount of water released in field from one nozzle in the same time.

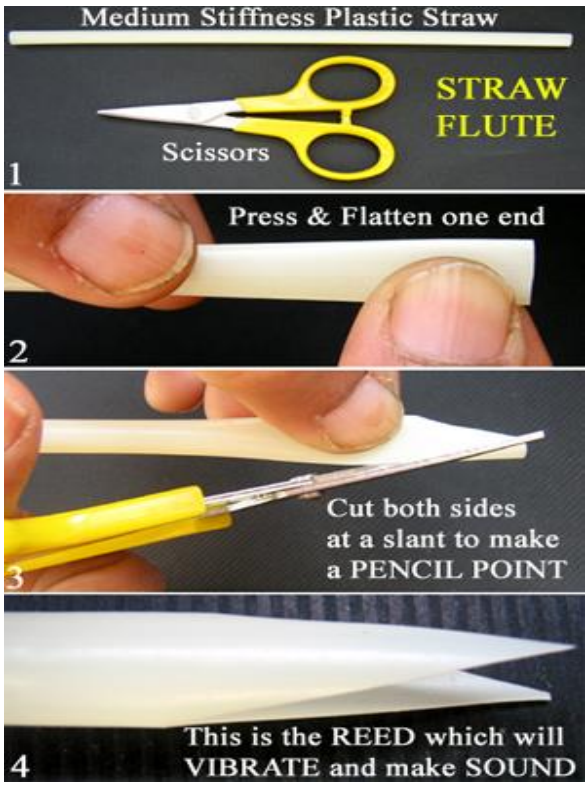
Q3 Calculate the amount of water in one hour from five nozzles.

Q4-What conclusion would Rahul draw from above activity?

Q5- If Rahul is living in desert area ,which system of irrigation he should use and why?

Q6 How much area in field will remain un irrigated in field B if dimensions of field are 3x2 metre ?

CHAPTER 25) STRAW FLUTE SCIENCE



Above is given a simple experiment on vibrations!
Insert the pointed end of the straw into your mouth and blow. If the pointed end of the straw is in the correct spot in your mouth you will get the end to vibrate, creating a kazoo-like sound.

Shorten the straw you shorten the standing wave within it, increasing the number of times the wave vibrates per second; changing its pitch. To keep it simple, the shorter the instrument the higher the sound.

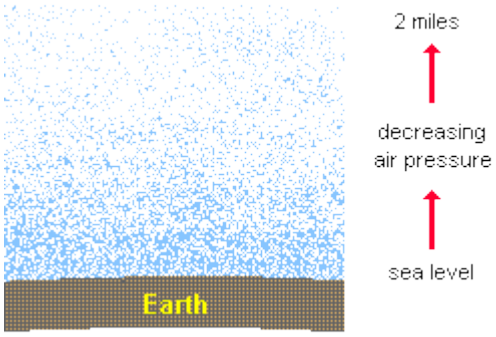
Question 1.1
What do you think will happen if you increased the length of the straw?

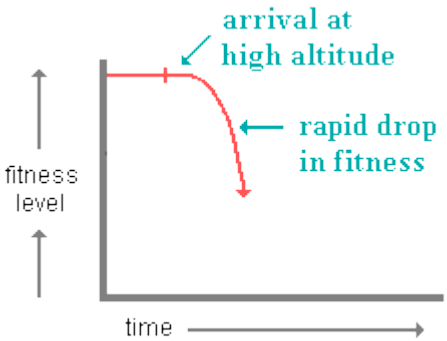
Question 1.2
In which straw would you expect the pitch of the sound to be higher? Explain why?

Question 1.3
Why do we prefer women at telephone exchanges and at call centres?

CHAPTER 26) SURVIVAL OF THE FITTEST & PITCHER PERFECT

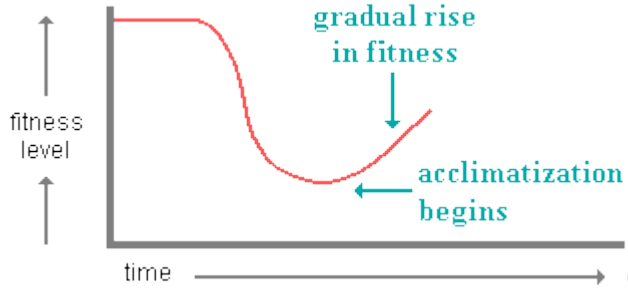
The percentage of oxygen in the air at two miles (3.2 km.) is essentially the same as at sea level (21%). However, the air pressure is 30% lower at the higher altitude due to the fact that the atmosphere is less dense--that is, the air molecules are farther apart.Solubility of a gas is afunction of pressure. When we travel to high mountain areas, our bodies initially develop inefficient physiological responses. There is an increase in breathing and heart rate to as much as double, even while resting. Pulse rate and blood pressure go up sharply as our hearts pump harder to get more oxygen to the cells. These are stressful changes, especially for people with weak hearts.

i. 



