



Education Department, UT Chandigarh

Critical and Creative Thinking

Science Practice Booklet
Class:8-10



राज्य शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
SECTOR-32 UT CHANDIGARH



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Environment

FOREST FIRES

Area : Environment

Class – 8

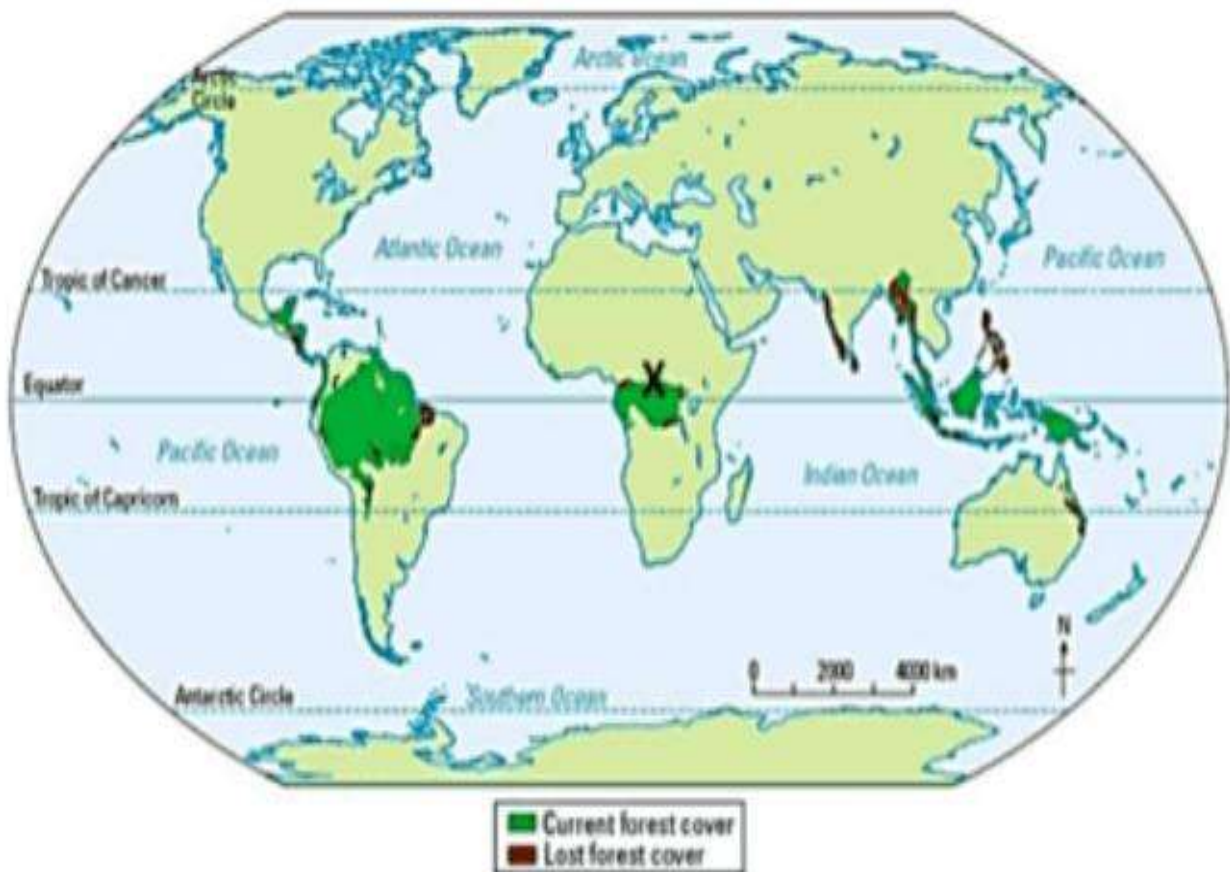
Chapter- 7

Chapter Name: Conservation of Plants and Animals

Concept: Consequences of Deforestation

Learning Outcomes: Students will be able to

1. make efforts to protect environment,
2. suggest ways to cope with environmental hazards like forest fires;
3. interpret content to understand the consequences of deforestation;
4. classify different types of rain forests.



Q.1 Identify the tropical rain forest labeled as 'X' in the given figure.

- a) Congo rainforest
- b) Amazon rainforest
- c) South east Asia's rainforest

Q.2 Recently a devastating forest fire incident took place in Australia which has killed several animals. It affected the people of that area as many respiratory disorders have been faced by them like suffocation. Which forests are called lungs of the world? In which country are they located?

.....

.....

Q.3 Scientists have always warned of rising temperature due to increase of release of green house gases which has led to climate change. What could be the possible reasons for forest fire? Explain.

.....

.....

Q.4 Are all forest fires dangerous? Comment.

.....

.....

Q.5 What can be done to prevent forest fires?

.....

.....

Item description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1.	close constructed	Interpret data and evidence scientifically	Content	Global	Medium
2.	open ended	Explain phenomenon scientifically	Content	global	Medium
3.	close constructed	Explain phenomenon scientifically	Content	personal	Low
4.	open ended	Explain phenomenon scientifically	epistemic	global	high
5.	open ended	Explain phenomenon scientifically	epistemic	global	high

Answer key:

1. Congo rain forests
2. Amazon rainforests, located in Brazil
3. Release of green house gases rise in temperature, change in climatic patterns
4. No. Mild surface fires do not lead to devastation due to burning of dry leaves. Fire removes low growing underbrush, cleans the forest floor of debris, opens it up to sun light and nourishes the soil.
5. Limiting release of green house gases ,use of technology, robots, artificial intelligence

CIRCULAR CARBON ECONOMY

Area: Environment

Class: 10

Chapter: 4

Chapter Name: Carbon and its Compounds.

Concept: Carbon.

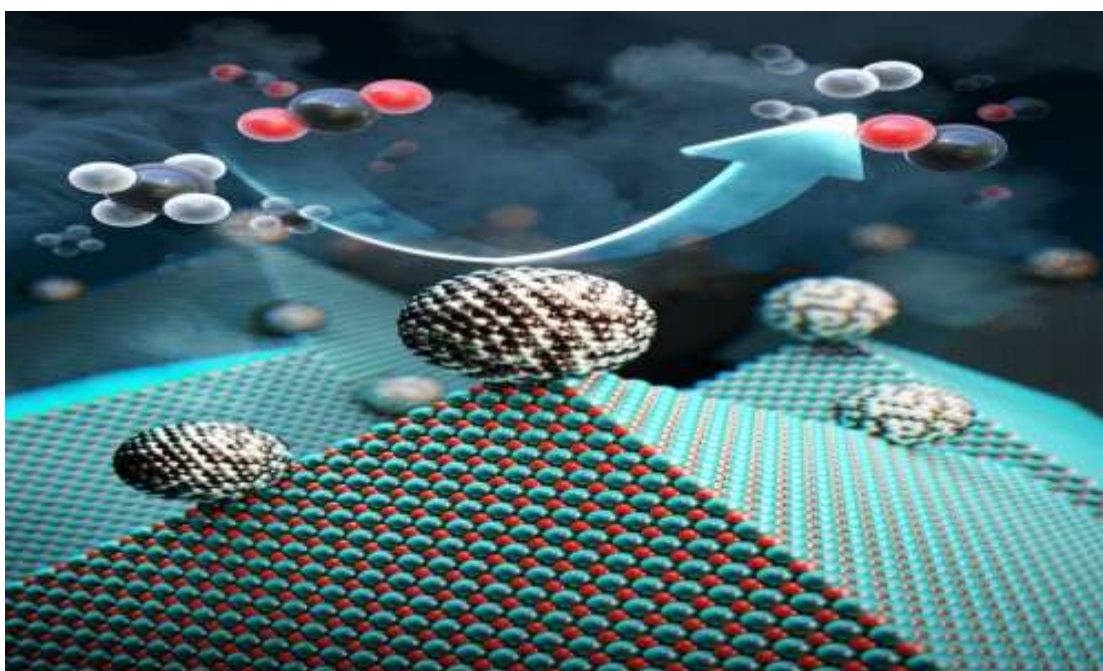
Learning outcomes: The student will be able to

1. Apply the concepts of 4 R's in carbon economy to conserve the environment.
2. Apply the concept of catalysts in solving the environmental issues.
3. Create eco friendly models to reduce carbon foot print.

The circular carbon economy is a system where carbon emissions are reduced, reused, recycled and removed (4R).

Of course, nature has been recycling carbon dioxide for millions of years. Photosynthesis turns sunlight, carbon dioxide and water into sugars and energy. But most plants turn less than 1 % of solar energy they receive, into useful energy rich compounds. Scientists are working on technologies that they hope will improve on nature and make recycling carbon dioxide a profitable industry.

Scientists have taken a major step toward a circular carbon economy by developing a long-lasting, economical catalyst that recycles greenhouse gases into ingredients that can be used in fuel, hydrogen gas, and other chemicals. The results could be revolutionary in the effort to reverse global warming, according to the researchers.



The catalyst that recycles greenhouse gases into ingredients that can be used in fuel, hydrogen gas and other chemicals

"We set out to develop an effective catalyst that can convert large amounts of the greenhouse gases carbon dioxide and methane without failure," said Cafer T. Yavuz, paper author and associate professor of chemical and biomolecular engineering and of chemistry at KAIST.

The catalyst, made from inexpensive and abundant nickel, magnesium, and molybdenum, initiates and speeds up the rate of reaction that converts carbon dioxide and methane into hydrogen gas. It can work efficiently for more than a month.

This conversion is called 'dry reforming', where harmful gases, such as carbon dioxide, are processed to produce more useful chemicals that could be refined for use in fuel, plastics, or even pharmaceuticals. It is an effective process, but it previously required rare and expensive metals such as platinum and rhodium to induce a brief and inefficient chemical reaction.

Other researchers had previously proposed nickel as a more economical solution, but carbon byproducts would build up and the surface nanoparticles would bind together on the cheaper metal, fundamentally changing the composition and geometry of the catalyst and rendering it useless.

"The difficulty arises from the lack of control on scores of active sites over the bulky catalysts surfaces because any refinement procedures attempted also change the nature of the catalyst itself," Yavuz said.

The researchers produced nickel-molybdenum nanoparticles under a reductive environment in the presence of a single crystalline magnesium oxide in the presence of reactive gas. The nanoparticles moved on the pristine crystal surface seeking anchoring points. The resulting activated catalyst sealed its own high-energy active sites and permanently fixed the location of the nanoparticles -- meaning that the nickel-based catalyst will not have a carbon build up, nor will the surface particles bind to one another.

"It took us almost a year to understand the underlying mechanism," said first author Youngdong Song, a graduate student in the Department of Chemical and Biomolecular Engineering at KAIST. "Once we studied all the chemical events in detail, we were shocked."

The researchers dubbed the catalyst Nanocatalysts on Single Crystal Edges (NOSCE). The magnesium-oxide nanopowder comes from a finely structured form of magnesium oxide, where the molecules bind continuously to the edge. There are no breaks or defects in the surface, allowing for uniform and predictable reactions.

"Our study solves a number of challenges the catalyst community faces," Yavuz said. "We believe the NOSCE mechanism will improve other inefficient catalytic reactions and provide even further savings of greenhouse gas emissions."

Questions:

- 1) What are the main gases that contribute to increase in greenhouse effect?
 - a) Methane
 - b) Carbon dioxide
 - c) water vapours
 - d) Carbon monoxide
- 2) Which metals act as effective catalyst in recycling greenhouse gases?
- 3) What was the difficulty faced while using the new catalyst during recycling greenhouse gases?
- 4) How was nickel based catalyst produced by the researchers ?
- 5) Why nickel-based catalyst acts as an effective catalyst to recycle greenhouse gases?

Item description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	complex multiple choice	Explain phenomenon scientifically	Content	Global	Low
2	close constructed	Evaluate and design Scientific enquiry	Content	Global	Low
3	close constructed	Evaluate and design Scientific enquiry	Content	Global	Medium
4	close constructed	Explain phenomenon scientifically	Content	Global	Medium
5	close constructed	Explain phenomenon scientifically	Content	Global	Medium

Answer Key :

Ans.1.

- Score 2 if response is a,b and c
- Score 1 if response is a or b or c
- Score 0 for any other response

Ans.2. Nickel, Magnesium and molybdenum

- Score 2 for above response
- Score 0 for any other response

Ans.3. 1) Carbon byproducts would build up and the surface nanoparticles would bind together on the cheaper metal, fundamentally changing the composition and geometry of the catalyst and rendering it useless.

2) There is lack of control on scores of active sites over the bulky catalysts surfaces because any refinement procedures attempted also change the nature of the catalyst itself

- Score 2 for above response 1 and 2
- Score 1 for response 1 or 2
- Score 0 for any other response

Ans.4. The researchers produced nickel-molybdenum nanoparticles under a reductive environment in the presence of a single crystalline magnesium oxide in the presence of reactive gas

- Score 2 for above response
- Score 0 for any other response

Ans. 5. The nickel-based catalyst will not have a carbon build up, nor will the surface particles bind to one another.

- Score 2 for above response
- Score 0 for any other response

GREEN HOUSE EFFECT

Area: Environment/Hazards

Class – 10

Chapter- 15

Chapter Name: Our Environment

Concept: Green House Effect

Learning Outcomes:

Students will be able to relate processes and phenomenon with causes.

Green House Effect is the long term effect of increase in concentration of carbon dioxide. This has been measured at Mauna Loa in Hawaiian Island for more than 10 years. The present value is increased from 290 ppm in 1890 to 320 ppm now with a gradual increase of 0.7 ppm per year. There are some seasonal variations also.

The increasing Ultraviolet, Visible and Infrared (IR) radiation have maximum intensity 483 nm at earth surface. While energy remitted is mainly IR intensity ($\lambda \sim 10000$ nm), these IR are absorbed by water vapour, CO₂ and re-emitted in all direction.

Q1. Considering seasonal variation, in which season of the Year do you expect the decrease in the level of CO₂ in atmosphere?

Q2. If we assume earth as a green house, in which layer of Earth's atmosphere CO₂ acts as the glass of green house.

Q3. A consequence of green house effect can be more frequent hurricanes and cyclones in tropical oceans. Is it correct? Justify.

Q4. Give scientific explanation for estimated rise in temperature from 0.1 to 4.9 degree celsius, with increase in CO₂ concentration to 600 ppm. (Consider average increase around 2 degree celsius for doubling the concentration of CO₂)

Item Description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Close ended	Explaining phenomenon scientifically.	Content	Local	Medium
2	Close ended	Explaining phenomenon scientifically.	Content	Global	Low
3	Open ended	Explaining phenomenon scientifically.	Content	Global	Low
4	Close ended	Evaluate and design scientific enquiry.	Epistemic	Global	High

Answer key/Marking scheme

Ans.1. Full credit if the answer is

In spring, due to flowering growth they require more CO₂ or other such scientific reason Otherwise no credit

Ans.2. Full credit if the answer is

Troposphere

Otherwise no credit

3. Full credit if the answer is

Yes because warmer sea water will lead to above said phenomenon or other such scientific reason

Otherwise no credit

4. Full credit if the answer is

With increased level of CO₂, the IR waves will be trapped more. or similar scientific reason.

Otherwise no credit

HOW DO TIBETANS SURVIVE AT HIGH ALTITUDES? (Part-1)

Area: Environment

Class: 10

Chapter: 9

Chapter Name: Heredity and evolution.

Concept: Evolution

Learning outcomes: The student will be able to

1. Explain the process of Homeostasis.
2. Apply his learning in hypothetical situation related to travelling in mountains.
3. Correlate adaption with the environmental conditions.

1 If you live in the lowlands, you may have experienced the huffing and puffing that typically accompany a trip to higher altitudes. That's because oxygen levels go down as one goes up. Travelling to Shimla from sea level means a 17 % decrease in available oxygen. Our bodies compensate for even this small change with faster breathing and a higher heart rate—at least until we acclimate to the thinner atmosphere.



2 What happens when you travel to the mountains.

As you increase elevation the PO_2 (P stands for partial pressure of oxygen in the atmosphere which is related to it's percentage) in the air drops which affects the pressure in arterial blood (PAO_2). The brain detects these changes and sends a message to increase respiration rate condition called **hyperventilation**. You are likely to take deeper breaths in addition to breathing faster and your rate will increase. You may experience dizziness, nausea, fatigue, and headaches.

3 Low arterial PO_2 will cause the release of **erythropoietin** from the kidneys. Erythropoietin will stimulate the bone marrow produce **more red blood cells** to increase the concentration of haemoglobin in the blood. This haemoglobin will have the effect of providing tissues with more oxygen

4 Extra haemoglobin may compensate for decreased oxygen levels, allowing breathing and heart rate to return to normal. This is an example of **phenotypic plasticity**, shifts in an organism's body, physiology or behaviour that are dependent upon the environment it occupies **it is not a genetic change**. People can usually acclimate to higher altitudes within a couple of weeks.

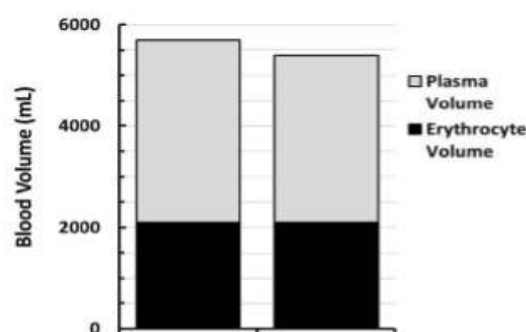
Q1. What does the word 'compensate' mean. How does your circulatory system compensate for low levels of oxygen?

Q2. What is Hyperventilation? What are the side effects of hyperventilation?

Q3. What is the role of your kidneys in compensating for low levels of oxygen?

Q4. Read the example of phenotypic plasticity and provide another example of this phenomenon. Think about this!

Q5. The following chart compares the haematocrit (the ratio of the volume of red blood cells to the total volume of blood) of blood samples taken from a person at sea level and one at a high altitude. Explain your choice:



BAR 1-A

BAR 2-B

Some People Didn't Just Acclimate, They Evolved

Item Description:

Q.No	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Closed constructed	Explain Phenomenon scientifically	Content	Global	Low
2	Closed constructed	Explain Phenomenon scientifically	Procedural	Global	Medium
3	Closed constructed	Explain Phenomenon scientifically	Procedural	Global	Medium
4	Open ended	Explain Phenomenon scientifically	Epistemic	Global	High
5	Open ended	Interpret data	Epistemic	Global	High

Answer Key:

1. To overcome the deficiency. By increasing respiratory rate and heart rate.
2. As the elevation (altitude) increases the **PO₂ in the air drops** which affects the pressure in arterial blood (PAO₂).

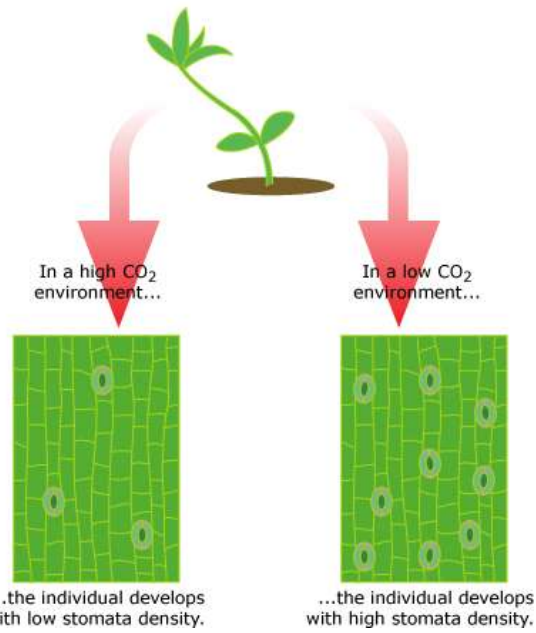
The brain detects these changes and sends a message to **increase respiration rate** condition called **hyperventilation**.

