

Maharashtra Board Class 10 Science and Technology 72-N-653-2024

Question Paper with Solutions

Time Allowed :2 Hour

Maximum Marks :40

Total Questions :4

General Instructions

Read the following instructions very carefully and strictly follow them:

- (i) All questions are compulsory.
- (ii) The numbers to the right of the questions indicate full marks.
- (iii) In case of MCQs [Q. No. 1 (A)] only the first attempt will be evaluated and will be given credit.
- (iv) Scientifically and technically correct, labeled diagrams should be drawn wherever necessary.
- (v) Each new question should be started on the new page.

1.(A) Choose and write correct option number as answer :

i. Regeneration occurs in

- (A) amoeba
- (B) paramecium
- (C) euglena
- (D) planaria

Correct Answer: (D) planaria

Solution: Regeneration is the process where an organism regrows lost body parts. The ability of regeneration is found in organisms like Planaria (a type of flatworm), which can regrow parts of their body if they are cut. While other organisms like amoeba and paramecium reproduce via binary fission, regeneration is not their characteristic trait. Thus, planaria is the correct answer.

Quick Tip

Planaria are capable of remarkable regeneration, growing back lost parts of their bodies.

(ii) Lactobacillus brevis gives us the beverage

- (A) cocoa
- (B) coffee
- (C) wine
- (D) cider

Correct Answer: (D) cider

Solution: Lactobacillus brevis is a bacterium used in the fermentation process. It is specifically known for being involved in the production of cider, a fermented beverage made from apples.

Thus, the correct answer is cider.

Quick Tip

Lactobacillus brevis is important in the fermentation process, especially in making cider from apples.

(iii) A minor change occurs due to change in position of any nucleotide is termed as

- (A) transcription
- (B) translocation
- (C) mutation
- (D) translation

Correct Answer: (C) mutation

Solution: A mutation is defined as a change in the DNA sequence or the position of a nucleotide. These changes can occur naturally due to errors during DNA replication or can be induced by external factors such as radiation or chemicals.

Thus, the correct answer is mutation.

Quick Tip

Mutations can lead to changes in genetic traits, and they may have beneficial, neutral, or harmful effects on organisms.

(iv) **Atomic power plant in Maharashtra is** .

- (A) Chandrapur
- (B) Koyana
- (C) Tarapur
- (D) Anjanwel

Correct Answer: (C) Tarapur

Solution: The Tarapur Atomic Power Station is located in Maharashtra, India. It was the first nuclear power plant in India, established with the help of the United States. The plant is situated near the town of Tarapur, about 100 kilometers north of Mumbai.

Thus, the correct answer is Tarapur.

Quick Tip

Tarapur Atomic Power Station is India's first nuclear power plant, located in Maharashtra.

Example of phylum Arthropoda is

- (A) scorpion
- (B) starfish
- (C) earthworm
- (D) hydra

Correct Answer: (A) scorpion

Solution: Arthropoda is the largest phylum of the animal kingdom, and it includes organisms that have an exoskeleton, a segmented body, and jointed appendages. Examples of arthropods include scorpions, spiders, insects, and crustaceans.

Thus, the correct answer is scorpion.

Quick Tip

Scorpions are an example of arthropods, known for their exoskeleton and jointed limbs.

(B)Solve the following :

(i) Pick the odd man out :

duckbill platypus, pomfret, lungfish, peripatus.

Correct Answer: pomfret

Solution: Duckbill Platypus, lungfish, and peripatus are all unique species that share the characteristic of being amphibians or semi-aquatic animals with distinct evolutionary traits. The pomfret is a fish but does not have these amphibian features, making it the odd one out. Thus, the correct answer is pomfret.

Quick Tip

Pomfret is the only fully aquatic fish among the listed species, unlike the others that have amphibian-like traits.

(ii) Write co-relation :

Skin : Melanin : : Pancreas :

Correct Answer: Insulin

Solution: Melanin is a pigment found in the skin, which determines skin color. Similarly, the pancreas is responsible for producing insulin, a hormone that helps regulate blood sugar levels.

Thus, the correct correlation is Skin : Melanin : : Pancreas : Insulin.

Quick Tip

The pancreas produces insulin, which is important in regulating blood sugar, just like melanin regulates skin color.

(iii) State, true or false :

Production of various useful aquatic organisms with the help of water is called blue revolution.