(Initial inefficientresponse to lowoxygen pressure)

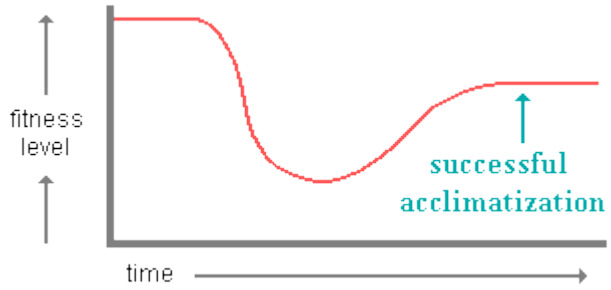
ii



(ii)

(Beginning ofsuccessfulacclimatizationto low oxygenpressure)

iii.



(Increased fitness level after successful acclimatization to low oxygen pressure)

(source: Palomar.edu)

Question 1. Which of the following cells will increase if to adapt to live at high altitudes?

a. RBCs
b. WBCs
c. Platelets
d. All will increase in same proportion

Question 2. A pregnant lady was supposed to attend a friend's wedding in Kashmir from Mumbai, but his doctor husband refused to allow her to attend the wedding. What could be the possible reason for his refusal?

a. At high altitude the temperature is very low during night.
b. As fetus is developing it requires more oxygen, but oxygen is less dense at high altitudes.
c. The time of journey is too long for a pregnant lady.
d. The increased blood pressure at high altitudes may cause heart attack.

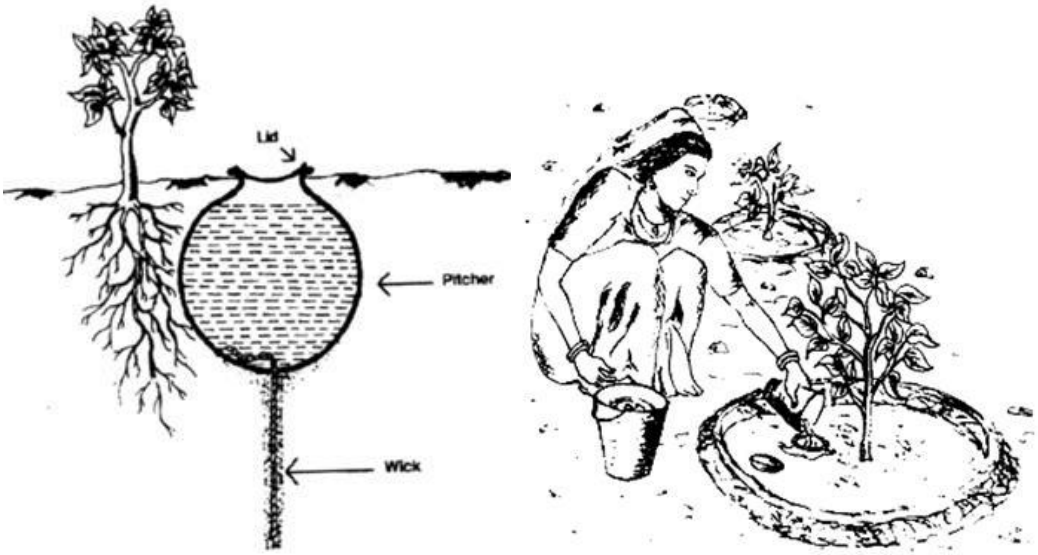
Question 3. U.S. maintains an Olympic training centre in the mountains of Colorado. What according to you is the correct explanation of this?

a. Increased blood pressure will build his muscles stronger.
b. Increased altitude will make him practice more and he can sweat more by doing less work.
c. Lung expansion capacity will increase and there will be increased number of RBCs.
d. The good air quality help to relax athletes mind for greater performance.