Symptoms - dizziness, nausea, fatigue, and headaches.

3. Low arterial PO₂ causes the release of **erythropoietin** from the kidneys.
Erythropoietin stimulates the bone marrow to **produce more red blood cells** to increase the concentration of haemoglobin in the blood. This haemoglobin provides the tissues with more oxygen
4. Phenotypic plasticity refers to the capacity of the same organisms to exhibit different characteristics under varied environmental conditions.

Anyone training for a marathon knows that although the goal may at first seem unattainable, with the correct exercise regime, even the least promising athlete will eventually cross the finish line. This is an e.g of phenotypic plasticity, which allows us to reshape our bodies within the strictures of our genetic make-up.

Change in stomata density in an individual
due to phenotypic plasticity



E.g. from plants

5. The bar A represents that of person high altitude at as blood volume is more. (acclimatisation)

HOW DO TIBETANS SURVIVE AT HIGH ALTITUDES? (Part-2)

Area: Environment

Class: 10

Chapter: 9

Chapter Name: Heredity and evolution.

Concept: Evolution

Learning outcomes: The student will be able to

1. Explain the process of Homeostasis.
2. Apply his learning in hypothetical situation related to travelling in mountains.
3. Correlate adaption with the environmental conditions.

5 Tibetan highlanders have no trouble living at 13,000 metres, and many of them can climb parts of Mount Everest without supplemental oxygen. How do they do it? New research makes it clear that Tibetan highlanders haven't just acclimated to their mountain home; they have evolved unique physiological mechanisms for dealing with low oxygen levels.



6 The evolutionary adaptation that allows Tibetans to function at high altitudes are very different from the acclimatization process that most of us go through when we spend time in those places.

7 One of these adaptations is almost exactly the opposite of a lowlander's response to high altitude. Tibetans have **gene** versions that cause to produce **fewer** red blood cells. How is that helpful? It turns out that extra red blood cells make blood thicker-more like honey than water -and after a certain point, this cell – laden blood can actually get so thick that it doesn't pass through capillaries efficiently to oxygenate cells. Having blood with too many red blood cells can be particularly problematic during pregnancy since it is linked to slow foetal growth and high rates of **foetal mortality**.

8] The basis for the Tibetans' adaptation is not a change in a gene that produces a haemoglobin or any one of the other proteins that make up red blood cells. Instead, the key change seems to be in a stretch of **DNA, called EPAS1**, which helps control the process of producing red blood cells. The change in EPAS1 seems to make Tibetans less likely to overproduce red blood cells at extreme altitudes.

9] Biologists compared the genomes (genetic makeup) of ethnic Tibetans to the genomes of Han Chinese individuals. The basic reasoning was that if a particular gene version was found in Tibetans, but not in their close relatives who lived in lowlands (Han), then that gene likely arose from **natural selection**. It was found that the Tibetans were much more likely to have this gene than Han Chinese.

Genetic studies estimate that the **Tibetan's split from the Hans Chinese** and began migrating to the highlands less than 3000 years ago, which means adaptation for living at high altitudes occurred in the population in about a hundred generations. That would represent the fastest example of human evolution ever documented!

Q1. How is adaptation as observed in the Tibetan population different from acclimatization ?

Q2. What are the consequences of having too many red blood cells.

Q3. What is EPAS1 and what is its role in circulatory system?

Q4. Why did scientists want to compare the genes of Tibetans to the genes of Han Chinese?

Q5. Scientists examined Tibetans and Han Chinese to compare average hemoglobin (Hb) amounts the blood. Does the data support the CLAIM that Tibetans have evolved? Or does it provide evidence that the Tibetans have adjusted? Explain your Reasoning.(2 pts)

Group	Average [Hb] (g/dL) at high elevation	Average [Hb] (g/dL) at sea level
Lowlanders (Han Chinese)	18.5	15.3
Tibetans	15.8	15.6

Item Description:

Q.No	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Open ended	Explains phenomenon scientifically	Epistemic	Global	High
2	Closed constructed	Explains phenomenon scientifically	Procedural	Global	Medium
3	Closed constructed	Explains phenomenon scientifically	Content	Global	Medium
4	Open Ended	Explains phenomenon scientifically	Epistemic	Global	High
5	Open Ended	Evaluate and design scientific enquiry	Epistemic	Global	High

Answer Key:

- Tibetan population have adapted to the high altitude. Tibetans have **gene** versions that cause to produce *fewer* red blood cells. Whereas acclimatization is temporary and takes few days to happen. How is that helpful? Having
- The extra red blood cells make blood thicker-more like honey than water -and after a certain point, this cell – laden blood can actually get so thick that it doesn't pass through capillaries efficiently to oxygenate cells.
 - Blood with too many red blood cells can be particularly problematic during pregnancy.
since it is linked to slow foetal growth and high rates of **foetal mortality**
- EPAS1** is a stretch of **DNA**, which helps control the process of producing red blood cells
The change in EPAS1 seems to make Tibetans less likely to overproduce red blood cells at extreme altitudes.
- To study the process of natural selection.
- The data supports the claim that Tibetans have evolved as
 - The lowlanders (Han Chinese) have increased haemoglobin at high elevation (18.5 g/dl) in comparison to the Tibetans living at high elevation.
 - The haemoglobin level of Tibetans is almost same at sea level and high levels.

ZERO EMISSION

Area : Environment

Class: 10

Chapter: 14

Chapter Name: Our Environment.

Concept: Waste materials added to the environment.

Learning outcomes: The student will be able to

1. Advocate the use of energy efficient electrical devices to reduce air pollution.
2. Compare the pollution levels created by electricity driven vehicles and fossil fuel driven vehicles.
3. Make efforts to conserve environment.

The government of India, as a part of its commitment to reduce green house gas emission and also in view of the recurring episodes of high air pollution in major cities, has an ambitious plan to shift from petrol/diesel vehicles to electric vehicles for both public and private sector by 2030. Instead of petrol/diesel we can use electric vehicles because there is no petrol tank.



Q.1 Which type/s of pollution is/are caused by vehicular emission?

.....

Q.2 What are the advantages of electric vehicle over petrol/diesel vehicle?

.....

Q.3 "The electric vehicle has zero emissions." Comment.

.....

Q.4 Is it possible to replace all diesel/petrol cars with electric cars by 2030? Justify by giving reasons.

.....

Q.5 Give your view:

S.No.	Conditions/facts	agreed	Strongly agreed	disagreed	Strongly disagreed
(i)	Electric vehicle are cost effective.				
(ii)	Electric cars can be used for long distance driving.				

Item description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1.	Close ended	Interpret data and evidence scientifically	content	Global	Low
2.	Close ended	Explain phenomenon scientifically	Epistemic	Global	Medium
3.	Open ended	Evaluate and design Scientific enquiry	Procedural	Global	Medium
4.	Open ended	Explain phenomenon scientifically	Epistemic	Global	Medium

Answer key

Q1. Air Pollution and noise pollution

Q2. Answer contains answers which include following (any two):-

1. Pollution free
2. Fossil fuel will be exhausted soon.
3. Cost effective can be charged with solar energy

Q3. Zero emission if charged with solar power otherwise there will be emission due thermal power plants.

Q4. Correct if answered with scientific reasoning.

Frontiers of Science and Technology

BED OF NAILS: SCIENCE OF CIRCUS

Area : Frontiers Of Science And Technology

Class – 8

Chapter- 11

Chapter Name - Force And Pressure

Concept : Force And Pressure

Learning Outcomes: Students will be able to -

1. relate force pressure and area
2. apply the knowledge to day to day life.

Bed of Nails is primarily a form of entertainment in circus, side-shows and other venues. Lying on a bed of nails is an expression of a performer's stamina, bravery and imperviousness to pain. At first, it seems baffling that a person could lie on a bed of pointed nails and not be injured...but it's a matter of distributing your weight across many nails so they don't pierce you.

Pressure is the application of force over a particular area. In mathematical terms, pressure is equal to **force divided by area**.

If you step on the point of a nail, your foot exerts a tremendous amount of pressure on the nail's tiny point. As a result, the point can go straight through your foot. But a bed of nails has lots of points that are close together -- there's a lot of surface area for the body to cover. Hundreds of nails support the weight of your body instead of just one. Typically, your body doesn't exert enough pressure on any one nail for it to break the skin.



(Picture Source : Mental Floss.com)

Q1. Why can you lie down on a bed of nails without having any nail piercing your skin, but if you step on a single nail, it will go right through your foot?

- a) There is more force exerted on a single nail than the entire bed of nails.

- b) The force is the same in both cases, but there is less pressure when you lie on the bed of nails.
- c) The force is the same in both cases, but there is more pressure when you lie on the bed of nails.
- d) The area is the same in both cases, but there is more force when you lie on the bed of nails.

Q2. Match the following

Column A	Column B
a) Camel	i) Broad and Deep Foundation
b) Pressure	ii) Six or Eight Tyre
c) Truck	iii) Sharp Cutting Edge
d) High Building	iv) Broad Feet
e) Knife	v) Pascal

Q3. Shoes with stiletto heels go in and out of fashion. (Stiletto is an Italian word meaning a small and murderous dagger).



i) Stiletto heels pose many health risks to the person wearing them. The organ system likely to be the most affected is

- a) Respiratory System
- b) Circulatory System
- c) Skeletal System
- d) Nervous System

ii) Such heels can also damage floors and dance halls. Calculate the pressure exerted by a woman dancer exerting 600N force on a heel of area 1 cm^2 ($1 / 10000 \text{ m}^2$)

If the floor is damaged by pressure over 5MPa ($5 \times 10^6 \text{ Pa}$), will it be damaged?

Q4. Pick the **odd** one out :

- a) Force, Pressure, Time, Area
- b) Camel's Feet, Shoulder Straps of School Bags, Surgeon's Knife, Truck Tyres

Q5. When force is doubled and area of contact is halved, the resultant pressure becomes;

- a) halved
- b) two times
- c) four times
- d) remains the same

Q6. You are walking out on a frozen lake and you begin to hear a sound of ice cracking beneath you. Which strategy is the best for getting off ice safely?

- a) try to leap in one bound to the shore
- b) jump up and down to decrease the contact time with ice
- c) shuffle your feet without lifting them to reach the shore
- d) lie down flat on ice and crawl to the shore

Item description:

Q No.	Q type	Competency	Knowledge	Context	Difficulty
1	Close ended	Explaining phenomenon scientifically	Content	Global	Medium
2	Close constructed	Evaluating and designing scientific enquiry	Content	Global	Easy
3	i) Close ended	Interpreting data evidence scientifically	Epistemic	Global	Medium
	ii) Close ended	Evaluating and designing scientific enquiry	Procedural	Global	Medium
4	Close Constructed	Evaluating and designing scientific enquiry	Epistemic	Global	Medium
5	Close ended	Interpreting data evidence scientifically	Content	Global	Medium
6	Close ended	Interpreting data evidence scientifically	Content	Global	Medium

Answer Key :

Q1. (b) FC for correct answer and NC for incorrect answer

Q2 a - iv, b - v , c - ii, d - i, e - iii

FC for all correct answers, PC for 2 incorrect answers, FC for more than 2 incorrect answers

Q3.i) (c)

ii) Pressure exerted by a woman dancer : $P = \text{force} / \text{Area}$

$$P = 600/0.0001$$

$$= 6000000 \text{ Pa} = 6 \times 10^6 \text{ Pa} = 6 \text{ MPa which is more than } 5 \text{ MPa}$$

Thus, the dance floor will be damaged.

FC for both parts correct ,PC for one part correct and NC for both parts incorrect

Q4. a) Time b) Surgeon's Knife

FC for both options correct, PC for one option correct, NC for both options incorrect

Q5. (c) FC for correct answer and NC for incorrect answer

Q6. (d) FC for correct answer and NC for incorrect answer

SOUND IN SPACE

Area: Frontiers Of Science And Technology

Class: 8

Chapter No: 13

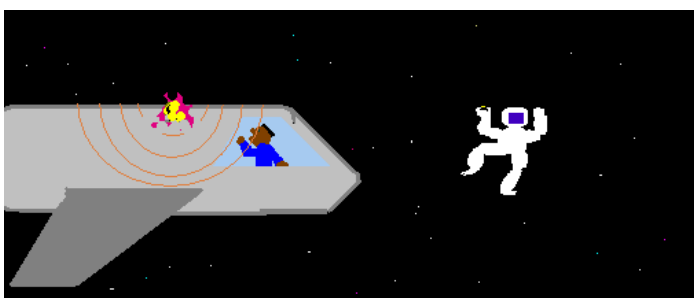
Chapter Name: Sound

Concept: Sound and Medium

Learning Outcomes: The student will be able to:

1. understand that the material medium is necessary for propagation of sound
2. recognize scientific principle and evidences involved

[This is an observation that astronaut when travel in space encounters difficulty in talking with



another astronaut when both are outside the space ship, but they easily talk with each other when inside a space ship. As you can see in figure that waves are travelling from one place to another inside the space ship but not to an astronaut outside the space ship.]¹[NASA is an agency which is known for research and exploration in space

science and world's largest research agency of USA. According to NASA there is a sound in the space and we need special arrangements to hear or record these sounds i.e. haunting the sound.]²[This is amazing that NASA has recorded various sounds in space, recording instruments should be such that they provide material medium to trap or haunt the sound. These instruments are developed on the principle of integrated approach where all the important parameters are taken in to consideration.]³

Question 1:- Why two astronauts are able to talk inside space ship but not outside the space ship.

- a) There is some gaseous medium inside the space ship but not outside the space ship
- b) There is some air or oxygen inside the space ship but not outside the space ship
- c) Sound waves travel inside the space ship but not outside the space ship
- d) There exists a sound in the space but we don't hear because of absence of medium in space.

Question 2: What is the basic requirement of a device used to record a sound in space?

- a) Integrated approach involving material medium to record a sound in space.
- b) All the parameters necessary for recording a sound in space must be incorporated in a device.
- c) There should be availability of medium between source and receiver.
- d) There should be an amplifier circuit to trap or haunt the sound in space.

Question 3: Which part of passage indicates that recording of sound in space is not a simple task but this needs a special devices and arrangements.

- a) 1,2
- b) 2
- c) 2, 3
- d) 3

Item Description:

Q no .	Question type	Competency	Knowledge	Context	Difficulty Level
Q 1	Close ended	Explain phenomenon scientifically	Procedural	Personal	Medium
Q 2	Close ended	Interpret data and evidence scientifically	Procedural	Personal	Medium
Q 3	Close ended	Identifying evidence needed in a scientific investigation	Procedural	Personal	Medium

Answer key and Score Key

Q1). All a, b, c and d

- Score 2 if response is all a, b, c and d
- Score 1 if a, b and d are correct
 - Score 0 for any other response

Q2). a and b

- Score 2 if answer is a or b
- Score 1 if answer is a, b, c and d or any other responses having either a or b
- Score 0 if answer is c and d

Q3). c or b and d

- Score 2 if response is either c or both b and d only
- Score 1 if response is either b or d
- Score 0 if any other response

FRICTION AND SPORTS

Area: Frontiers for science and technology

Class – 8

Chapter- 12

Chapter Name: Friction

Concept : Friction

Learning Outcomes: Students will be able to

1. relate phenomenon with routine life
2. interpret the context
3. explain the phenomenon scientifically.

There are two types of friction, static friction and kinetic friction. Kinetic friction is the friction force when the object is moving or sliding. Air resistance is also a type of friction.



The force due to friction is generally independent of the contact area between the two surfaces. This means that even if you have two heavy objects of the same mass, where one is half as long and twice as high as the other one, they still experience the same frictional force when you drag them over the ground. This makes sense, because if the area of contact doubles, you may think that you should get twice as much friction. But when you double the length of an object, you halve the force on each square centimetre, because less weight is above it to push down. Note that this relationship breaks down when the surface area gets too small, since then the coefficient of friction increases because the object may begin to dig into the surface.

Friction is a force that is apparent in every sport, for example; a boat will have friction force when moving through water, a runner will experience a level of friction between their body and the air, a cyclist will have friction acting on their tyres...

In order to try and establish which sport has the most friction involved you could look at sports that have equipment specifically designed to reduce the effects of friction. A good example of this would be swimming, there are no rules in swimming as to the kind of swimsuit that can be worn, as there are some suit designs that decrease the effects of friction, and therefore are advantageous in competition.

If we use the premise that sports that involve air and water have the most friction, then that narrows the field down. Examples of these could be Swimming, Kayaking, Canoeing and Rowing.

Q1. What are different kinds of frictions mentioned in the above paragraph?

Q2. Give the name of sports where friction with air and water is mentioned in the paragraph.

Q3. How area of contact between two bodies affect force of friction?

Q4. Mention the sport you play and describe briefly how friction is involved in that sport? What possible way you adopt to use it effectively?

Item Description:

Q.No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Close ended	Explain phenomenon scientifically	Content	Global	Low
2	Close ended	Explain phenomenon scientifically	Content	Global	Medium
3	Close ended	Explain phenomenon scientifically	Content	Global	Medium
4	Open ended	Evaluate and design scientific enquiry	procedural	Personal	Medium

Answer Key:

A1. Static, kinetic (**FC**) ; Any one (**PC**)

A2. Runner, Swimming, Kayaking, Canoeing and Rowing. (**FC**); Any Three (**PC**)

A3. Area has no role to play unless its very small (**FC**); No role (**PC**)

A4. Open ended

Child would mention the sport he plays and expected to mention friction during running, holding, jumping, stopping etc. (**FC** – for any three relevant to sport)

FASCINATING WORLD OF SOUND

Area: Frontiers for science and technology

Class – 8

Chapter- 13

Chapter Name: Sound

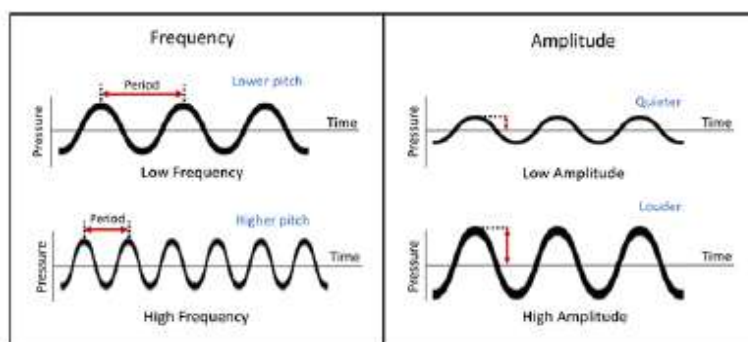
Concept : Vibrating Body Sound

Learning Outcomes: Student will be able to –

1. differentiate between various human Sound and also know the cause behind it like pitch, loudness, amplitude etc;
2. identify difference in various sounds;
3. draw conclusion regarding cause and effect;
4. draw conclusion about audible range of human ear.