Correct Answer: True

Solution: The blue revolution refers to the increased production of aquatic organisms like

fish, shrimp, and other marine organisms, primarily through aquaculture and fisheries. It aims to improve the supply of aquatic food resources. This term is indeed correct as it signifies the utilization of water bodies for the cultivation and production of aquatic organisms.

Thus, the correct answer is True.

Quick Tip

Blue revolution focuses on increasing the production of aquatic organisms through aquaculture and fisheries.

(iv) Write full form of WHO.

Correct Answer: World Health Organization

Solution: The full form of WHO is the World Health Organization. It is a specialized agency of the United Nations responsible for international public health. WHO is involved in setting health standards, providing leadership on health matters, and coordinating international efforts to improve health.

Thus, the correct answer is World Health Organization.

Quick Tip

WHO is responsible for promoting global health and coordinating international responses to health crises.

(v) Match the pair :

'A'	'B'
(1) Male	(a) 44 + XX
	(b) 44 + XY
	(c) 44 + YY

Correct Answer: (1) Male (b) 44 + XY

Solution: In humans: - Males typically have XY chromosomes. Hence, the pair is Male: 44 + XY.

- Females typically have XX chromosomes. Hence, the pair is Female: 44 + XX.

Thus, the correct matching is: - Male - (b) 44 + XY

Quick Tip

Humans typically have XY chromosomes for males and XX chromosomes for females.

2.(A) Give scientific reasons (any two) :

(i) Though tortoise lives on land as well as in water, it cannot be included in class-Amphibia.

Solution:

1. Tortoises are primarily land-dwelling reptiles and only spend a small part of their life in water. Amphibians, on the other hand, are more dependent on water for reproduction and early life stages.
2. Tortoises have a hard, bony shell that is not present in amphibians like frogs. Amphibians also have more permeable skin, allowing for respiration through their skin, while tortoises lack this characteristic.

Quick Tip

Amphibians generally have permeable skin and need water for reproduction, whereas tortoises are more adapted to terrestrial life.

(ii) Hydroelectric energy, solar energy, and wind energy are called renewable energies.

Solution:

1. Hydroelectric energy: Hydroelectric energy is derived from flowing water, which is constantly replenished through natural water cycles like rainfall and melting snow. Therefore, it is considered renewable.
2. Solar energy: Solar energy comes from the sun, which is a continuous and inexhaustible source of energy. As the sun will continue to shine for billions of years, solar energy is a renewable resource.
3. Wind energy: Wind energy is harnessed from the wind, which is powered by the sun's

heat and the Earth's rotation. Since wind is constantly generated, it is also considered renewable.

Quick Tip

Renewable energies like hydro, solar, and wind are sustainable and have little to no environmental impact compared to fossil fuels.

(iii) We feel tired after exercise.

Solution:

1. **Energy Depletion:** During exercise, the body uses energy stored in muscles, primarily in the form of glycogen. After prolonged or intense exercise, these energy reserves are depleted, leading to fatigue and a feeling of tiredness.
2. **Lactic Acid Build-up:** During vigorous exercise, especially anaerobic exercise, the body produces lactic acid as a byproduct. The accumulation of lactic acid in muscles contributes to muscle fatigue and soreness, making us feel tired.
3. **Increased Oxygen Demand:** After exercise, the body requires more oxygen to recover. The elevated heart rate and breathing rate are part of this recovery process, contributing to the feeling of tiredness as the body works to restore balance.

Quick Tip

Tiredness after exercise is a normal result of energy depletion and the build-up of waste products like lactic acid.

(B) Answer any three of the following : (i) Write four adverse effects of radiations on human body.

Solution:

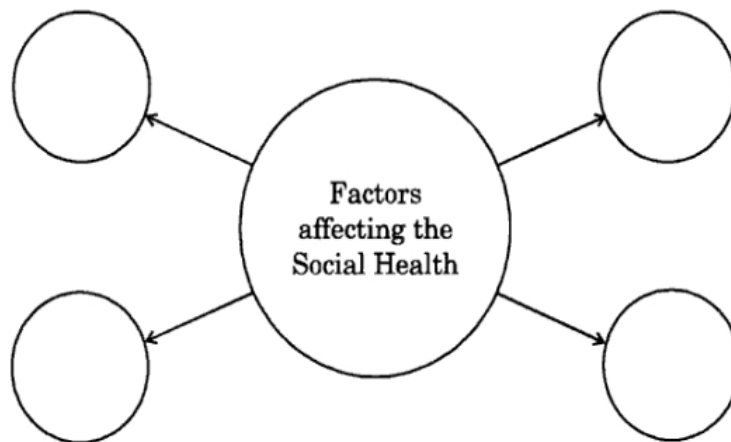
1. **DNA Damage:** Exposure to radiation can cause direct damage to the DNA structure, leading to mutations that may result in genetic disorders or cancer.