Question 4. As mentioned in the last two lines of the passage what would be the effect on cardiac output of a person if its heart beat rate increased to 1.5 times at high altitudes than on planes.(Cardiac output is the amount of blood pumped out of the ventricles in one cardiac cycle which is 70ml and there are 72BPM on planes).

Question5. From the graphs shown above line first falls, then start rising and finally become parallel to the time axis. What would be its path when a person after visiting from hills comes back to planes.

PITCHER PERFECT



Summer is here and the debates on water conservation are heating up. And what about rural areas and the farm lands? Through centuries, farmers have devised their own methods for preserving and conserving this precious natural commodity. For example, in the coastal areas of Kerala, farmers have been using a simple indigenous technique called pitcher irrigation which greatly reduces the demand for water.

It is ideal for small holdings (1-2 acres). It consists of a clay pot with a cotton wick fixed at the bottom of the pot, and buried in the soil (up to its neck) and filled with water. The number of pitchers required per acre depends on the crop variety grown. For coconut seedlings about 170 pots per hectare (that is 70 pots per acre), and for areca nut about 1100 pots (440 pots per acre) will be required.

If you have a garden at home try this irrigation method (source: thehindu.co.in)

Question 1. If area of your field is 5000sq.m and you want to grow coconut in the entire field using pitcher irrigation. How many pots would be required by you? (1 hectare = 10000sq m).

a. 170
b. 250
c. 85
d. 340

Question 2. If you assume a pitcher in the shape of perfect sphere of diameter 42cm and the shape of its mouth is circle of radius 3.5cm. How much water will be left in the pitcher if rate of diffusion is 2litre/8hrs in a span of two days?

Question 3. Use of pitcher for irrigation can lead to massive production of pots and this will generate employment to potters but at the same time it will cause soil erosion. As a responsible citizen what would be your approach towards this method of irrigation.

CHAPTER 27) SWING ON SWING

A girl is swinging on a swing in sitting position, then time period of her swing is given by the relation $T=2\pi\sqrt{l/g}$. What do you think-

Q1- When girl stands up, does time period change? Explain.

Q2- If two girls sit at the same swing at the same time, how does time period vary?

Q3- At fill swing, if she wants to stop it and she applied friction by her feet, then time period –

(I) Increases

(II) Decreases

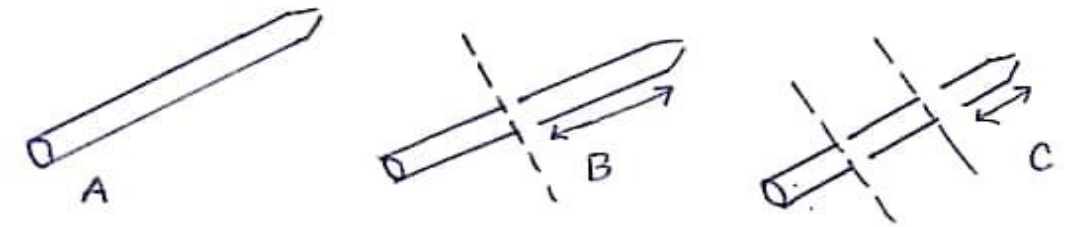
(III) Remains same

Q4- If the girl instead of swinging on earth goes on moon, then does time period vary?

Q5- Does this formula of time period works in vacuum too?

CHAPTER 28) SWINGS INSIDE A STRAW

Cut one end of a drinking straw to make it triangular and pointed. Put it gently between your lips and blow air to get your own sound producing instrument. (Fig A)



Q1. Which part vibrates when sound is produced from the straw?

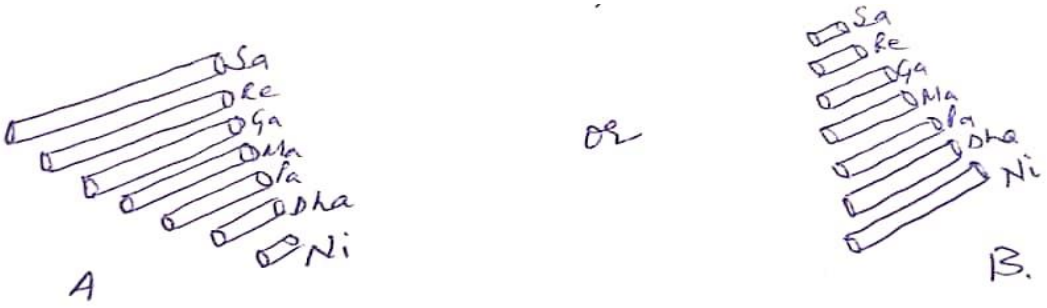
Q2. Listen to this sound carefully and then cut one part of the straw to make it shorter

(fig. B) and blow again. Do you feel any change in the sound quality?