We can recognize many familiar sounds without seeing the objects producing them. These sounds must be different to enable you to recognize them. Fire alarms / sirens are loud, whispers are soft and every one of your friends has a different voice. The differences between sounds are caused by mainly due to difference in amplitude and frequency. Frequency is expressed in hertz and its symbol is Hz. A frequency of 1 Hz is one oscillation/vibration per second. Loudness is measured by



amplitude, when amplitude of vibration is large the loud sound is produced, loudness cannot be assigned a specific number but intensity of sound is measured in decibels. A whisper is about 10 decibels intensity sound and sounds with intensities above 84 decibels may damage your ears. If a sound is loud enough over 120 decibels intensity then it can be painful to

listen to, this is the threshold of pain. The frequency determines the pitch of sound. Drum produces a sound of low pitch on the other hand a whistle produce a sound of high pitch. A bird makes a high pitched sound whereas a lion makes a low pitched roar. The roar of a lion is very loud while sound of the bird is quite feeble. This science of sound (acoustics) is very interesting and is useful in

understanding the types of sound and also helpful in making various musical instruments also. This science is an integral part of our life and creates fascinating world of sound around us.

Q1. Sound of siren and whistle are different as we perceive and can be easily differentiated, this difference is mainly due to

- a) different amplitude and frequency
- b) different amplitude only
- c) different frequency only
- d) difference in ear structure of humans

Q2. The symbol of unit of frequency is

- a) hz b) Hz c) HZ d) Hertz

Q3. Which factor determines the loudness of sound? Explain briefly.

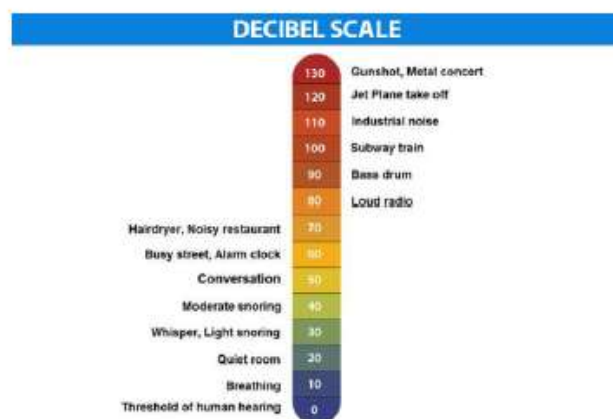
Q4.High amplitude sounds definitely have:

- a) High energy Yes/No
- b) High pitch Yes/No
- c) More loudness Yes/No
- d) High frequency Yes/No

Q 5 Acoustics is a science of

- a) studying the sound and its causes (agree/disagree)
- b) studying cause hearing impairment (agree/disagree)
- c) understanding the types of sound (agree/disagree)
- d) making various musical instruments (agree/disagree)

Q 6 Study the following figure and choose appropriate responses



- a) Gunshot sound can be painful to ears to listen (correct/incorrect)
- b) Threshold of human hearing is 10 decibel (correct/incorrect)

c) Threshold of human hearing is < 10 decibel (correct/incorrect)

d) Whispering and breathing sounds are equal in decibels (correct/incorrect)

Item Description:

Q.No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Close ended	Explain phenomenon scientifically	Content	Global	Medium
2	Close ended	interpreting data and evidence scientifically	Content	Global	Medium
3	Close ended	Explain phenomenon scientifically	Content	Global	Medium
4	Close ended	interpreting data and evidence scientifically	Content	Global	Medium
5	Close ended	Explain phenomenon scientifically	Content	Global	Medium
6	Close ended	interpreting data and evidence scientifically	Content	Global	Medium

Answer Key

1). a

2). b

3). answer should be strictly in accordance with the passage

4). a) yes b) no c) yes d) no

5). a) agree b) disagree b) agree c) agree

6). a) correct b) incorrect c) correct d) correct

AVERAGE SPEED CAMERA

Area: Frontiers of Science and Technology

Class: 9

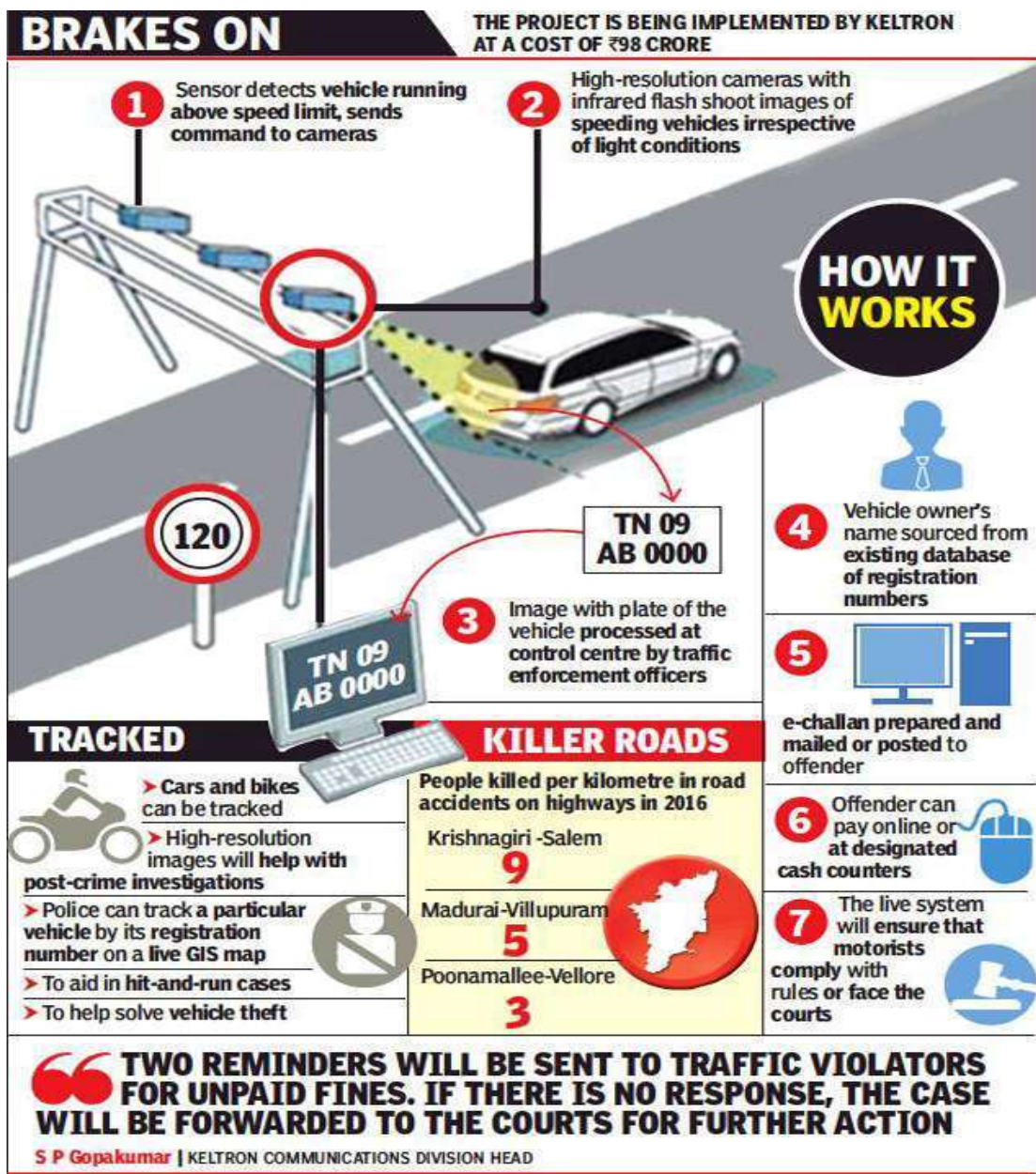
Chapter : 8

Chapter Name : Motion

Concept: Understanding Speed Camera

Learning Outcomes:- Student will be able to:

1. derive a relationship between speed, time and distance.
2. understand the relationship between breaking distance and speed
3. analyse the reason for road accidents



(Picture 1)

Image Source:-Time of India

Average Speed cameras are used to determine if a vehicle is moving faster than the prescribed speed limit for the road. They work by using an automatic number plate recognition (ANPR) system to record a vehicle's front number plate at each fixed camera site. As the distance is known between these sites, the average speed can be calculated by dividing this by the time taken to travel between two points.

Q.1 Write down the formula to calculate speed?

Q. 2 The speed limit for a car driven on national highways is 25m/s (90 Km/hr). Calculate the distance travelled by car in 15 s at the given speed?

Q. 3 If the car covers 600m (Distance between two fixed average speed camera points) in 20 seconds. Find out whether the car is speeding or not. Shall there be challan for this?

Q. 4 Can the following conclusions be drawn from the Information given in the Picture 1? Circle “Yes “or “No “or each conclusion

Can this conclusion be drawn from the Picture 1	Yes or No
All kinds of vehicles can be tracked by this system.	Yes/ No
Speed violators can also tracked at night time.	Yes/ No
All the roads will have to be remetaled or resurfaced.	Yes/No

Q. 5 Do you think this will help in preventing road accidents? Give argument in favour or against it?

Q. 6 (Attitude) How much do you agree with the following statement? Tick only one box in each row.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Average speed cameras should be installed on all the roads of India.				
Installation of these cameras would end the rash driving by regular offenders.				
It is not possible to administer the no. of cases through e-challan as most of people are not tech-savy.				

Item Description:

S.No	Item Type	Competency	Context	Knowledge	Difficulty Level
1	Close ended	Explain phenomenon scientifically	global	content	Low
2	Close ended	Interpret data and evidence scientifically	global	procedural	Medium
3	Close ended	Interpret data and evidence scientifically	global	procedural	Medium
4	Close ended	Explain and design scientific enquiry	global	epistemic	Medium
5	Open ended	Interpret data and evidence scientifically	personal	epistemic	Medium
6	Open ended	Interpret data and evidence scientifically	personal	epistemic	Medium

Answer Key:**Scoring Q1****Full credit**

Speed= Distance/Time

No Credit

Any other answer.

Scoring Q2**Full credit**

375m or 0.375 Km

No Credit

Any other response

Scoring Q3**Full credit**

Speed:- $\frac{300}{10} = 30\text{m/s}$, Yes Speeding, Yes Challan should be issued

No Credit

Any other response

Scoring Q4

Full credit Yes, Yes, No **No Credit**

Any other response

Scoring Q5

Full credit Argument in Favour **Partial Credit** Argument against it **Scoring Q6**

Full credit

Disagree, Agree, Disagree

Partial Credit

Any Deviation from Answer.

COMMERCIAL UNIT OF ENERGY

Area: Frontiers of Science and Technology

Class: 9

Chapter : 11

Chapter Name: Work And Energy

Concept: Unit and Measurement

Learning Outcomes:-

Student will be able to:

1. calculate the BoT units (energy/tariff) consumed in a month from electricity bill
2. differentiate the electrical energy consumed in domestic and commercial sites.
3. apply scientific concept in daily life.

To express large quantities of energy we use a bigger unit of energy called kilowatt hour (kW h). What is 1 kW h? Let us say we have a machine that uses 1000 J of energy every second. If this machine is used continuously for one hour, it will consume 1 kW h of energy. Thus, 1 kWh is the energy used in one hour at the rate of 1000 J s^{-1} (or 1 kW).

$$1 \text{ kW h} = 1 \text{ kW} \times 1 \text{ h}$$

$$= 1000 \text{ W} \times 3600 \text{ s}$$

$$= 1000(1\text{Js}^{-1}) \times 3600 \text{ s}$$

$$= 3600000 \text{ J}$$

$$1 \text{ kW h} = 3.6 \times 10^6 \text{ J.}$$



The energy used in households, industries and commercial establishments are usually expressed in kilowatt hour. For example, electrical energy used during a month is expressed in terms of 'units'. Here, 1 'unit' means 1 kilowatt hour.

Based upon the knowledge gained from above information and your day to day life experiences answer the following questions:-

Q.1 Monthly consumption of electrical energy in houses, factories etc. is expressed as

Q.2 (i) 1 Hour = seconds

(ii) 1KW= Js⁻¹

(iii) 1KWh = J

Q.3 An electric bulb of 60 W is used for 6 hours per day. Calculate units of energy consumed by the bulb in one day.

Q 4. a) Using the electricity bill given in the picture, find out the total energy consumed in the months November- December 2020.

Meter No.	Make	Capacity	Digit	Meter Status	Bill Status
100001765941-8145055	Avon Meters Pvt.Ltd	(0)	6	O	NORMAL
Connected Load(kW)	Category	Security Cons. Amount	Meter Security	Interest of Security	Concession Units
5	SAP-SBM-DS-GEN	-1850	-625	0	0
Reading Date	Reading	Multiplier	Old Meter Units Consumed (kWh):0		
New	Old	New	Old	Current Meter Units Consumed (kWh):264	
16-DEC-2020	25-Oct-2020	16397	16133	1	Total Units Consumed (kWh):264
(A) Fixed Charges	(a) Load(80%)	(b) Rate/kW/Month	(c) Bill Period	FC = a x b x c x 12/366	
	4	60	52	409	
(B) Energy Charges	Units	Rate/kWh	Amount	Total Energy Charges	
100kWh/month	173	4.49	776.77	1354	
101-300kWh/month	91	6.34	576.94		
301-500kWh/month	0	0	0		
above 500kWh/month	0	0	0		
(C) FCA	Units	Rate kWh	Amount		
	0	0	0		
*Additional Surcharge	264	0.3	79		
(D) Rentals	Meter Rentals	MCB Rentals	Other	SGST	CGST
	14	7	0	1.89	1.89
(E) Taxes	ED	IDF	Municipal Tax	Cow Cess	Others
	239	92	37	0	0
(F) Previous Adjustment Amount	Fixed Charges	Energy Charges	FCA + Rentals	Taxes	Total
	0	0	0	0	0
(G) Previous Unpaid Bill Arrears	Pending Amount	Late Payment Surcharge	Interest	Others	Total
	0	0	0	0	0
(H) Sundry Charges	Fixed Charges	Energy Charges	FCA + Rentals	Taxes	Total
Notice No: 0	0	0	0	0	0
Date: /00/0000					
(I) Sundry Allowance	Fixed Charges	Energy Charges	FCA + Rentals	Taxes	Total
Notice No: 0	0	0	0	0	0
Date: 0					
(J) Subsidy	Subsidised Units	Others	GoP Subsidy Amount		
	0		0		
(K) SC WSD Amount Withheld 0	(L) Net Bill Amount Payable (A + B + C + D + E + F + G + H + I + J + K)			Rs.2230/-	
				Two Thousand Two Hundred Thirty Rupees Only	
DueDate Cash/Online	DueDate Cheque/DD	Amount Payable by due date	Late Payment Surcharges @2% of unpaid bill	Amount Payable upto 15 days after due date	
31-Dec-2020	29-Dec-2020	Rs. 2230	Rs. 45	Rs. 2275	
Consumption History for 6 Cycles					
Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
921	914	1028	425	301	540
Payment History:					
7790.00/- Dated : 20201027	0	0	0	0	0
Message:					
1. PSPCL Electricity Bill Payments exceeding Rs. 50,000/- shall be accepted in digital mode only w.e.f. 01.07.2019					
2. **Surcharge arising out of the judgment and order dated 07.08.2019 passed by the Hon'ble Supreme Court in Contempt Petition (Civil) Nos. 1766-1767 of 2018 filed by TSPL and Contempt Petition (Civil) Nos. 1277-1278 of 2018 filed by NPL -					

- b) In which of the cycles energy consumption was highest and in which it was lowest.
- c) Calculate the average energy consumed in six cycles.
- d) The total energy charges are Rs. 1354 and excise duty on it is Rs. 239. How much percentage is contributed by excise duty to the total electricity bill?

Item Description:

Q no .	Question type	Competency	Knowledge	Context	Difficulty level
Q1	Close ended	Interpret data and evidence scientifically	Content	Global	Low
Q 2	Close ended	Interpret data and evidence scientifically	Content	Global	Medium
Q 3	Close ended	Interpret data and evidence scientifically	Procedural	Global	Medium
Q4	Close ended	Interpret data and evidence scientifically	Procedural	Local	High

Answer/Scoring key:

Answer 1 1KWh.

Answer 2 (i) 3600 seconds

(ii) 1000

(iii) 3.6×10^6

Answer 3 Unit or KWh both are correct.

Answer 4 Power of electric bulb = 60 W

= 0.06 kW. Time used, $t = 6$ h

Energy = power \times time taken = $0.06 \text{ kW} \times 6 \text{ h} = 0.36 \text{ kW h} = 0.36$ 'units'.

The energy consumed by the bulb is 0.36 'units'.

HARNESSING SOLAR POWER

Area: Frontiers of Science and Technology

Class: 10

Chapter : 14

Chapter Name : Sources Of Energy

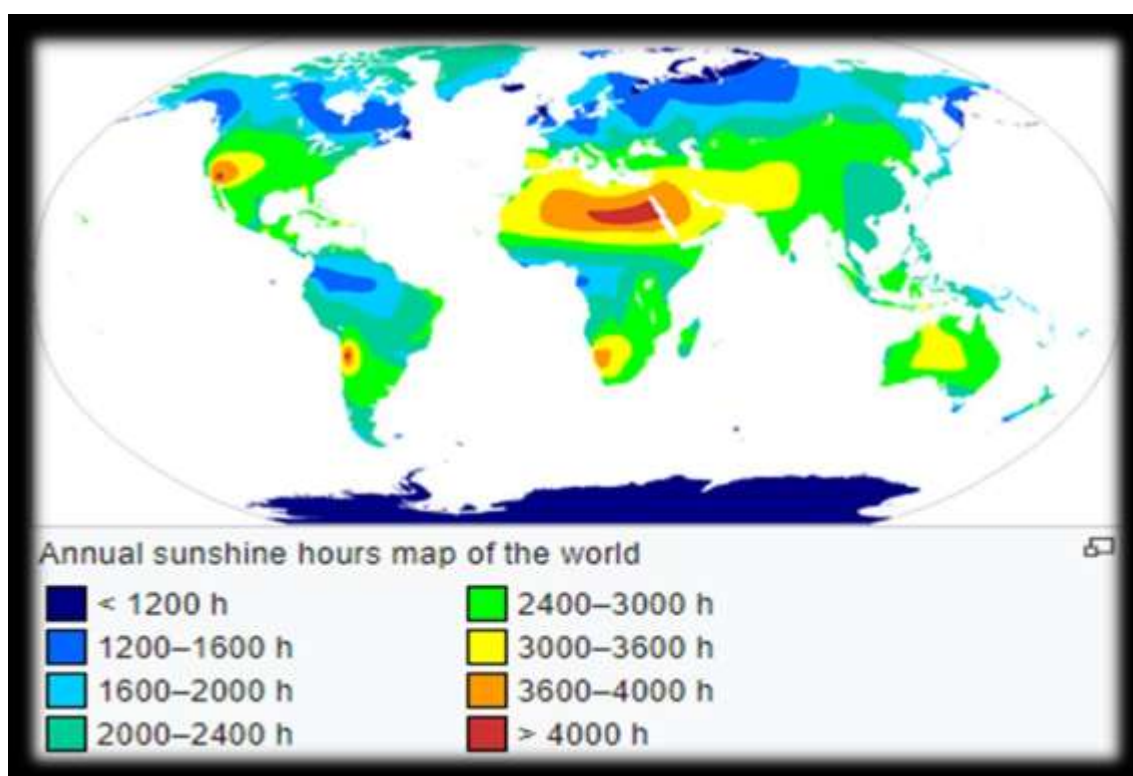
Concept: Harnessing Solar Energy

Learning Outcomes:-

Student will be able to:

1. understand the amount of solar energy received with latitude and longitude,
2. understand the use of renewable resources.