2. Cancer: Ionizing radiation, such as X-rays and gamma rays, can increase the risk of developing various types of cancer, including skin cancer, lung cancer, and leukemia.
3. Skin Burns: High doses of radiation can cause radiation burns on the skin, which can result in redness, blisters, and tissue damage. In severe cases, it can lead to long-term scars.
4. Radiation Sickness: Prolonged exposure to high levels of radiation can lead to acute radiation sickness, characterized by nausea, vomiting, fatigue, and, in extreme cases, organ failure and death.

Quick Tip

Radiation exposure can have severe effects, including genetic mutations, increased cancer risk, and tissue damage. Proper safety measures are crucial.

shapes, arrows.meta **iii.Redraw and complete the given chart.**



Solution:

[node distance=2cm and 3cm, mycircle/.style=circle, draw, text centered, minimum size=2cm, mybox/.style=rectangle, draw, text centered, minimum width=3cm, minimum height=1.5cm] [mycircle] (center) Factors affecting the Social Health;
[mycircle, above left=of center] (node1) Family Support; [mycircle, above right=of center] (node2) Community Interaction; [mycircle, below left=of center] (node3) Education Level; [mycircle, below right=of center] (node4) Economic Stability;

$[-\dot{z}]$ (node1) – (center); $[-\dot{z}]$ (node2) – (center); $[-\dot{z}]$ (node3) – (center); $[-\dot{z}]$ (node4) – (center);

Quick Tip

Social health is impacted by factors like family support, community interaction, education level, and economic stability. A balanced approach to these aspects can lead to improved social well-being.

(iii) Write any four important facts which must be thought over while considering the scope of disaster.

Solution:

1. Type of Disaster: The nature and type of disaster, such as natural (earthquakes, floods) or man-made (industrial accidents, nuclear incidents), play a key role in determining the scope of the disaster.
2. Impact Area: The geographical area affected by the disaster, including urban and rural zones, and whether it involves multiple regions or countries.
3. Severity and Duration: The extent of damage caused and the duration for which the disaster lasts, which will influence the level of resources needed for recovery.
4. Vulnerable Populations: Identifying and prioritizing the most vulnerable groups such as children, the elderly, and those with disabilities, who may require additional support during and after the disaster.

Quick Tip

Considering the type, area, severity, and vulnerable populations will help in planning a more effective disaster response.

(iv) Name two fuels obtained by microbial processes. Why is it necessary to increase the use of such fuels?

Solution:

1. **Biogas:** It is produced by microbial digestion of organic matter such as food waste, manure, and sewage. The microbes break down these materials in an anaerobic environment to produce methane.
2. **Ethanol:** Produced through the fermentation process, where microorganisms like yeast convert sugars into ethanol and carbon dioxide. It is commonly used as a biofuel in vehicles.

Reason for Increasing the Use of Microbial Fuels:

1. **Sustainability:** Microbial fuels are renewable sources of energy, unlike fossil fuels, which are finite and depleting.
2. **Environmental Benefits:** Microbial fuels like biogas and ethanol produce fewer greenhouse gases and are less polluting compared to conventional fuels, helping in the fight against climate change.
3. **Waste Reduction:** The production of these fuels utilizes organic waste, turning it into valuable energy, thus reducing environmental pollution and waste accumulation.

Quick Tip

Microbial fuels like biogas and ethanol are eco-friendly alternatives to fossil fuels and can help reduce waste while promoting sustainability.

(v) What is DNA fingerprinting? Where is it mainly useful?

Solution:

DNA fingerprinting is a technique used to identify individuals based on their unique genetic makeup. It involves analyzing the patterns in an individual's DNA, specifically focusing on regions that are highly variable between individuals. This pattern is akin to a fingerprint, which is why it is called DNA fingerprinting.

It is done by extracting DNA, amplifying specific regions (using techniques like PCR), and comparing the banding patterns produced through gel electrophoresis or other methods.