Q3. Cut it **shorter** and every time notice the change in sound quality. Find out the reason for it.

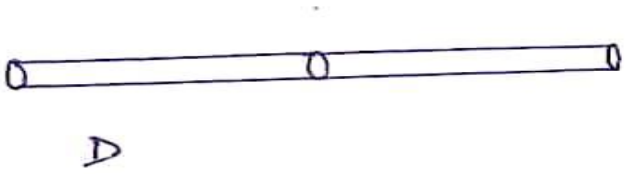
Q4. When we keep cutting the straw uniformly, do you think the change in frequency will also be uniform?

Q5. If you cut 7 different straws in decreasing length then which arrangement may go hand in hand with our musical notes- Sa, Re, Ga, Ma Pa, Dha, Ni.



Q6. How do you expect the pitch to change if we take straw double the diameter?

Q7. What will happen if you push another straw into your first one to **increase the length**? (Fig D).



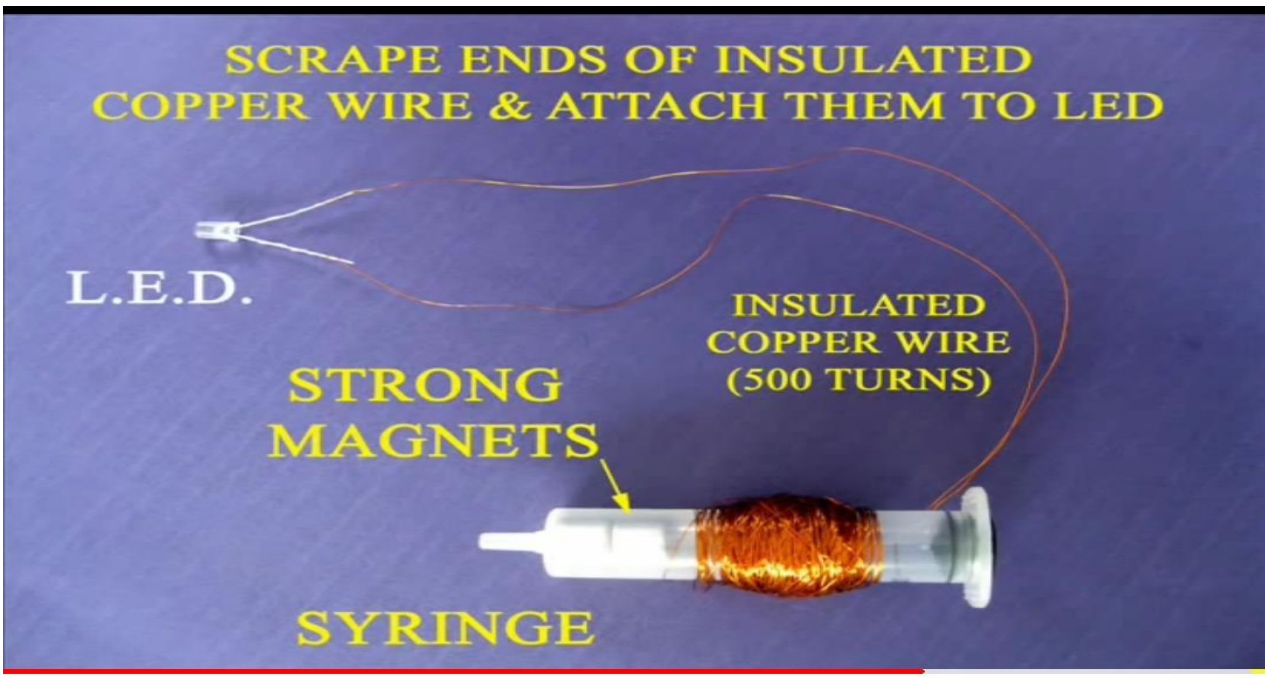
Q8. Will there be a change in sound quality on changing the **material** of the straw?

Q9. Blow your straw again and find out which all **organs** of your body are working to do it.