Annual sunshine hours map of the world is given. Sunshine duration follows a general



geographic pattern: subtropical latitudes (about 25° to 40° north/south) have the highest sunshine values.

Q1. Name a few countries, which can trap solar power by making solar farms?

Q2. Find out the annual sunshine (in hours) range that is received by India?

Q3. Can the following conclusions be drawn from the Information provided? Circle “Yes”

or “No” or each conclusion

Can this conclusion be drawn from the Database 1	Yes or No
Subtropical region suits best for windmill installation.	Yes/ No
June and July are the months having highest average sunny hours	Yes/ No
India is suitable for installation of solar plants and solar farms	Yes/No

Q4. Do you think India is suitable for harnessing solar power? Justify your opinion.

Q5. How much do you agree with the following statement? Tick only one box in each row.

	Strongly Agree	Agree	Disagree	Strongly Disagree
Govt. should provide subsidy at a higher rate for installation of solar plants.				
Govt. should enforce strictly the installation of solar plant on roofs of the houses and buildings having areas more than 600 sq. yards.				
Subsidies on fossil fuels like diesel, LPG should continue.				

Item Description:

S.No	Item Type	Competency	Context	Knowledge	Difficulty Level
1	Close ended	Explain phenomenon scientifically	Global	Context	Low
2	Close ended	Interpret data and evidence scientifically	Global	Context	Medium
3	Close ended	Interpret data and evidence scientifically	Global	Procedural	Medium
4	Open ended	Explain and design scientific enquiry	Local	Epistemic	Medium
5	Open ended	Interpret data and evidence scientifically	Personal	Epistemic	Medium

Answer Key:**Scoring Q1**

Full credit: Countries in the subtropical region. Mainly desert countries such as Egypt, Sudan, Libya, Chad, and Niger, India etc.

No Credit: Countries in other regions.

Scoring Q2

Full credit: 2400 to 3600 hrs **No Credit:** Any other response

Scoring Q3

Full credit: No, No, Yes

No Credit: Any other response

Scoring Q4

Full credit: Argument in favour

Partial credit: Argument against it

Scoring Q5

Full credit: Strongly Agree, Strongly Agree, Strongly Agree, Strongly Disagree

Partial credit: Any Deviation From Answer

QR CODE AND BARCODE SCANNER

Area: Frontiers of Science and Technology

Class: 10

Chapter: 10

Chapter Name: Light: Reflection and Refraction.

Concept: Reflection.

Learning outcomes:

The student will be able to

1. Differentiate between a bar code scanner and a QR code scanner.
2. Discuss and appreciate stories of scientific discoveries like mobile communication QR codes.
3. Conduct simple investigations to seek answers to queries.
4. Explain the process and phenomena of reflection and signal communication scientifically.

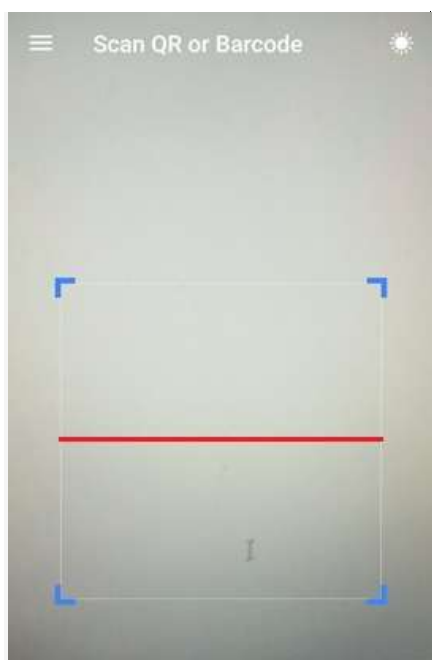


Figure 1



Figure 2

QR code (Quick Response code) is the trademark for a type of matrix barcode first designed in 1994 for the automotive industry in Japan.

Bar code and QR Code technique is fascinating, innovative and very useful to share information. A barcode scanner has three parts: the illuminator, the decoder, and the sensor/convertor. The barcode scanner first illuminates the barcode with red light and sensor/convertor part of the scanner then detects the reflected light. Once the light is detected, an analog signal is produced. This signal is electrical in nature and contains varying voltage based on the intensities of the reflected light. Next the analog signal is converted into a digital

signal by the sensor. Decoder interprets the digital signal, finally the decoder then sends the information to the computer attached to the scanner.

There is one difference that in QR code scanner, the decoder sends the information to your mobile phone instead of a computer. The mobile application which you download for your phone from Google play store that is a QR code scanner contains the illuminator, which is the red light that runs across the screen when you open the app (screen shot shown in figure No 1).The sensor and decoder then work to decode the QR code. Then the decoder sends the information to your phone, and you will be able to see where the QR code was supposed to take you.

The way the scanner reads the reflected light it actually a lot more complicated than the way that it is simply described here, but it's very interesting that all you have to do is download a free application and now your phone is a Barcode/QR code scanner. Since this scanning technology is so easily accessible with most phones, QR codes as a marketing tool seems like they will be around for a while.

Activity: Scan the QR Code provided above in figure 2 and discuss with your teacher (Optional)

(Source : Wikipedia and <http://www.qrcodestickers.org/>)

Q1. Enlist the differences between Barcode scanner and QR Code scanner?

Q2. Which of the optical phenomenon is applied in Barcode scanner and QR Code scanner respectively:-

- | | |
|----------------------------|----------------------------|
| a) Reflection , Refraction | b) Refraction, Reflection |
| c) Reflection, Reflection | d) Refraction, Refraction |

Q3. State whether the following statements are true or false:-

- a) A barcode scanner is composed of two parts: the illuminator, and the sensor/convertor.
- b) A QR Code scanner is composed of three parts: the illuminator, the decoder, and the sensor/convertor.
- c) Smart phone can read both QR Code and Bar Code.
- d) Sensor/convertor part of the scanner detects the reflected light and then , an analog signal is generated.

Q4. Steps of procedures take place in Bar Code Scanner are given below, arrange them in correct sequence

1. Barcode scanner illuminates the barcode with red light.
2. The sensor/convertor part of the scanner then detects the reflected light.
3. Once the light is detected, an analog signal is generated.
4. The analog signal is converted by the sensor into a digital signal.
5. The digital signal is then interpreted by the decoder.

6. The decoder then sends the information to the computer attached to the scanner.

a) 1,3,2,4,5,6

b) 1,2,3,4,5,6

c) 2,1,3,4,6,5

d) 3,1,2,4,5,6

Q5. Light of which colour is used in Barcode scanner and QR Code scanner respectively:-

a) Red Light, White Light

b) Red Light, Red Light

c) White Light , Red Light

d) White Light, White Light

Q6. What information do you receive while scanning QR code?

Item Description:

Q.No.	Q.Type	Competency	Knowledge	Context	Difficulty Level
1	Open Ended	Interpret Data and evidence Scientifically	Content	Personal	M
2	Simple Multiple Choice	Interpret Data And Evidence Scientifically	Content	Personal	M
3	Closed Constructed	Explain Phenomenon Scientifically	Procedural	Personal	M
4	Simple Multiple Choice	Evaluate And Design Scientific Enquiry	Procedural	Personal	H
5	Simple Multiple Choice	Interpret Data And Evidence Scientifically	Procedural	Personal	M
6	Open Ended	Evaluate And Design Scientific Enquiry	Procedural	Personal	M

Answer/Scoring Key

Q 1 Full marks for two differences, Partial marks for one difference. No marks for irrelevant and vague responses.

Q 2 Ans c, Full credits for correct answer, No credit for any other response.

Q 3 Ans F,T,T,T Full credits for all correct answers, Partial credits for less than four correct answer in ratio.

Q 4 Ans b, Full credits for correct answer, No credit for any other response.

Q 5 Ans b, Full credits for correct answer, No credit for any other response.

Q 6 Optional

ELECTRIC FUSE

Area: Frontiers of Science and Technology.

Class: 10

Chapter: 13

Chapter Name: Magnetic Effects of Electric Current.

Concept: Magnetic Effects of Electric Current.

Learning outcomes:

The student will be able to

1. differentiate between a short circuit and overloading.
2. relate the rating of the electric fuse required for a particular circuit.
3. explain the working of an electric fuse.
4. apply the knowledge of working of fuse in day to day life.

Electric fuse is a safety device used in electric circuits to protect the circuit and appliances from damage due to overloading and short circuiting. It is a wire having high resistance and low melting point. If excess current flows through the circuit, the fuse wire melts and breaks the circuit. Fuse wire is made of a metal or an alloy of metals like lead, tin, aluminium and copper. Fuse wire is connected in series with the live wire.



FUSE



MCB

These days more and more houses are using 'Miniature Circuit Breakers' (MCBs) to protect the household wiring from the excessive flow of electric current through it. If the current becomes too large, the miniature circuit breaker puts off a switch cutting off the electric supply. The MCB can be re set when the fault has been corrected.

Fuses are also used to protect the individual domestic electrical appliances from damage which may be caused due to excessive current flow through them. Costly electrical appliances like T.V. sets and refrigerators have their own fuses which protect them against damage by too much current. The fuse used for each electrical appliance should be slightly larger than the normal current drawn by it.

1. At the time of short circuit, the current in the circuit:

- a) Reduces substantially
 - b) Does not change
 - c) Increases heavily
 - d) Varies continuously
2. Which of the following statements is not true?
- a) In a house circuit, lamps are used in parallel.
 - b) Switches, fuses and circuit breakers should be placed in the neutral wire.
 - c) An electric iron has its earth wire connected to the metal case to prevent the user receiving a shock.
 - d) When connecting a three core cable to a 13 A three pin plug, the red wire goes to the live pin.
3. Which of the following would be most suitable for protecting an amplifier rated at 240V, 180W?
- a) 250mA b) 500mA c) 1 A d) 5 A
4. An MCB which cuts off the electricity supply in case of short circuiting or overloading works on the:
- a) Magnetic effect of current
 - b) Chemical effect of current
 - c) Heating effect of current
 - d) Electroplating effect of current
5. Daksh was given two thin wires X and Y in the science laboratory. The teacher asked him to find out (by performing suitable activities) which wire was 'fuse wire' and which one a 'nichrome wire'. Daksh was given batteries of 3 V and 12 V, and some copper connecting wires along with crocodile clips. The teacher also advised Daksh to put off fan while performing the activities and take necessary precautions to avoid burns. Daksh performed the activities and concluded that wire X is a fuse wire whereas wire Y is a nichrome wire.
- a) Describe briefly the activity which Daksh could have performed to conclude that wire X is a fuse wire.
 - b) Describe briefly the activity which Daksh could have performed to conclude that wire Y is a nichrome wire.

Item description:

Q. No.	Q Type	Competency	Knowledge	Context	Difficulty Level
1.	Close ended	Explain phenomena scientifically	Content	Global	Low
2.	Close ended	Explain phenomena scientifically	Content	Global	Medium
3.	Close ended	Explain phenomena scientifically	Content	Global	Medium
4.	Close ended	Explain phenomena scientifically	Content	Global	Medium
5.	Close ended	Evaluate and design scientific enquiry.	Procedural	Global	High

Answer key:

1. (c) Increases heavily
2. (b) Switches, fuses and circuit breakers should be placed in the neutral wire.
3. (c) 1 A
4. (a) Magnetic effect of current
5. (a) Daksh first connected the wire X in series circuit with 3 V battery. The wire got heated a little but did not glow. Daksh then connected wire X in series with 12 V battery. He found that wire X got heated too much, melted and broke into two pieces. So wire X is a fuse wire.
(b) Daksh first connected the wire Y in series circuit with 3 V battery. He found that the wire got heated and became dull red. Daksh then connected wire Y in series with 12 V battery. He found that wire Y got heated too much and started glowing bright red. This shows that the wire Y is like the heating element of an electric heater and hence made of nichrome.

Scoring key:

1. Full credit: option (C)
No credit: any other response.
2. Full credit: option (B)
No credit: any other response.
3. Full credit: option (C)
No credit: any other response.
4. Full credit: option (A)
No credit: any other response.
5. (a) Full Credit: Daksh first connected the wire X in series circuit with 3 V battery. The wire got heated a little but did not glow. Daksh then connected wire X in series with 12 V battery. He found that wire X got heated too much, melted and broke into two pieces. So wire X is a fuse wire.
No credit: Any other response.
(b) Daksh first connected the wire Y in series circuit with 3 V battery. He found that the wire got heated and became dull red. Daksh then connected wire Y in series with 12 V battery. He found that wire X got heated too much and started glowing bright red. This shows that the wire Y is like the heating element of an electric heater and hence made of nichrome.
No credit: Any other response.

Hazards

DESTRUCTIONS CAUSED BY CYCLONE

Area: Hazards

Class: 8

Chapter: 8

Chapter Name: Winds, Storms and Cyclone

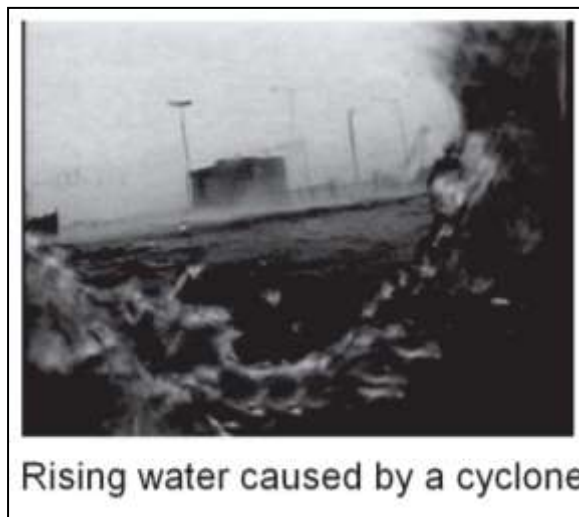
Concept: Destructions caused by Cyclone

Learning outcomes: The student will be able to:

1. Explain the destructions caused by cyclone.
2. Relate the hazard caused by other natural disasters.
3. Apply his learning's to hypothetical situations in day today life.

Cyclones can be very destructive. Strong winds push water towards the shore even if the storm is hundreds of kilometres away. These are the first indications of an approaching cyclone. The water waves produced by the wind are so powerful that a person cannot overcome them. A cyclone is known by different names in different parts of the world. It is called a 'hurricane' in the American continent. In Philippines and Japan it is called a 'typhoon'.

The low pressure in the eye lifts water surface in the centre. The rising water may be as high as 3–12 meters.



Rising water caused by a cyclone

Source: NCERT text book

It appears like a water-wall moving towards the shore. As a result, the seawater enters the low-lying coastal areas, causing severe loss of life and property. It also reduces the fertility of the soil.

Continuous heavy rainfall may further worsen the flood situation. High-speed winds accompanying a cyclone can damage houses, telephones and other communication systems, trees, etc., causing tremendous loss of life and property.

Q.1 What is the first indication of an approaching Cyclone?

.....
.....

Q.2 In the American continent, a cyclone is called..... whereas it is called 'typhoon' in.....

Q.3 The height of rising water during a cyclone may be metre.

Q.4 Make a list of major destructions caused by Cyclones.

Q5. In which of the following parts of the tropical cyclone, wind speed attains maximum value, that is typically 15 to 30 Km from the centre of the storm:

- (a) Eye
- (b) Eye wall
- (c) Warm core
- (d) None of the above

Item Description:

Q.no .	Question type	Competency	Knowledge	Context	Difficulty level
1	Closed constructed	Explain phenomenon scientifically	Content	Global	Medium
2	Closed constructed	Explain phenomenon scientifically	Content	Global	Low
3	Closed constructed	Explain phenomenon scientifically	Content	Global	Low
4	Open ended	Evaluate and design scientific enquiry	Content	Global	Medium
5	Closed ended	Interpret data and evidence scientifically	Content	Global	Medium

Answer key:

Ans.1. Strong winds push water towards the shore even if the storm is hundreds of kilometres. away.

Ans. 2. 'Hurricane', Philippines and Japan

Ans. 3. 3–12 meters

Ans. 4. The seawater enters the low-lying coastal areas, causing severe loss of life and property. It also reduces the fertility of the soil. Continuous heavy rainfall may further worsen the flood situation. High-speed winds accompanying a cyclone can damage houses, telephones and other communication systems, trees, etc., causing tremendous loss of life and property.

Ans. 5. Option B

E-WASTE

Area: Hazards

Class : 8

Chapter :

Chapter Name: Environment

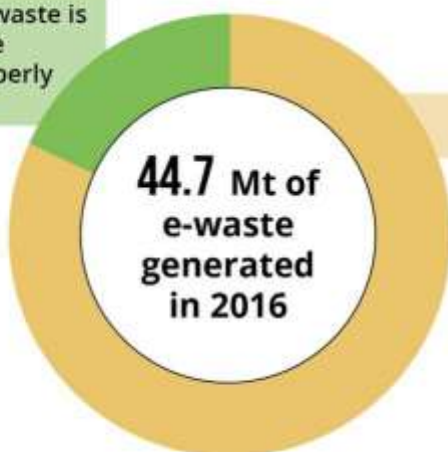
Concept : E- Waste

Learning Outcome:

Students will be able to relate processes and phenomenon with causes.

Collection methods of e-waste in 2016

20% (8.9 Mt) of e-waste is documented to be collected and properly recycled



80% (35.8 Mt) of e-waste is not documented

- 4% (1.7 Mt) of e-waste in the higher income countries is thrown into the residual waste
- The fate of 76% (34.1 Mt) of e-waste is unknown; this is likely dumped, traded, or recycled under inferior conditions

The Global eWaste Monitor 2017



UNITED NATIONS
UNU-VIE SCYCLE
Sustainable Development

ISWA
International Solid Waste Association

The advancement in technology and changing lifestyle, status or perception of consumers has driven the demand of electronic items. Consumers' dependency on information and communication technology has been increasing very rapidly. The new innovations in information technology because of the rising demand for higher efficiency and productivity in the businesses and work have become a matter of day to day life. Technologies which were new yesterday have become obsolete for today.

The increase in demand for "White Goods segment" i.e. on consumer durables such as television sets, microwave ovens, calculators, air-conditioners, servers, printers, scanners, cellular phones, computers etc. is for obvious. Thus, there can be broad range of waste electric and electronic goods which have outlived their use, ready for disposal.

These contain chemical materials considered hazardous for human well beings and natural environment. The increasing rate of waste electronic products and additionally the illegal

import of junk electronics from abroad create a complex scenario for solid waste management in India.

Q1: What according to you is e-waste? (Tick the correct answer/s)

1. Waste generated by emails in the trash box
2. Waste collected in the school , home or at community level
3. Waste generated by electronic goods we use and throw
4. Waste caused due to all the electrical gadgets we use at home
5. Waste caused because of both electrical and electronic gadgets

- A) 1 only
 B) 2 only
 C) 3, 4 and 5
 D) None of the above

Q2: Identify some of the e-waste which are generated at school level and at your home level or at both levels and place it in the appropriate column. Encircle the one which does not cause any waste.

HAIR DYER	LCD	CHIMNEY	E-BOOKS	SOAPS
WASHING MACHINES	CFL	WOODEN BENCHES	MOBILE	
CALCULATOR	SOLAR PANNEL	TUBELIGHTS	CARS	
AIRCOOLERS	STABILIZERS	FRIDGE	ELECTRONIC BELLS	
E-MAIL	ELECTRONIC IRON	LAPTOP	SPEAKERS	AT SCHOOL LEVEL
LEVEL	BOTH LEVELS			AT HOME

AT SCHOOL LEVEL	AT HOME LEVEL	BOTH LEVELS

Q3: By looking at the picture shown above can you fill in the table given below

	PERCENTAGE	METRIC/TONS
TOTAL E-WASTE GENERATED GLOBALLY		
E-WASTE PROPERLY RECYCLED		
E-WASTE NOT PROPERLY DOCUMENTED		
E-WASTE WHICH IS DUMBED		

Q4: What according to you are the possible reasons of the increased usage of white goods segment, which has contributed to e-waste globally?

Q5: Let's imagine that the total waste generated in 2020 at global level increases to 50 metric tonne. If percentage remains same of the documented and undocumented waste then find out the following

Waste generated	In percentage	In metric tonne
1. That can be recycled		
2. That cannot be Recycled		

Q6: Give your suggestions which you think is appropriate related to the above given scenario:

Statement	Agree	Strongly Agree	Disagree	Don't know
We should change our life style to solve this global issue				
Every single person's Contribution will not affect				

Its a global concern which should be dealt very seriously				
We should stop using technology with immediate affect				
Recycling changes the quality of the substance				

Item Description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Closed constructed	Explaining phenomenon scientifically.	Content	Global	Medium
2	Closed constructed	Explaining phenomenon scientifically.	Content	Global	Medium
3	Closed constructed	Interpret data and evidence scientifically.	Content	Global	Low
4	Open ended	Explaining phenomenon scientifically	Content	Global	Medium
5	Closed constructed	Interpret data and evidence scientifically	Procedural	Global	Medium
6	Open ended	Explaining phenomenon scientifically	Epistemic	Global	Medium

Answer key:

Ans 1. Option C

Ans. 2. Home level: lcd, washing machines, mobile, calculator, solar pannel, cars, aircoolers, stabilizers, fridge, electronic bells, steam iron, laptop, speakers.

School level: lcd, mobile, calculator, solar pannel, aircoolers, stabilizers, fridge, electronic bells, laptop, speakers

Not an e-waste: email, wooden bench, soaps, e-books, tubelight, cfl.

Ans 3.

	PERCENTAGE	METRIC/TONS
TOTAL E-WASTE GENERATED GLOBALLY	100	44.7
E-WASTE PROPERLY RECYCLED	20	8.9
E-WASTE NOT PROPERLY DOCUMENTED	80	35.8
E-WASTE WHICH IS DUMPED	76	34.1

Ans: 4 The advancement in technology, changing lifestyle and technology getting obsolete at a very fast rate.

Ans 5.

Waste generated	In percentage	In metric tonne
1. That can be recycled	20	10
2. That cannot be recycled	80	40

POLLUTION

Area: Hazards

Class: 8

Chapter: 18

Chapter Name:

Concept: Air Pollution

Learning Outcomes:

Students will be able to relate processes and phenomenon with causes.



Air pollution is a mix of particles and gases that can reach harmful concentrations both outside and indoors. Its effects can range from higher disease risks to rising temperatures. Soot, smoke, mould, pollen, methane, and carbon dioxide are a just few examples of common pollutants

Sulphur Dioxide and nitrogen dioxide are the major source of pollutants from industries and causes respiratory and cardiovascular illness. It has degradable effect to the environment. Carbon monoxide , lead , particulate matter are major source of pollutant as an emission from vehicles .carbon monoxide causes headaches and weakens the cardiovascular health. Lead damages the nervous system and also kills fishes and animals.

Q1. Encircle the major air pollutants from the list given below:

Carbon dioxide	Nitrogen	Ozone	Sulphur dioxide
Chlorine	Mercury	Sulphur monoxide	Lead Fluorine
Urea	Pollen	Nitrogen dioxide	Helium
Mercury	Soot		

Q2. From the data given in the above picture

a) List two countries which have

1. Maximum air pollution _____

2. Minimum air pollution _____

b) List two continents which have deaths due to pollution

1. less than 50000 million_____

2. about 50000 million_____

3. over 2 million_____

Q3. How is indoor pollution caused? What are the preventive measures we can take to reduce this pollution?

Q4. Analyze the given data and draw conclusion:

a) which of the cities mentioned below are under a high threat of diseases like stroke etc.

b) write them in increasing order of threat.

New Delhi, New York, Sydney, Peru, Beijing, Tokyo , Cairo

Item Description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Closed constructed	Explaining phenomenon scientifically	Content	Global	Low
2	Closed constructed	Interpreting data and evidence scientifically	Content	Global	Low
3.	Open ended	Explaining phenomenon scientifically	Content	Global	Medium
4.	Closed ended	Interpreting data and evidence scientifically	Content	Global	Medium

Answer Key:

A1. Carbon dioxide, nitrogen, ozone , sulphur dioxide, mercury, Sulphur monoxide, lead, pollen grains, nitrogen dioxide, Helium, soot

A 2:

- a) 1. Maximum air pollution: India, Bangladesh
2. Minimum air pollution: America, Argentina
- b) List 2 continents which has ...
4. USSR
5. Parts of Africa
6. Asia, Europe

A3. a) Reasons of Indoor pollution: carpets, Paints, Perfumes, Furniture,

Preventive measure: Indoor plants, Less use of aerosols,

A4. New York, Peru, Cairo, Beijing, Sydney Tokyo , New Delhi,

HAZARDS OF POLYTHENE BAGS

Area : Environment/Hazards

Class : 8

Chapter: 3

Chapter Name: Synthetic Fibres And Plastic

Concept: Understanding effects of hazards of polythene on environment

Learning Outcomes:

Students will be able to

1. apply learning of scientific concept in day to day life e.g. segregating biodegradable and non biodegradable waste
2. make efforts to protect environment
3. differentiate natural and man made fibres

You must have seen garbage dump and animals especially cows eating this garbage. In this process of eating food waste they swallow materials like polythene bags and wrappers of food. But their consequences are very harmful. The plastic material chokes the respiratory system of these animals or forms a lining in their stomach and can even cause death. The polythene bags thrown here and there also block drains and can even cause floods.



Q. 1 Damages caused by which thing are being discussed here?

Q. 2 Which problems are faced by cows or other animals by swallowing polythene?

Q.3 Study the table carefully:-

Type of Waste	Approximate Time taken to Degenerate	Nature of Material
Peels of vegetable and fruits, leftover foodstuff, etc.	1 to 2 weeks	Biodegradable
Paper	10 to 30 days	Biodegradable
Cotton cloth	2 to 5 months	Biodegradable
Wood	10 to 15 years	Biodegradable
Woollen clothes	About a year	Biodegradable
Tin, aluminium, and other metal cans	100 to 500 years	Non-biodegradable
Plastic bags	Several years	Non-biodegradable

• Source: <http://edugreen.teri.res.in/explore/solwaste/types.htm>

How does polythene bag cause such damage?

Q.4 How much do you agree the following statement pick only one box in each row

	Strongly agree	agree	disagree	Strongly disagree
a. We should use polythene bags.				
b. We should throw polythene bags here and there.				
c. We should use cotton bags instead of polythene bags.				

Q.5 Answer in 'Yes' or 'No'

(i) We should use steel Tiffin instead of plastic Tiffin – Yes/No

(ii) As Swachh Bharat Abhiyan is going on in our country so we should not throw polythene bags outside. - Yes/No

(iii) We should use paper bags. - Yes/No

Items Description:

Q.No.	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Closed	Explaining phenomenon scientifically	Content	Local	Low
2	Open ended	Evaluating and designing scientific enquiry	Content	Local	Medium
3	Open ended	Interpreting data and evidence	Content	Local	Medium
4	Open ended	Explaining phenomenon scientifically	Epistemic	Local	Medium
5	Open ended	Explain phenomenon scientifically	Content	Local	Medium

Scoring/Answer Key

Q. 1 Damages caused by which thing are being discussed here?

Score1 -for Polythene Bags

Q. 2 What problems are faced by cows or other animals by swallowing polythene?

Score 1 -for valid reason e.g. the plastic material chokes the respiratory system of these animals or forms a lining in their stomach and can even cause death.

Q.3 How does polythene bag cause such damage?

Score 1 -for correct reason –Because these are non-biodegradable

Q.4 No scoring only to check scientific attitude, Expected answers

	Strongly agree	agree	disagree	Strongly disagree
a. We should use polythene bags.				√
b. We should through polythene bags here and there.				√
c. We should use cotton bags instead of polythene bags.	√			

Q.5 No scoring only to check scientific attitude, Expected answers

(i) We should use steel Tiffin instead of plastic Tiffin – Yes

(ii) As Swachh Bharat Abhiyan is going on in our country we should so we should not throw polythene bags outside. - No

(iii) We should use paper bags. - Yes

Health

TREATING AN INFECTION

Area : Health

Class – 8

Chapter- 2

Chapter Name: Microorganisms - Friends And Foe

Concept: Antibiotics

Learning Outcomes: Students will be able to

1. apply learning of scientific concepts in day to-day life,
2. discuss and appreciate stories of scientific discoveries;
3. relate processes and phenomenon with causes such as relating immunity with antibiotics.

Antibiotics are powerful medicines that fight certain infections and can save lives when used properly. They either stop bacteria from reproducing or destroy them.

Before bacteria can multiply and cause symptoms, the immune system can typically kill them. White blood cells (WBCs) attack harmful bacteria and, even if symptoms do occur, the immune system can usually cope and fight off the infection.

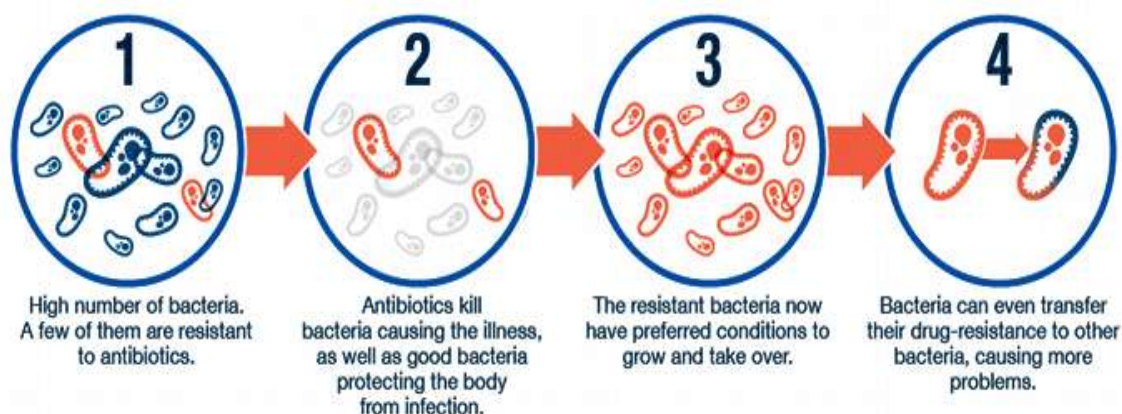
Sometimes, however, the number of harmful bacteria is excessive, and the immune system cannot fight them all. Antibiotics are useful in this scenario.

Antibiotics are strong medicines that treat bacterial infections. Antibiotics won't treat viral infections because they can't kill viruses. You'll get better when the viral infection has run its course.

Common illnesses caused by bacteria are urinary tract infections, strep throat, and some pneumonia. Antibiotics can treat bacterial infections by killing the bacteria that causes them. Some medical professionals have concerns that people are overusing antibiotics. They also believe that this overuse contributes toward the growing number of bacterial infections that are becoming resistant to antibacterial medications.



How does antibiotic resistance occur?



- 1)
 - a) Identify the personality in the given picture.
 - b) What was his contribution in the field of biology?
 - c) Define the term given in answer (b).
 - d) What can be the sources of (b)?
 - e) Give 4 examples of (b).
 - f) Give reason- It (b) should not be taken without the consult of a qualified doctor.
 - g) Is it safe to take antibiotics? Say yes/no. Justify your answer.

Item Description:

Q NO.	Q Type	Competency	Knowledge	Context	Difficulty Level
1 a	Close ended	Evaluating and designing scientific enquiry	Epistemic	Global	Low
B	Close ended	Evaluating and designing scientific enquiry	Epistemic	Global	Medium
C	Close ended	Interpreting evidence	Content	Global	Medium
D	Close ended	Evaluating and designing scientific enquiry	Epistemic	Global	High
E	Close ended	Explaining phenomena scientifically	Content	Global	Medium
F	Open ended	Evaluating and designing scientific enquiry	Epistemic	Global	High
G	Open ended	Explaining phenomena scientifically	Epistemic	Global	High

Answer Key:

- 1a) Alexander Fleming
- b) First antibiotic, penicillin
- c) Drugs which kill or stop the growth of other organisms.
- d) Bacteria and Fungi
- e) Penicillin, Streptomycin, Tetracycline, Chloromycetin.
- f) Can kill good bacteria, antibiotic resistance.
- g) No, can lead to antibiotic resistance, antibiotic no longer show its effects.

Scoring key:

- 1 a) correct response – 1 point.
Any other response/ no response - 0 point.
- b) correct response – 1 point.
Any other response/ no response - 0 point.
- c) correct response – 1 point.
Any other response/ no response - 0 point.
- d) correct response – 1 point.
Any I response Bacteria or fungi- ½ point(partial credit)
Any other response/ no response - 0 point.
- e) correct response – 2 point.
For any 2 correct responses- Partial credit- 1 point
Any other response/ no response - 0 point.
- f) correct response – 1 point.
Any I response - ½ point(partial credit)
Any other response/ no response - 0 point.
- g) correct response – 1 point.
Any other response/ no response - 0 point.

VIRUS

Area: Health

Class – 8

Chapter- 2

Chapter Name: Microorganisms: Friends And Foe

Concept: Harmful Microorganisms

Learning Outcomes: Students will be able to

1. acquire knowledge about virus;
2. apply learning of scientific concepts in day to day life.

Viruses are found in all the ecosystems on Earth. They are microscopic organisms .They consist of nucleic acid covered with protein sheath. They reproduce only inside the cells of the host organisms which may be a bacterium, plant or an animal.

1. Why viruses are considered as living as well as non living?

.....
.....

Common ailments like cold, influenza, cough are caused by viruses. Serious diseases like polio, chicken pox are also caused by viruses. Covid 19, an infectious diseases caused by newly discovered virus, Corona virus. It causes mild to moderate respiratory ailment. Situation is more alarming for small children and old people and for those with medical problems like asthma, diabetes, cardiac and cancer. WHO has declared it pandemic.

2. What are the symptoms of corona virus infection?

.....

3. What precautions should be taken to prevent corona virus infection?

.....
.....

Corona virus spreads through droplets of saliva or discharge from the nose when an infected person cough or sneeze.

4. Why is it necessary to wear a mask or to cover your mouth while talking to others?

.....
.....

5. Read the following statements and mark aptly:

- | | | |
|----|--|----------------|
| a) | N-95 mask gives better protection than cloth mask. | Agree/Disagree |
| b) | Antibiotics drug works against bacteria | Agree/Disagree |

- Not against viruses..
- c) You should self isolate yourself if you have travelled somewhere. Agree/Disagree

Item Description:

Q NO.	Q Type	Competency	Knowledge	Context	Difficulty Level
1	Close ended	Explaining phenomena scientifically	Epistemic	Global	Medium
2	Close ended	Explaining phenomena scientifically	Epistemic	Global	Low
3	Close ended	Explaining phenomena scientifically	Epistemic	Global	Low
4	Close ended	Evaluating and designing scientific enquiry	Content	Global	Medium
5	Close ended	Evaluating and designing scientific enquiry	Epistemic	Global	Medium

Answer key:

1. Living : when present inside living cell
Nonliving : when present outside living cell
2. running nose, sore throat, dry cough, fever, difficulty in breathing
3. use mask, sanitizing, wash your hands for 20 sec with soap, social distancing, cover your mouth while coughing or sneezing
4. it is infectious and spreads through droplets of saliva
5. Agree, Agree, Agree

ENDOCYTOSIS

Area: Health

Class: 9

Chapter : 6

Chapter Name : Tissues

Concept: Endocytosis

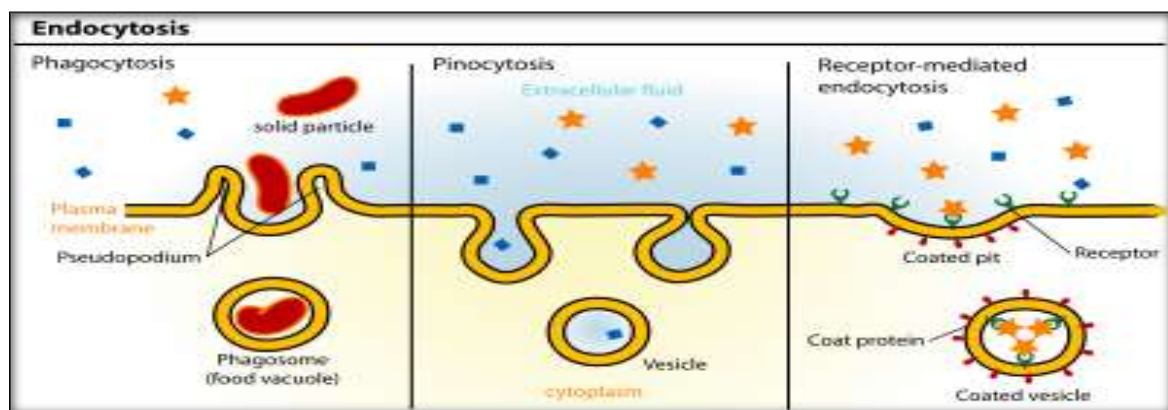
Learning Outcomes

Student will be able to :-

1. explain the process of endocytosis
2. apply imagination and draw the conclusions
3. relate the processes taking place in endocytosis.

Imagine you are a macrophage: a merciless white blood cell that stalks, amoeba-like, through the tissues of the body, looking for pathogens, dead and dying cells, and other undesirables. When you encounter one of these, your task is not just to destroy it, but to devour it whole. (Chomp!)

Q1. Imagine that you are a white blood cell, where would you be found in the human body?



(Source- Mariana Ruiz Villarreal [LadyofHats](https://en.wikipedia.org/wiki/Endocytosis) - Own work/<https://en.wikipedia.org/wiki/Endocytosis>)

How does a macrophage “eat” a pathogen or a piece of cellular debris? The cells need **bulk transport mechanisms**, in which large particles (or large quantities of smaller particles) are moved across the cell membrane. These mechanisms involve enclosing the substances to be transported in their own small globes of membrane, which can then bud from or fuse with the membrane to move the substance across. For instance, a macrophage engulfs its pathogen

dinner by extending membrane "arms" around it and enclosing it in a sphere of membrane called a food vacuole (where it is later digested).

- Q2. Reading the above paragraph, Can you relate the above process to the mode of nutrition of a single celled organism that you may have read about? Name any one such organism. Write the steps of ingestion of food by the organism you have named.