CHAPTER 29) SYRINGE GENERATOR

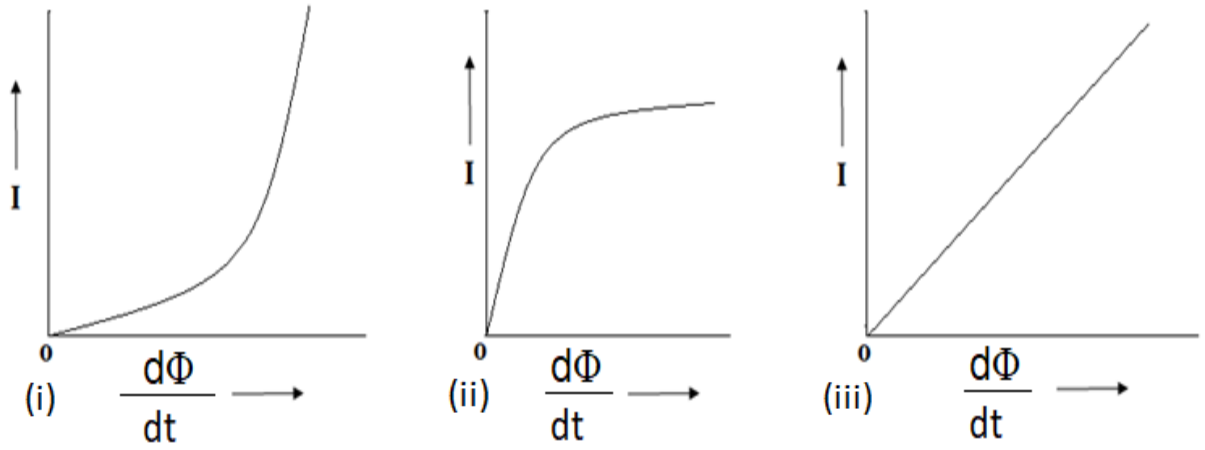
A small device constructed using syringe, Neodymium magnets, thin insulated copper coil, LED.

The working is based on the principle of Electromagnetic Induction. Whenever there is a change in magnetic flux linked with the coil an induced e.m.f and hence an induced current develop in the coil. The direction of current is given by Fleming's Right Hand Rule.



Questions

1. The thin copper wire is wound over the barrel at the centre. If we wind the wire near one of its ends, will the bulb glow?
2. Ramesh covered the whole barrel with the copper wire and shook it vigorously. Will the bulb glow? If not, then why?
3. Suppose two students are preparing the syringe generator. Student A shakes 50 times in 5 sec and student B shakes 1000 times in 20 sec. In which case current produced will be more?
4. Which graph represents the rate of change of magnetic flux vs current graph?

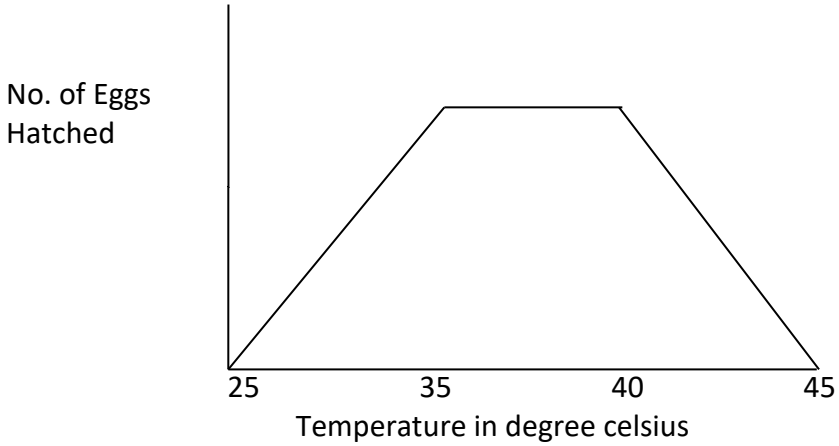


5. Sahil shakes the barrel vigorously then suddenly stops and starts shaking. How does the glow of bulb changes during this process?
6. What do you think, will the generator work if the magnets remain stationary and instead the coil moves with the same speed as above?

CHAPTER 30) THE EGGY BUSINESS

In the summer vacations, Ria decided to help her grandfather on his poultry farm. She was surprised that eggs of the same hen species hatched at different times and were of different quality. Grandfather told her that during incubation (period before hatching), eggs were affected by food and its quality, temperature, light, humidity, ventilation and sanitation. She decided to test for herself.