Endocytosis (*endo* = internal, *cytosis* = transport mechanism) is a general term for the various types of active transport that move particles into a cell by enclosing them in a vesicle made out of plasma membrane.

- Q3. Active transport is the transport in which energy of the cell is used. On the other hand in passive transport no energy is used. Then how does passive transport actually take place? Write your answer in the box given below-

Phagocytosis (literally, "cell eating") is a form of endocytosis in which large particles, such as cells or cellular debris, are transported into the cell. **Pinocytosis** (literally, "cell drinking") is a form of endocytosis in which a cell takes in small amounts of extracellular fluid.

- Q4. You all must have read about cell organelles. Which process out of phagocytosis or pinocytosis, the Lysosomes perform? Why?

Receptor-mediated endocytosis is a form of endocytosis in which receptor proteins on the cell surface are used to capture a specific target molecules i.e. the molecules that the cells need. However, sometimes less friendly particles may gain entry by the same route. Flu viruses, diphtheria, and cholera toxin all use receptor-mediated endocytosis pathways to gain entry into cells.

(Source- <https://www.khanacademy.org/science/biology/membranes-and-transport/bulk-transport/a/bulk-transport>)

- Q5. In the above text the term “Specific Target molecules” has been used. These target molecules are represented by a ☆ in the figure shown above, which are recognised by the receptors on the surface of plasma membrane. If you are a non friendly pathogen and want to seek entry into the cell, what would be your strategy?

Item Description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Closed constructed	Explain the process scientifically	content	Personal	Low
2	Open constructed (human coded)*	Explain the process scientifically	content	Personal	Medium
3.	Closed constructed	Explain the process scientifically	content	Personal	Medium
4.	Closed constructed	Explain the process scientifically	content	Personal	Medium
5.	Open constructed (human coded)	Explain the process scientifically	content	Personal	High

*human coded question is the one that is open ended, can have multiple answers hence the examinee checks and can take responses other than given in the answer key.

Answer Key:

- (1) Blood and lymph
- (2) Amoeba

The process in which the food is ingested by these single celled organism which includes food approaching the organism, formation of finger like projections, these projections surround the food, form a food vesicle and then pinch off the membrane to ingest the food.

- (3) Passive transport takes place by diffusion.
- (4) Phagocytosis. Lysosomes engulf the worn out and dead parts of the cells and digests them to release nutrients.
- (5) Strategies can be any of the following-

- I can take up the shape of a star
- my surface has same protein as that of the useful materials.
- I can change the surface of the cell, in which I want to enter.

- **Scoring:**

- (1) Partial credit if any one option mentioned and full credit for both.
- (2) Partial credit for naming the organism correct and full credit for explaining the process.
- (3) No partial credit.
- (4) Partial credit for naming the process correct and full credit for explaining the reason.
- (5) Any one strategy full credit,

MALARIA: CHALLENGES AND OVERVIEW

Area: Health

Class: 9

Chapter : 13

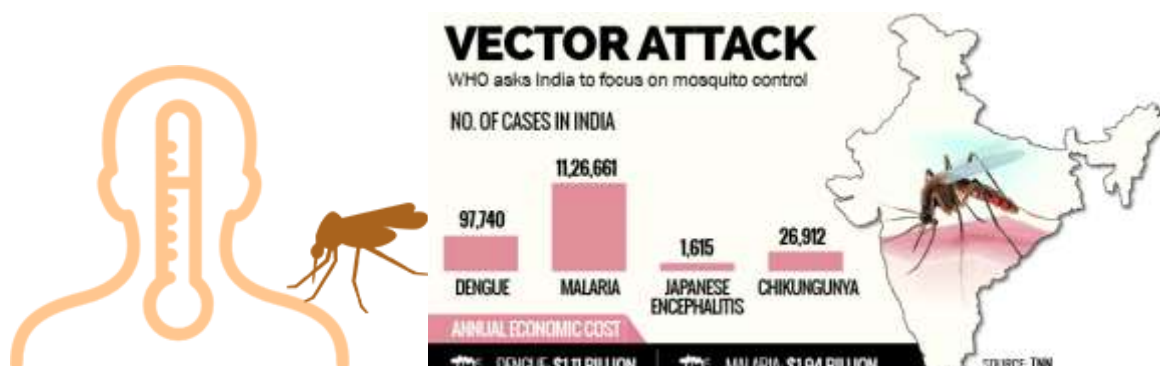
Chapter Name : Why Do We Fall Ill ?

Concept: Infectious Disease By Protozoan Parasites

Learning Outcomes:-

Student will be able to:-

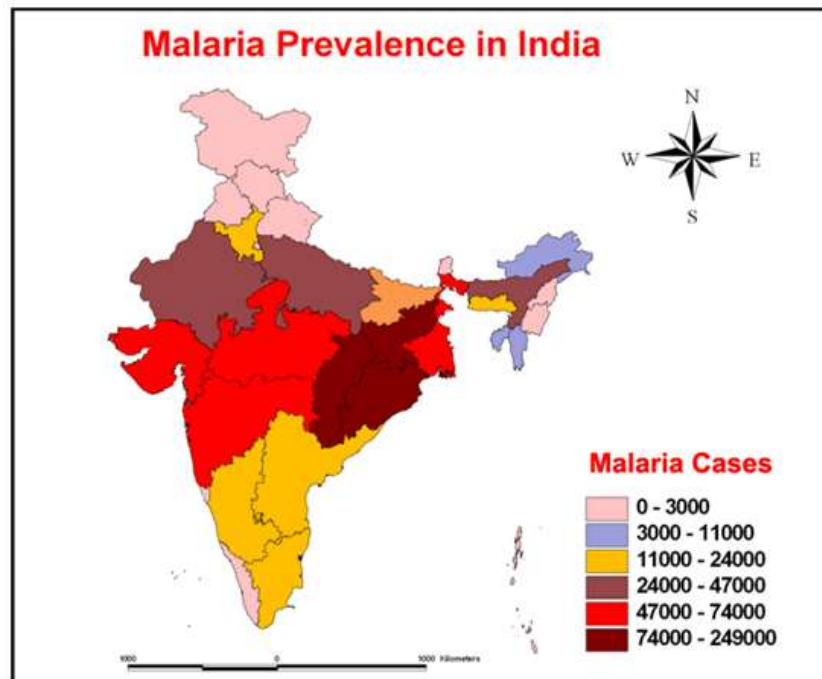
1. analyse and interpret the given figure
2. relate the processes and phenomena with cause and symptoms of diseases
3. apply scientific concept in daily life
4. differentiate between infectious diseases and non-infectious diseases.



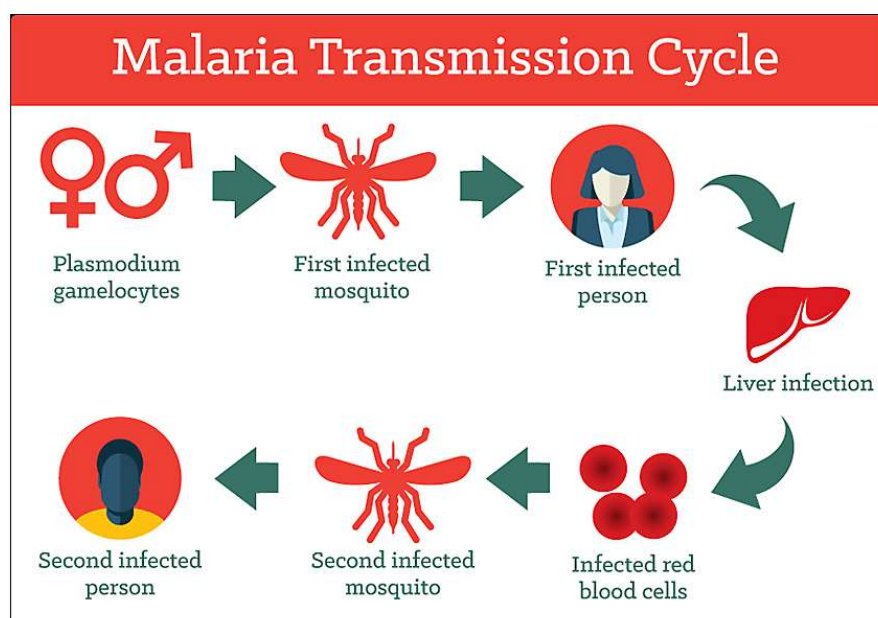
The Government of India is committed to eliminating malaria by 2027. The National Vector Borne Disease Control Programme, an umbrella programme for prevention and control of vector borne diseases, aims to reduce the morbidity and mortality due to malaria and improve the health and quality of life. The national strategy on malaria control has undergone a paradigm shift following the introduction of new interventions for case management and vector control. However, much more needs to be done to scale up malaria control interventions to ensure those suffering from malaria get correct, affordable and complete treatment.

Reference: <http://www.indiahealthfund.org/malaria-centre/malaria-centre-overview/>

Q1. WHO has asked India to focus on mosquito control. Name any two diseases we could be protected from, if this became a reality?



Q2. The incidence of malaria is seen to be quite high in some Indian states. Name any two states that show highest number of malaria cases and what could be the reason?



Q3. Elimination of mosquitoes is a sure way of prevention of malaria. Justify.

Some Details of the Pathogen, symptoms of the disease and prevention

Organism type	Protozoan Protist- <i>Plasmodium vivax</i> , <i>Plasmodium falciparum</i> , <i>Plasmodium ovale</i> , <i>Plasmodium malariae</i>
Pathogen	Most deaths from <i>Plasmodium falciparum</i> and <i>P. vivax</i> . 3 other species cause malaria.
Mode of transmission	<ul style="list-style-type: none"> • The vector, the female Anopheles mosquito, is active from dusk throughout the night and dawn. • A single bite can cause infection. Mosquito distribution is likely to increase with global warming, which suggests the incidence of malaria in temperate climates might increase. • The continued presence of malarial infection relies on high human and mosquito density. • Male mosquitoes feed on plant nectar, not blood, so they are not vectors of <i>Plasmodium</i>.
Affected tissue	<p>In humans, when the skin is pierced as the mosquito feeds:</p> <ul style="list-style-type: none"> • Plasmodium enters blood in the mosquito's saliva and travels to liver • Asexual reproduction in hepatocytes produces more individuals. • More red blood cells are infected. • Infected red blood cells burst, coinciding with symptoms • Male and female gametes form. <p>In the mosquito, following a blood meal: Gametes fuse to form zygotes</p> <p>Asexual reproduction occurs <i>Plasmodium</i> migrates to the mosquito's salivary glands</p>
Prevention	<ul style="list-style-type: none"> • Insecticide-treated nets • Insecticide spraying indoors, especially the walls, where mosquitos rest • Draining or covering stagnant, still water e.g. water tanks, especially urban areas to reduce areas where larvae develop • Fish (<i>Gambusia</i> sp) introduced to eat larvae • Infecting mosquitos with the bacterium Wolbachia blocks Plasmodium development in mosquitoes

- | | |
|--|--|
| | <ul style="list-style-type: none">• X-irradiating male mosquitos to sterilise them |
|--|--|

Q4. The prevalence of malaria would increase in temperate climate region in the coming years. What could be the possible reason?

Q5. Male mosquitoes do not cause malaria, still sterilizing them would help reducing malaria cases. Comment.

Q6. It is a popular belief that if we sleep under the mosquito net during night, chances of occurrence of malaria are highly reduced. Justify.

Q7. Two biological control methods have been suggested for mosquitoes in the above reading material. One represents the prey-predator relationship and the other parasite-host relationship. Identify the organisms.

Item Description:

Q.No	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Close constructed	Explain phenomenon scientifically	Content	National	Low
2	Close constructed	Interpreting data scientifically	Content	National	Medium
3	Close constructed	Explain phenomenon scientifically	Procedural	Global	Low
4	Open ended	Evaluate and design scientific enquiry	Procedural	Global	Medium
5	Close constructed	Evaluate and design scientific enquiry	Procedural	Global	Medium
6	Open ended	Evaluate and design scientific enquiry	Procedural	Personal	Medium
7	Close constructed	Explain phenomenon scientifically	Content	Global	High

Answers Key:

1. Malaria, Dengue, Chicken Guinea, Japanese encephalitis
2. Odisha, Meghalaya, Bihar, Chhattisgarh, Mizoram. The reason being conducive temperature and rainfall.
3. Elimination of mosquito would result in removal of the vector which carries the *Plasmodium* sp. Thus helping in breaking the mode of transmission of the pathogen.
4. Global warming is resulting in increase of temperature globally. Increased temperature may result in promoting breeding of mosquitoes in temperate countries.
5. Sterilizing the male mosquito will prevent the production of eggs and thus reducing mosquito population.
6. Mosquitoes are active not only during night but also during early morning and evening.
7. **Prey predator relationship**-*Gambusia* fish and mosquito larvae

Parasite and host relationship- Bacterium *Wolbachia* blocks *Plasmodium* development in mosquitoes

BLOOD DISORDERS INCLUDED IN THE RIGHTS OF PERSONS WITH DISABILITIES (RPWD) ACT, 2016

Area: Health

Class: 10

Chapter: 9

Chapter Name: Heredity and evolution.

Concept: Heredity.

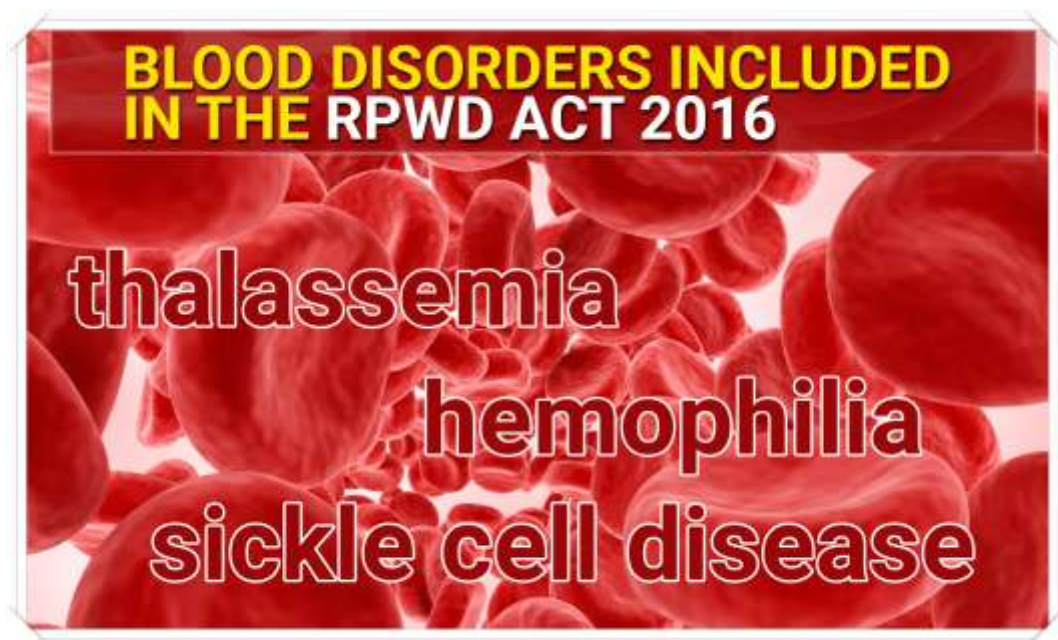
Learning outcomes:

The student will be able to

1. Differentiate the causes of Thalassemia, Haemophilia and Sickle Cell disease.
2. Relate the symptoms with the given types of blood disorders.
3. Understand the blood disorders included in the RPWD Act, 2016.

What are the blood disorders covered in The RPWD Act, 2016?

The three blood disorders included in The RPWD Act are Thalassemia, Hemophilia and Sickle Cell Disease.



Thalassemia

In Thalassemia, body cannot make enough haemoglobin or makes defective red blood cells (RBC) due to imbalance in alpha and beta genes in haemoglobin. RBCs break much early by 10-20 days than normal lifespan of 120 days. This leads to severe anaemia. Severe anaemia leads to lethargy, loss of appetite, disfigurement of facial bones, enlarged liver and spleen which lead to protruded abdomen and increased destruction of red blood cells.

Haemophilia

In Haemophilia, there is a deficiency of one of the factors necessary for coagulation of blood. This leads to excessive bleeding. People with haemophilia bleed easily, and the blood takes a longer time to clot. There are different types of Haemophilia – Types A and B, based on the deficiency of the type of the clotting factor.

Sickle Cell Anaemia/Disease (SCD)

Normal RBC's (red blood cells) are smooth surfaced, enabling them to change their shape to flow through small blood vessels. Under certain conditions RBC's containing haemoglobin become rigid, elongated, and sickle shaped. These sickle-shaped cells are not flexible; they stick to vessel walls, causing a blockage of blood flow resulting into reduced supply of oxygen in nearby tissues causing sudden, severe pain attacks, called pain crises. Signs and symptoms of SCD include severe pain, hand-foot syndrome, abdominal pain, infections, leg ulcers, anaemia, gallstones, organ damage, hip bone necrosis and stroke.

Q1. The RPWD 2016 act has included some blood disorders. These include:

_____.

Q2. A person suffered a cut. Due to genetic blood disorder, he suffered from severe blood loss, which was life threatening. Which blood disorder was he suffering from?

Q3. A player suffered from fatigue, abdominal pain, organ damage and infection. What could be the reason for these symptoms?

Q4. Thalassemia patients are at the risk of anaemia and lethargy. Justify

Item Description

Q.No	Q. Type	Competency	Knowledge	Context	Difficulty Level
1	Closed constructed	Explain Phenomenon scientifically	Procedural	National	Low
2	Closed constructed	Explain Phenomenon scientifically	Procedural	National	Medium
3	Closed constructed	Explain Phenomenon scientifically	Procedural	National	Medium
4	Closed constructed	Explain Phenomenon scientifically	Procedural	National	Medium
5	Open ended	Explain Phenomenon scientifically	Epistemic	National	Medium

Answer Key:

1. Thalassemia, Haemophilia and Sickle cell disease
2. The person is suffering from haemophilia.
3. The person suffers from sickle cell anaemia
4. Body cannot make enough haemoglobin or makes defective red blood cells (RBC) due to imbalance in alpha and beta genes in haemoglobin. RBCs break much early by 10-20 days than normal lifespan of 120 days. This leads to anaemia.

Person feels lethargic as less amount of oxygen is available for oxidation of food, resulting in low level of energy.

UNSUNG HEROES OF THE BODY- HORMONES

Area: Health

Class: 10

Chapter: 7

Chapter Name: Control and coordination.

Concept: Endocrine system.

Learning outcomes: The student will be able to

1. Explain the functions of hormones in human body.
2. Calculate the required units of insulin for diabetic patients.
3. Apply the knowledge of functions of hormones in identifying various hormonal disorders.

These unsung heroes of the body inform cells when its time to go to work. Various tissues of the body secrete hormones into fluids, like blood. From there, the hormones travel far from the place they were made until they reach cells that read the chemical as an instruction. That hormone might tell the cell to grow- or to stop. It might direct a cell to change its shape or activity. These instructions might cause the heart to pump more rapidly or signal hunger to the brain. Another hormone might let you know that you're full. One hormone latch onto sugar in the bloodstream and then helps ferry that sugar into cells to fuel their work. Yet another might tell your body to burn some nutrients as fuel- or instead store their energy as fat for use at a later date.

Q1. Rahul is a player. Sometimes he feels weakness while playing. The doctors diagnose the cause of Rahul's condition to be diabetic. They advised him to calculate the number of grams of carbohydrates in his meal so that he can calculate the number of units of insulin he will need to lower his blood glucose concentration.

Each unit of insulin he injects reduces his blood glucose concentration by 1.5 milli moles/dm³

He needs to inject one unit for every 10 grams of carbohydrates he consumes. The table shows estimated carbohydrates in the breakfast eaten by the player.

Food	Carbohydrates
One glass Juice	25 gms
Two slices of bread toast	70 gms
300 grams of pulses	38 gms
Tea with sugar	25 gms

Calculate how many unit of insulin the athlete would need to inject to control the rise in blood glucose level.

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Q2. A person is detected as underactive thyroid gland. The thyroid gland secretes thyroid hormones. If an under reactive thyroid could cause the person to feel tired and have an increased body mass, then what would be the functions of thyroid hormones in our body?

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Item Description:

Q. No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Closed constructed	Interpret data and evidence scientifically	content	Personal	High
2	Closed constructed	Explain the process scientifically	content	Personal	Medium

Answers:

A 1 158/10 (1 point)

16 units of insulin (1 point)

A2. The explanation should include:

- thyroid gland helps to regulate metabolic rate
 - an underactive thyroid would cause less hormone to be released
 - metabolic rate drops
 - feel tired as less energy would be released.
 - more fat storage so the person gains body mass
- (1 point each for each of the above explanation. Student to write any two points)

Natural Resources

GREEN COVER IN INDIA

Area: Natural Resources

Class: 7

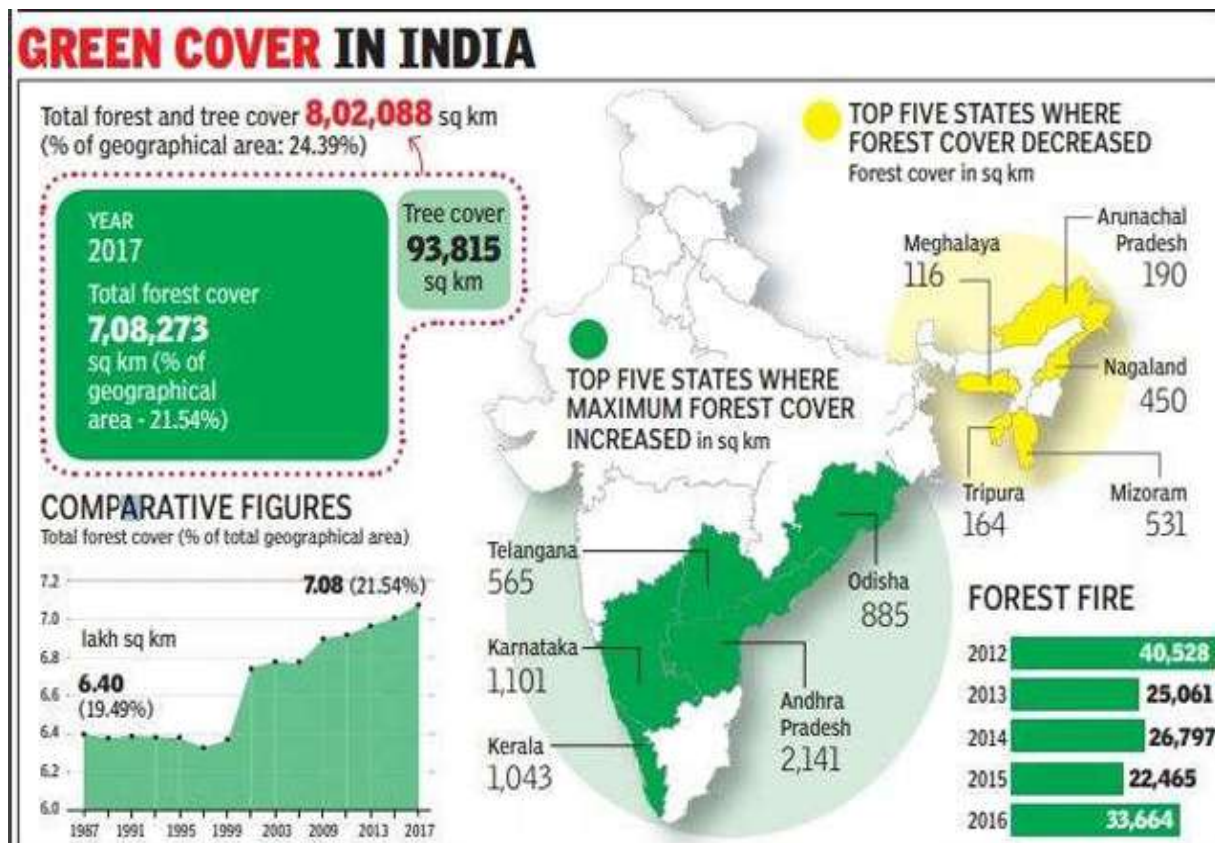
Chapter No: 17

Chapter Name: Forest Our Lifeline

Concept: Forest Exploration

Learning Outcomes: Students will be able to

1. Make effort to save the environment and efficient use of resources.
2. Simple investigation to find factors that can lead to decrease of forest cover globally
3. To calculate increase or decrease of forest cover
4. To prepare pie chart of the data given.



Google Images

Global Forest Watch, (GFW)—a collaborative project of the University of Maryland, Google, USGS, and Nasa—suggests that **green cover has declined sharply in the country**.

Forest Survey of India employs satellite imagery to estimate “forest cover”, considering “all lands which have a tree canopy density of **more than 10%** when projected vertically on the horizontal ground, within a minimum areal extent of one hectare” as forests.

This definition fails to distinguish between **native forests and man-made tree plantations**, overstating the extent of forest cover.

While the Convention on Biological Diversity has a similar definition of forests, it mentions that the land in question should not be under agricultural or non-forest use

While the latest estimate of tree cover extent from GFW is of 2010, data on loss of forest cover is updated annually. The tree cover loss for Indian states shows an accelerating trend in recent years, with the heavily forested **north-eastern states, Odisha, and Kerala showing the greatest amount of tree cover loss in the period 2001-2017**.

However, the official data represents that **Kerala gained 30% forest cover** in the same period. This can be explained by the fact that Kerala is one of the **biggest producers of plantation crops in India**, with rapidly growing plantation crops likely compensating for the loss of native forest cover.

According to the GFW data, all states and union territories with the exception of Chandigarh show a **decline in the extent of tree cover** in the time period 2000-2010. In contrast, in terms of official data, 28 of 36 states and UTs have registered an increase in forest cover.

Reference: <https://www.insightsonindia.com/2018/07/09/insights-into-editorial-indias-forest-cover-what-data-shows/>

QUESTIONS

Q1. A forest cover is defined as

1. All trees which are projected vertically on the horizontal ground.
2. All land which have a tree canopy density of **more than 10%**.
3. All land area which shows distribution of trees.
4. All area except the water bodies is included as forest cover.

Q2. Which states have shown drastic decrease of forest cover in last 5 years?

1. Kerala, Andhra Pradesh, Karnataka, Maharashtra
2. Meghalaya, Tripura, Arunachal Pradesh, Nagaland, Mizoram.
3. Punjab , Haryana, Himachal Pradesh, UP

Q3. Kerala had forest cover loss in the period 2001-2017. How could the loss of the state be compensated so fast as current data reveals that tree loss has been recovered?

Q4. From the data shown above kindly interpret the forest area cover in sq. Km from 1995 till 2017

Year	Total Forest Cover in sq. Km
1995	
1999	
2003	
2009	
2013	
2017	

Q5. From the data provided above, find out the states which have shown increase of the forest cover.

SR.NO	STATE NAME	INCREASE OF FOREST COVER(sq. Km)

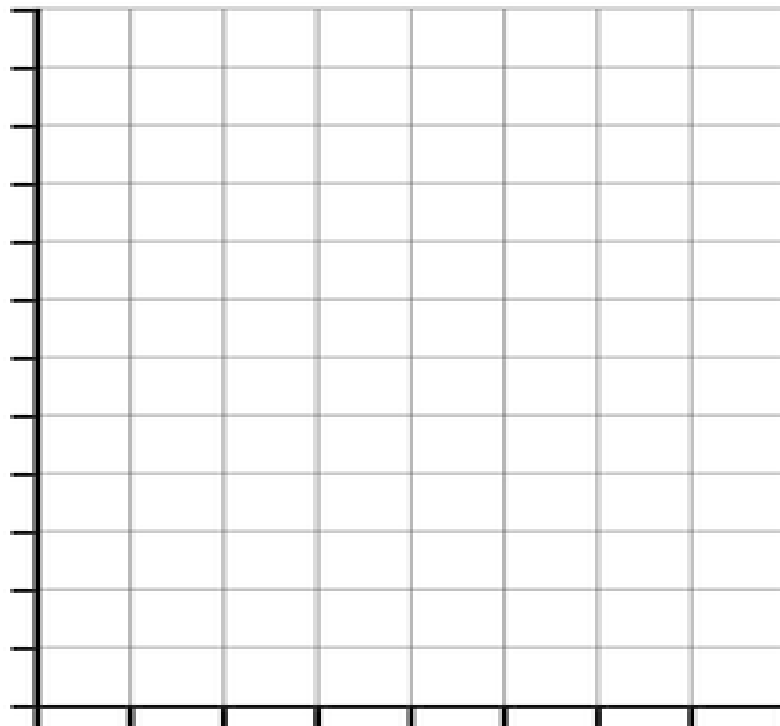
Q6. Find out the percentage increase of the forest cover of one state over the other state.

SR.NO	% increase of one STATE over the other STATE	INCREASE OF FOREST COVER (sq. Km)
1	Andhra Pradesh over Telangana	
2	Karnataka over Kerala	
3	Kerala over Odisha	
4	Odisha over Telangana	

Q7. Fill in the table with appropriate information (ATTITUDE BASED)

SR.NO	Statement	Agree	Disagree	Partially Agree	Partially Disagree
1.	Forest fires play a major role in the destruction of the forest cover of any area.				
2.	Citizens of any country do not contribute in the green growth of any place.				
3.	As a citizen we all must pledge and take steps towards the green progress of our country.				
4.	Tree Cover loss can be recovered in a few months.				
5.	Of all the union Territories, Chandigarh outshines in the green cover growth.				

Q8 Prepare a Bar graph of the data provided in question no. 5 below.



Item Description:

Q. NO	Q. TYPE	COMPETENCY	KNOWLEDGE	CONTEXT	DIFFICULTY LEVEL
1	Closed constructed	Explain the phenomenon scientifically	Content	Global	Low
2	Closed constructed	Explain the phenomenon scientifically	Content	Global	Medium
3	Open ended	Interpret the data & evidence scientifically	Content	Local	Medium
4	Closed constructed	Interpret the data & evidence scientifically	Procedural	Local	Medium
5	Closed constructed	Interpret the data & evidence scientifically	Content	Local	Low
6	Closed constructed	Interpret the data & evidence scientifically	Procedural	Local	Medium
7	Open ended	Interpret the data & evidence scientifically	Content	Global	Medium
8	Closed constructed	Interpret the data & evidence scientifically	Content	Local	Medium

Answer Key:

Ans1: option 1 and 2

Ans 2: option 2

Ans.3: Kerala is one of the **biggest producers of plantation crops in India**, with rapidly growing plantation crops likely compensating for the loss of native forest cover.

Ans 4.

Year	Total Forest Cover in sq. Km
1995	6.4
1999	6.4
2003	6.8
2009	6.9
2013	7.0
2017	7.08

Ans 5.

SR.NO	STATE NAME	INCREASE OF FOREST COVER (sq. Km)
1	Telangana	565
2	Odisha	885
3	Kerala	1043
4	Karnataka	1101
5	Andhra Pradesh	2141

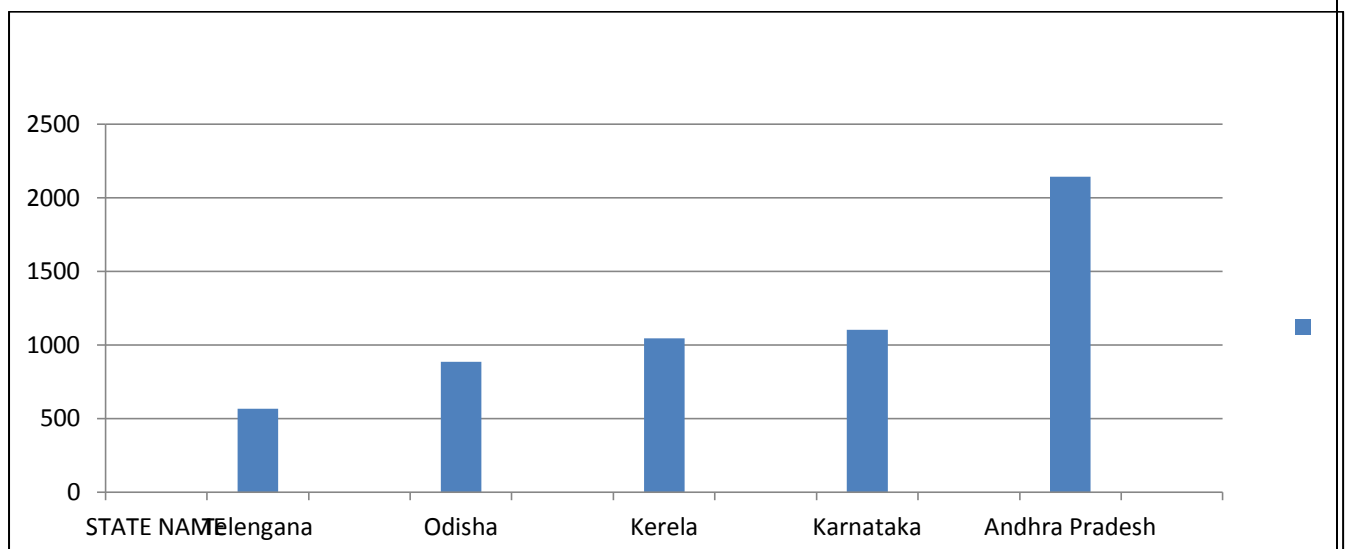
Ans 6.

SR.NO	% increase from one STATE over other STATE	INCREASE OF FOREST COVER (sq. Km)
1	Andhra Pradesh from Telangana	2141-1043=1098 $1098/2141*100=51.28\%$
2	Karnataka from Kerala	1101-1043=58 $58/1101*100=5.26\%$
3	Kerala from Odisha	1043-885=158 $158/1043*100=15.14\%$
4	Odisha from Telangana	885-565=320 $320/885*100$

Ans. 7

1. Partially Agree
2. Disagree
3. Agree
4. Disagree
5. Agree

Ans 8. Bar chart



Scoring Key:

1. FULL CREDIT (2) if both answers are correct
NO CREDIT (0) any correct answer
2. FULL CREDIT (2) if correct answer given
NO CREDIT (0) any other answer
3. FULL CREDIT (2) If proper reason given
NO CREDIT (0) any other answer
4. FULL CREDIT (2) if all answers are correct
PARTIAL CREDIT (1) If any three answers correct
NO CREDIT (0) no correct answer
5. FULL CREDIT (2) if all answers are correct
PARTIAL CREDIT (1) If any three answers correct
NO CREDIT (0) no correct answer
6. FULL CREDIT (2) if all answers are correct
PARTIAL CREDIT (1) If any three answers correct
NO CREDIT (0) no correct answer
7. FULL CREDIT (2) if all answers are correct
PARTIAL CREDIT (1) If any three answers correct
NO CREDIT (0) no correct answer
8. FULL CREDIT (2) if Bar graph is shown
NO CREDIT (0) If Bar graph not drawn

CROP PRODUCTION & MANAGEMENT

Area: Natural Resources

Class: 8

Chapter:

Chapter Name: Crop Production And Management

Concept: Crop Production And Management

Learning outcomes:

The student will be able to:

1. Relate the effect of seasons on crop system,
2. Give reason of stubble burning and its effects on environment,
3. Devise an alternative way to use stubble.

India has two type of crops: Rabi and Kharif. In early April, Rabi crop like wheat are harvested and paddy, a Kharif crop is sown after June 20. After paddy harvest nearly 22 tons of straw is generated in Punjab. It has high silica content. The wheat straw produces chaff which is used as fodder. Only 1/3 of wheat residue is burnt as compared to paddy crop yet skyline is expected to be polluted when harvesting is done with.

Q1 Which process is being investigated in above information?

Q2 Straw of which crop will be burnt more by farmers. Give one or two pieces of information to support your answer.

Q3 Match the option given below in column 1 to the explanation given in column 2 that is supported by the text given above.

Rabi Crops	Sown at end of monsoon, at beginning of winter
Kharif Crops	Not affected by rain fall
Rabi Crops	May be called as summer crop
Kharif Crops	Wheat and Rice

Q4 Suppose you have a younger brother who tries to understand the meaning of above text but he does not understand the crop system, fodder, chaff, silica etc. Assume that he knows, name of months, seasons and crops like wheat and rice. Write an explanation to explain him about burning of stubble in Punjab.

Q5 A farmer suggested not to burn the paddy stubble and to spend extra money for pulling it to the side of field by tractor and keeping it under tree. Briefly explain how this suggestion could be tested.

Q6 How much do you agree/disagree with following situations?

Situations	Strongly Disagree	Disagree	Agree	Strongly agree
Government should impose fine on burning stubble.				
Government should pay the farmer for not burning.				
Government should provide a seed sowing machine which is not jammed by straw.				
Stubble management is related to investment cost of fertilizer.				

Item Discription:

Q.NO.	ITEM TYPE	KNOWLEDGE	CONTEXT	COMPETENCY	DIFFICULTY LEVEL
1	Close ended	Content	Local	Explain phenomenon scientifically	Low
2	Close ended	Content	Local	Explain phenomenon scientifically	Medium
3	Close ended	Content	Local	Interpret data and evidence scientifically	High
4	Close ended	Epistemic	Local	Interpret data and evidence scientifically	High
5	close ended	Epistemic	Local	Explain and design scientific enquiry	High
6	Open ended	Procedural	Local	Interpret data and evidence scientifically	Medium

Answer key

- Q1 Partial score for agriculture / Environmental pollution
Full score for Environmental pollution due to burning of stubble.
- Q 2 Paddy crop as it contains silica and cannot be used as chaff (full credit)
Partial credit for any one of the above stated reason.
- Q 3 Kharif crop: may be called as summer crop.
- Q 4 Any explanation which involve the relation of crop system with seasons and variables on which pollution caused by stubble burning depend.
- Q 5 Any explanation including following variable:
The plant residue will be converted into manure naturally (full score)
No credit if the above stated variable is missing.
- Q 6 Open ended .

PALM OIL AND RAINFORESTS

Area: Natural Resource

Class: 8

Chapter: 7

Chapter Name: Conservation of Plants and Animals

Concept: Plants and Animals

Learning Outcomes:

Students will be able to protect environment by using resources judiciously

Palm oil is edible vegetable oil. It is obtained from palm tree fruit. The oil is trans-fat free and economical, so it is widely used. The largest exporters of palm oil are Malaysia and Indonesia. In these countries rainforests are being cleared for plantation of palm oil. This illegal act of deforestation is fatal for rainforest ecosystem which is very fragile. These rainforests are home for a number of animals like orang-utans, elephants, and tigers.