After observing the number of eggs which hatched at a particular temperature, Ria made the following graph.



a) What range of temperature is most suited to get good quality of eggs?_____

b) She reasoned that reduction in egg production may be due to

i) Denaturing of protein in embryo due to high temperature

ii) Cracking of egg shell

iii) Abnormalities in developing embryo

iv) Both denaturing of protein and abnormalities cause reduction

c) Ria observed that more eggs died when kept in a closed box as compared to a big room with windows. What could be the reason for that?

d) Ria then took a few eggs and placed them at a height, on top of a hill, while others were kept at the bottom. What could have happened? In which case will more eggs hatch?

Q2) Eggs which were not turned and did not change position frequently, also did not hatch she thought that the reason could be

a) Less contact of immature embryo with food source.

b) Sticking of embryo with egg membrane

c) Both reasons contribute equally to proper growth

d) It does not matter if eggs are turned or not

Q3) What would happen if you do not turn while sleeping at night?

Q4) From the results obtained list two or more ideal conditions for hatching of eggs.

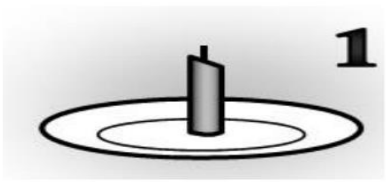
CHAPTER 31) WATER & CANDLE ACTIVITY & POTABLE WATER

WATER & CANDLE ACTIVITY

A person placed a candle at centre of plate and pour water in it 0.5 inch deep. He lights the candle and put gently a cylindrical transparent glass over it. He records the following observations:-

1) Firstly the candle stays burning for a short interval of time and water level rises slowly inside the inverted glass.
2) After a while the candle goes out, the water rises quickly.
3) On repeating the experiment with 2,3 and 4 candles of same length, the height of water inside glass given below:-

S.N.	No. of Candles	Water Level inside glass
01	01	1.1 cm
02	02	3.4 cm
03	03	4 cm
04	04	4.3 cm



On the basis of above experiment, answer the following questions:-

a) Why does a candle go out when you put a jar over it?
b) Why does the water rise in the experiment?
c) What will happens if glass of larger volume put over the candle?
d) Draw the graph between no. of candles and rise of liquid in glass.
e) What is the relationship between no. of candles and rise of liquid?

POTABLE WATER

Under the heading '*Arsenic in Bottled Water Prompts a Product Removal': How Much Is Safe? New York Times publishes a news*- the amount of arsenic in the public water exceeded the levelU.S. Environmental Protection Agency standards of 10 parts per billion.

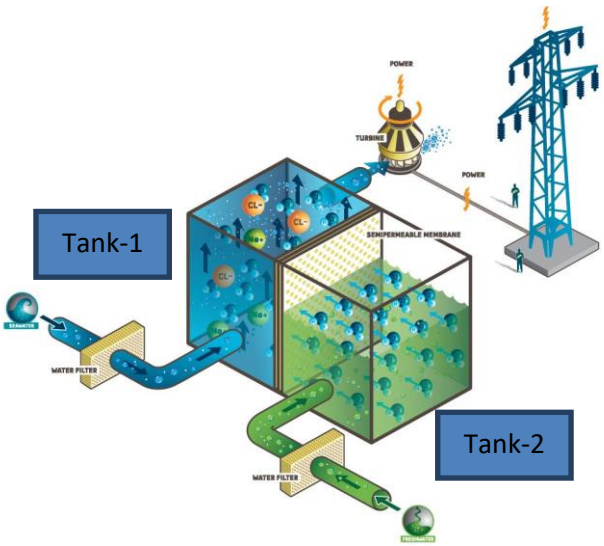
Unlike tap water, which is largely regulated by the Environmental Protection Agency, bottled water? The agency also oversees inspections of bottling plants. Some states require bottled water companies to be licensed annually.

But "some states have inconsistent arsenic guidelines in place for tap and bottled water, with stricter thresholds in place for tap than for bottled water," according to Consumer Reports. And "few states regularly conduct independent tests on bottled water for contaminants, as municipalities must for tap water."

a) What is a dangerous level (in mg per litre) of arsenic in drinking Water as per U.S. Environmental Protection Agency?
b) How does arsenic get into the water supply?
c) Is it safe to bathe in water with arsenic?
d) How do you remove arsenic from water?
e) What health risks are associated with arsenic consumption in drinking water?

CHAPTER 32) WATER POWER PLANTS

Blue power plants that is located where a fresh water river and water from the ocean meet. The power plant uses the differences in the salt concentrations in the two bodies of water to produce electricity.



1. Water moves from Tank 1 to Tank 2 due to difference in concentration of salt and water.
    a) Yes
    b) No
2. Which of the following will be the effect of water movement?
    a) Pressure and volume increases in the ocean water container.
    b) Pressure and volume increases in the river water container.
    c) Pressure alone increases in the ocean water container.
    d) Pressure increases in the river water container.
3. Give any two merits of this power plants using water as a resource.
4. If the fresh water tank is filled with polluted water, how does it affect the process?

CHAPTER 33) WHY DOES WATER RISE?

Activity: Why Does Water Rise?

Step-1: Add 2-3 drops of food colouring to the water. This will make the movement of the water easier to see later.

Step 2-: Pour the coloured water into the plate. You want about a half-inch (1 cm) deep puddle in the plate.

Step 3: Set the candle straight up in the puddle in the centre of the plate.

Step4: When the candle is stable, the water is calm, light the candle. The candle flame needs to burn brightly.

Step 5: Turn the container over again and lower it over the burning candle. Place the container on the plate in the water and let go but don't take your eyes off of the water level inside it. You may see bubbles coming from inside the container. At first, the candle stays burning and the water level rises slowly. About the time the candle goes out, the water rises quickly.

Find the answers of following questions from above para-

Q-1 Why we add colour to water?

Q-2 What is the necessity of more than 1-inch deep water?

Q-3 Which gas has consumed within the experiment and which one has produced?

Q-4 Why does the level of water rises in the container?

Q-5 Is it possible that the carbon di-oxide of container gets absorbed in water itself?

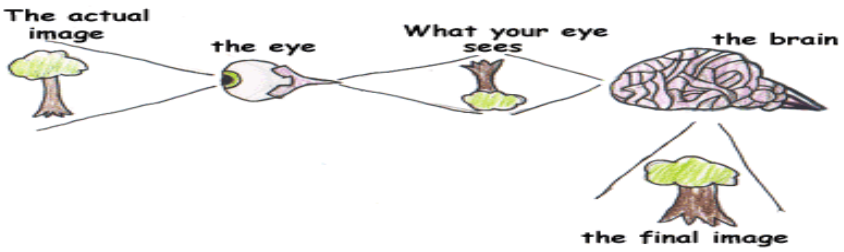
Q-6 Name some substances which may be used as colouring matter for the experiment.

CHAPTER 34) THE WORLD OF GREEN PLANTS & BANANA STORY (केले वाला)

We are able to see in the presence of light and green colour of the plants give a soothing effect to us. The sun light or white light that we know consists of seven different colours (VIBGYOR).

- V - Violet
- I – Indigo
- B – Blue
- G – Green
- Y – Yellow
- O – Orange
- R - Red

If one is able to see a plant, it is because of natural / white light is there and the print of the plant is formed in the brain. Actually a plant looks green because it did not absorb green light from the VIBGYOR.



Q1. How many colours form a rainbow formed during rainy season?

Q2. What four factors are required so that we are able to see?

Q3. In an experiment, a green plant is kept in a room without light. Will it be visible to you?

Q4. Based on the information given in question 3, if the room is lit by green light, will you be able to see it? What will be the colour of the plant ?

Q5. Based on the information given in question 4, if keeping everything else same, but replace the green light with red light. Now will you be able to see the plant? Why or why not. Also if you are able to see, then what will be the colour of the plant?

BANANA STORY (केले वाला)

India is a vast country with lot of possibilities that a particular thing may be sold in different ways. Bananas are sold as per dozen (1 dozen have 12 pieces) in northern part of India whereas in southern India the same bananas are sold as per kilogram (1 kg = 1000 gms).

Q1. If the weight of a single banana is 100 gms, then how many bananas can you buy if you want 1 kg of bananas?

Q2. Based on information given in question 1, If in a shopping mall, the bananas are being sold at the rate of Rs. 60 / kg, but in the local market the same sized banana is being sold as Rs. 60 per dozen. From where you would prefer to buy the bananas? Give reason for your choice.

Q3. Based on information given in question 1, If the rate of same sized banana in two different shops is as follows:

SHOP	@ Rs.	UNIT
1	Rs. 40/-	Per Kg
2	Rs. 60/-	Per dozen

From which shop would do you think you should buy the bananas? Give reason also.