References:

<http://www.orangutantrekkingtour.com>

Q 1 Indonesia and Malaysia are largest producers of palm oil. What kind of climatic conditions are required for the growth of palm trees?

Q 2 Keeping in mind the fact that palm oil is a vegetable oil, do you expect the use of palm oil in shampoo and cleaning agents? Support your answer with reason.

Q 3 Which of the following can be a problem related to palm oil plantation and deforestation. Mark yes or no (Along with reason).

STATEMENT	Y/N	REASON
It can lead to indigenous right abuse		
It can lead to modern day slavery and child labour		
It can lead to climate change		
It can lead to wildlife smuggling		

Q 4 In 2016, ONLY 45000 Orangutans were left in Borneo. If this continued this species will extinct in 25 years. Can you suggest one reason for decreasing population of orang-utans?

Item description:

Q. No.	Question type	Competency	knowledge	context	Difficulty level
1	Closed constructed	Interpret data and evidence scientifically	Epistemic	global	medium
2	Closed constructed	Explain phenomenon scientifically	Epistemic	global	high
3	Complex multiple choice	Interpret data and evidence scientifically	Content	global	medium
4	Open ended	Explain phenomenon scientifically	Epistemic	global	low

Answer key:

Answer 1. Tropical climate

Answer 2. Yes. It is a vegetable oil so can be used in manufacturing of soaps and shampoos.

Answer 3. Yes, yes, yes, yes.

All the reasons can be associated with deforestation and excessive plantation.

Answer 4. The reason for declining population is habitat destruction. It leads to extinction due to lack of food and human interference.

THE FISH FARMING INDUSTRY OF INDIA

Area: Natural Resources

Class: 9

Chapter: 15

Chapter Name: IMPROVEMENT IN FOOD RESOURCES

Concept: Improvement in Food resources

Learning Outcomes:

Student will be able to:-

1. Explain the processes of improvement in food resources
2. Communicate the processes/techniques involved in the production of fishes
3. Apply this scientific concept in daily life.



Total fish production in India in 2018 is estimated at 6.24 million metric tons (MMT), which is close to two-thirds of the total fish production in the country from both capture and culture sources. The growth in the fish farming sector mainly comes from the freshwater aquaculture sector, as marine finfish culture is hardly practiced on a large scale. About 12.8 percent of total animal protein consumed in India comes from freshwater fish.

Historically, the Indian freshwater fish farming was based on a multi-species system. Natural fish food organisms were generated by adding organic and inorganic manure to water and the multi-species utilize this food based on the trophic system in the pond.

A combination of Indian major carps – including catla (*Labeo catla*), rohu (*Labeo rohita*) and mrigala (*Cirrhinus mrigala*) – were used as the main target species for culture, as well as a

few Chinese carp species like silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*) and occasionally common carp (*Cyprinus carpio*). The very high level of technology developed for induced breeding of carps and the abundance of agri-byproducts used as supplemental feed led to the rapid development of freshwater aquaculture in the country.

For a long time, India did not change from this type of fish farming. Nutritionally poor feed ingredients in loose form were fed to fish using feed bags or by directly broadcasting it into the ponds. The feed conversion ratios (FCR) in this type of feeding systems range from 3 to 4 kg of feed to 1 kg of fish production. Fish are normally harvested at 1 to 1.2 kg body weight after 8 to 10 months. They are marketed in iced condition to important consumption markets, which are about 24 to 48 hours away by road.

Q. No.1.Name the method of obtaining fish from natural resources.

Q. No.2.Which technique is used by fish breeders to get economically important fish which generally do not breed in captive conditions?

Q. No.3.What are the two traditional ways of feeding the fish?

Q. No.4.Why a combination of carps like catla, rohu and mrigals are chosen in fish farming?

Q. No.5. Why are fish marketed in iced conditions?

Q. No.6. A fish was harvested with a weight of 500 gms. Will it be beneficial for the fish breeder. How much should be the minimum weight of the fish when it could be harvested?

Item Description:

Q.No.	Q. Type	Competency	Knowledge	Context	Difficulty level
1	Close Constructed	Explain phenomenon scientifically	Content	Global	Low
2	Close Constructed	Explain phenomenon scientifically	Content	Global	Medium
3	Close Constructed	Explain phenomenon scientifically	Content	local	Medium
4	Close Constructed	Explain phenomenon scientifically	Content	Global	Medium
5	Close Constructed	Explain	Content	Global	Medium

		phenomenon scientifically			
6	Close Constructed	Interpret data and evidence scientifically	Content	Global	Medium

Answer key:

Answer1: Score 2 if the answer is capture fishing.

Score 0 for any other answer.

Answer2: Score 2 if the answer is induced breeding.

Score 0 for any other answer.

Answer3: Score 2 for

- a) Ingredients in loose form were fed to fish in feed bags.
- b) Directly broadcasting it in the ponds.

Score 1 for either a or b.

Answer4: Score 2 for they have different feeding zone and different feeding habits and hence do not compete for food.

Score 1 for different feeding zones/ different feeding habits.

Answer5: Score 2 to prolong the shelf life and slow down the action of enzymes and bacteria.

Score 0 for any other vague answer.

Answer6: Score 2 for

- a) No, it will not be beneficial.
- b) Minimum weight should be 1kg or 1000 grams.

Score 1 for either a or b.

FIVE IMPORTANT R's OF OUR LIFE

Area: Natural resources

Class: 10

Chapter: 16

Chapter Name: Management of Natural Resources.

Concept: Sustainable management of natural resources

Learning Outcomes:

The Student will be able to:-

1. apply scientific concepts in daily life.
2. communicate the importance of five R's
3. make efforts to conserve environment realizing the interdependency and interrelationship in the biotic and a biotic factors of environment.



Reduce:Reducing the amount of waste you produce is the best way to help the environment. This means that you use less. You save electricity by switching off unnecessary lights and fans. You save water by repairing leaky taps. You do not waste food.

Recycle: This means that you collect plastic, paper, glass and metal items and recycle these materials to make required things instead of synthesizing or extracting fresh plastic, paper, glass or metal. In order to recycle, we first need to segregate our wastes so that the material that can be recycled is not dumped along with other wastes. In some towns you can leave your recyclables in bins outside your home, and a truck will come and collect them regularly.

Reuse:This is actually even better than recycling because the process of recycling uses some energy. In the 'reuse' strategy, you simply use things again and again. Instead of throwing

away used envelopes, you can reverse it and use it again. The plastic bottles in which you buy various food-items like jam or pickle can be used for storing things in the kitchen. Don't throw out clothes, toys, furniture, and other things that you don't want anymore. Somebody else can probably use them. You can bring them to a centre that collects donations, give them to friends, or even have a yard sale.

Refuse: This means to say **No** to things people offer you that you don't need. eg say **No** to plastic

Rot: To undergo decomposition from the action of bacteria or fungi

Q.1 What does it mean to reuse?

- A. Throw things away.
- B. Try to find new ways to use something again.
- C. Buy more of something.

Q.2 What are the 5 R's in sustainable development?

The Volume of e-waste generated in India is growing 21% annually. In 2016, newly launched e-waste management rules mandated manufacturers to register and collect e-waste and channel it to authorized recyclers.

Q.3(i) How is e-waste contaminating our environment?

(ii) Suggest measures to dispose off e-waste.

Q. 4 How much do you agree with the following statements?

Tick only one box in each row

	Strongly agree	Agree	Disagree	Strongly Disagree
Reducing the amount of waste you produce is the best way to help the environment				
Reuse creates less air and water pollution than making a new item or recycling.				

Item Description:

Q No	Q Type	Competency	Knowledge	Context	Difficulty level
Q NO 1.	Close ended	Explain phenomenon scientifically	Content	global	low
Q NO 2	Closed constructed	Explain phenomenon scientifically	Content	global	low
Q NO 3	Open ended	Explain phenomenon scientifically	Epistemic	global	medium
Q NO 4	Open ended	Interpret data and evidence scientifically	Content	global	medium

Answer Key:

Ans1. B

Ans2. Refuse, Reduce, Reuse, Recycle and Rot.

Ans3.1) when e-waste breaks down, it releases toxic heavy metals .When these toxins leach into the soil, they affect the plants and trees that are growing into this soil.

Ans4 strongly agree, agree

GREEN POWER

Area: Natural Resources

Class: 10

Chapter: 14

Chapter Name: Sources of Energy.

Concept: Sources of Energy

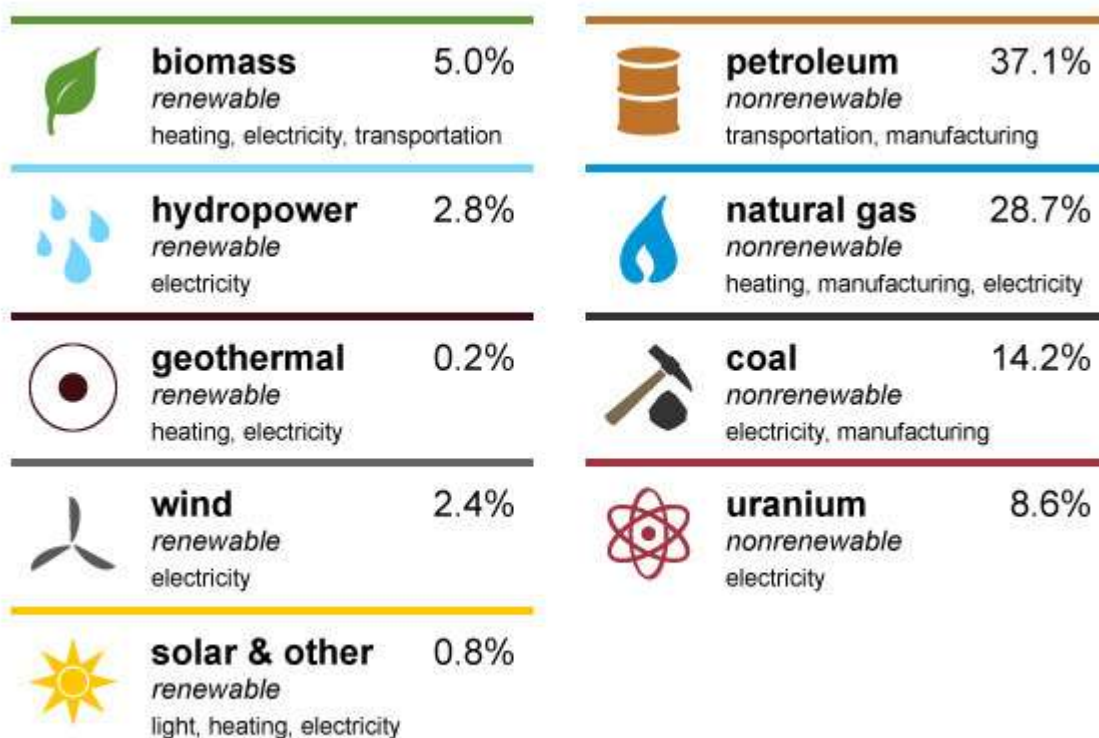
Learning outcomes:

The student will be able to

1. Explain phenomena scientifically.
2. Apply learning of scientific concepts in daily life.
3. Classify green power, non renewable and secondary energy sources.
4. Make efforts to conserve environment.

Energy is the capacity of a physical system to perform work. Energy exists in several forms. Renewable and non renewable energy can be converted into secondary energy sources. Secondary energy sources are those sources which are derived from the naturally available resources. More and more people want to use clean renewable energy. It is also called green power. In the United States most of the energy comes from non renewable sources.

U.S. energy consumption by source, 2017



Sum of individual percentages may not equal 100 because of independent rounding.




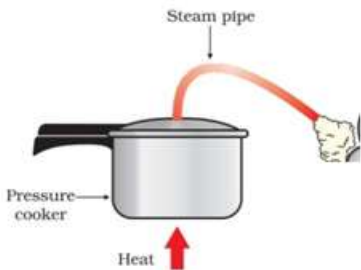
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3, April 2018, preliminary data

Now answer the following questions:

1. Name the maximum and minimum used energy source in the U. S.
2. List out the energy sources in green power, non renewable and secondary energy sources.

The flowing water and the tides in the sea are sources of energy. India is endowed with large hydro power potential of 145320 MW. Heavy investments are made on large and small hydro power plants. The estimated potential of small hydro power is about 15000 MW in the country. As on May 2019, the installed capacity of small hydro projects amount is 460375 MW. Total identified potential of tidal energy is about 12455 MW.

3. Which of the two has high hydro power potential? Why?

 <p>1</p>	 <p>2</p>	 <p>3</p>	 <p>4</p>
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4. Select the correct sequence for a model to demonstrate the process of thermo electric production.

- (A) 2, 3, 1, 4
 (B) 4, 2, 1, 3
 (C) 1, 2, 3, 4
 (D) 4, 2, 3, 1

5. Read the statements given below and answer:

S. No.	STATEMENT	AGREE	DISAGREE
1.	Replace light bulbs with CFLs		
2.	Don't unplug electronic gadgets when not in use.		
3.	Adjust the thermostat of your A. C. 5° higher than normal.		
4.	Nuclear power is a carbon free energy source.		

6. Write the environmental consequences of coal based thermal power plants.

Item description:

Q. No.	Q Type	Competency	Knowledge	Context	Difficulty Level
1.	Close structured	Explain phenomena scientifically	Content	Global	Low
2.	Close structured	Explain phenomena scientifically	Content	Global	Low
3.	Close structured	Explain phenomena scientifically	Content	Global	Medium
4.	Complex MCQ	Evaluate and design scientific inquiry	Content	Global	Medium
6.	Open Ended	Explain phenomena scientifically	Content	Global	Medium

Answer key:

- Full credit:
Maximum: Petroleum
Minimum: Solar and other.
No credit: any other response.
- Full credit:
Green Power: Biomass, Hydro Power, Geothermal, Wind, Solar.
Non renewable: Petroleum, Coal, Uranium, Natural Gas.
Secondary: Hydrogen, electricity, gasoline etc.
No credit: any other response.
- Full credit:
From the given information above, it can be clearly seen that the potential of flowing water is 145320MW, whereas that of tidal energy is 12455 MW. So the potential of flowing water is more.
No credit: any other response.
- Full credit:
Option (B).
No credit: any other response.
- Full credit:
Agree, disagree, agree, and agree (in this order).
No credit: any other response.
- Full credit:
Coal based thermal power plants pollute atmosphere, cause green house effect, cause acid rain, hot water from these plants adversely affects aquatic life, is expensive etc.
Partial credit: two or more of the above/any other relevant responses.
No credit: any other response

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CRITICAL AND CREATIVE THINKING (CCT)

Resource Material Developed

Mathematical Literacy

- 4 modules (classes 7 to 10) in English and Hindi medium
- 'Step by Step' Mathematics Booklet Series
- 'Mathlete' fortnightly series
- CCT Booklets for classes 8th, 9th and 10th (100 pages)

Scientific Literacy

- 5 Modules (classes 6 to 10) in English and Hindi medium
- 'Harshit /Joyful Learning' weekly series
- CCT Booklet for classes 8th -10th (100 pages)

Reading Literacy English

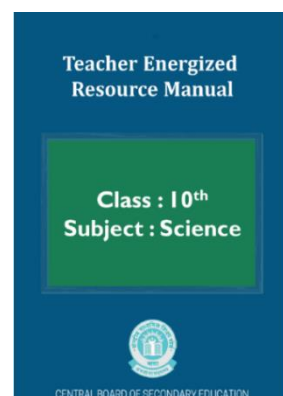
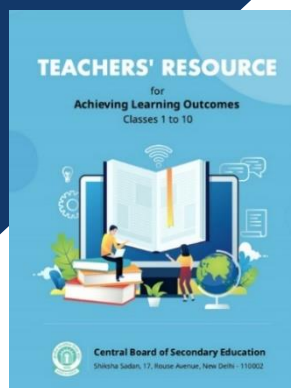
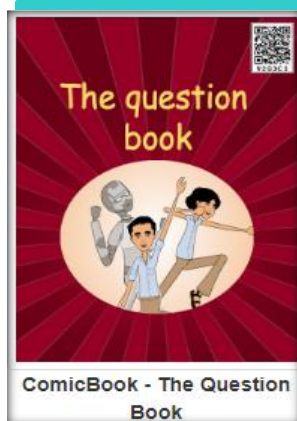
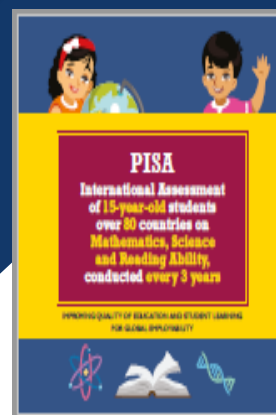
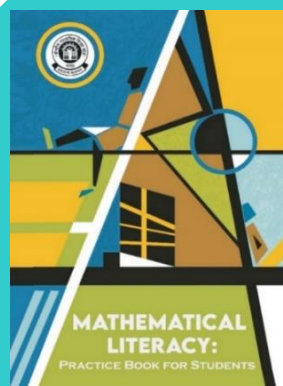
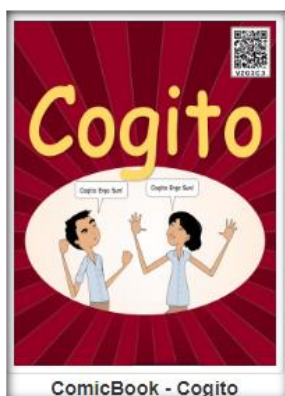
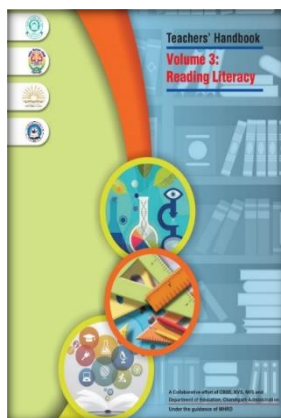
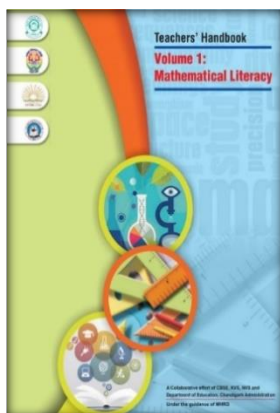
- 5 Handbooks/modules of Reading Literacy (classes 6 to 10)
- 3 Handbooks/modules of Reading Literacy for supplementary reader (classes 8 to 10)
- CCT Booklets for classes 8th, 9th and 10th (100 pages)

Reading Literacy Hindi

- 5 modules (Classes 6 to 10)
- 'Sankalp' Fortnightly Series
- Monthly CCT booklets for classes 6th- 8th and 9th-10th (January 2021 onwards)
- CCT Practice Booklets for classes 8th, 9th and 10th (100 pages)

CBSE Handbooks

- Vol.I Mathematical Literacy
- Vol.I Scientific Literacy
- Vol.I Reading Literacy
- Experiential Learning
- Joyful Teaching and Learning of Mathematics
- Art Integration
- Self-learning Resources
- Artificial Intelligence Integration Manual
- The Question Book
- Cogito
- 21st Century Skill Handbook
- Cyber Safety Manual
- Mathematical Literacy: Practice Book for Students
- PISA Primer
- Handbook of Joyful Learning



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