Main Uses of DNA Fingerprinting:

1. Forensic Science: DNA fingerprinting is commonly used in criminal investigations to match a suspect's DNA with evidence found at crime scenes.
2. Paternity Testing: It is used to confirm biological relationships, especially in paternity testing.
3. Genetic Research: DNA fingerprinting is used in research to study genetic variations within populations.
4. Identification of Species: In conservation biology, it helps in identifying animal species and in breeding programs.

Quick Tip

DNA fingerprinting provides a unique and highly accurate method for identifying individuals and determining biological relationships.

3. Answer any five:

(i) (a) What are vitamins ?

Solution: Vitamins are organic compounds that are essential for normal growth and nutrition. They are required by the body in small amounts to maintain good health and carry out vital metabolic functions. Vitamins cannot be synthesized by the body (except for Vitamin D) and must be obtained through diet or supplements.

(b) Classify them according to their solubility.

Solution: Vitamins are classified into two categories based on their solubility:

1. Water-soluble vitamins: These vitamins dissolve in water and are not stored in the body. They need to be consumed regularly. Examples include Vitamin C and the B-vitamins.
2. Fat-soluble vitamins: These vitamins dissolve in fat and are stored in the body's fat tissues and liver. Examples include Vitamins A, D, E, and K.

(c) Give one example of each type as per above classification.

Solution:

1. Water-soluble vitamin: Vitamin C (ascorbic acid)
2. Fat-soluble vitamin: Vitamin A (retinol)

Quick Tip

Water-soluble vitamins are quickly excreted by the body, while fat-soluble vitamins are stored for longer periods.

(ii) Explain the following terms :

(a) Stem cells

Solution: Stem cells are undifferentiated cells that have the ability to develop into various types of specialized cells in the body. They can divide and renew themselves, and under specific conditions, can differentiate into a variety of cell types, such as muscle, nerve, or blood cells. They are crucial in medical research and therapies, such as regenerative medicine.

(b) Cloning

Solution: Cloning is the process of creating an identical copy of an organism or cell through non-sexual reproduction. It involves duplicating an organism's genetic material to produce an organism that is genetically identical to the original. Cloning can be used in therapeutic settings, such as stem cell therapy, or for agricultural and reproductive purposes.

(c) Genetically modified crops

Solution: Genetically modified (GM) crops are plants whose genetic material has been altered through genetic engineering techniques. These modifications can enhance certain traits such as resistance to pests, diseases, or environmental conditions, or increase nutritional value. GM crops are widely used in agriculture to improve yield and reduce the need for chemical pesticides.

Quick Tip

Stem cells hold the potential for treating a wide variety of diseases, while cloning and genetically modified crops have important implications for both medicine and agriculture.

(iii) Complete the given paragraph by filling the blank spaces from the options given in the bracket.

[oxygen, pyridines, mechanical, CO₂, petroleum, fatal, polyester, norcadia]

Spilling of _____ oil occurs in ocean due to various reasons. This oil may prove _____ and toxic to aquatic organisms. It is not easy to remove the oil layer from surface of water by _____ method.

However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy the _____ and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called as hydrocarbonoclastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with _____ and water is formed in this process.

Solution:

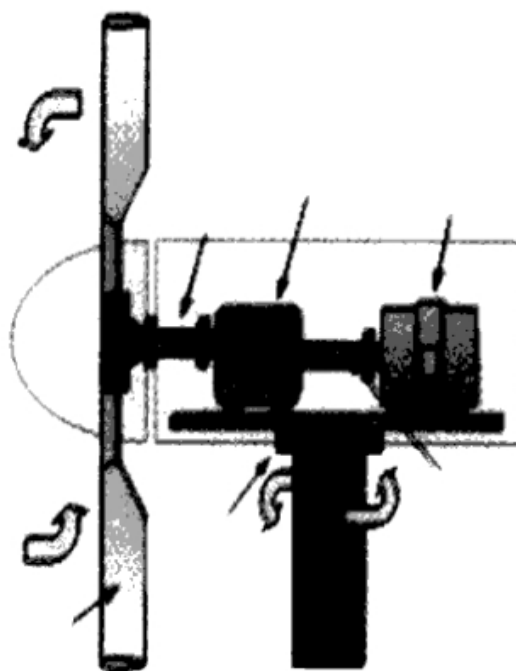
Spilling of **petroleum** oil occurs in ocean due to various reasons. This oil may prove **fatal** and toxic to aquatic organisms. It is not easy to remove the oil layer from the surface of water by **mechanical** method.

However, bacteria like *Pseudomonas* spp. and *Alcanovorax borkumensis* have the ability to destroy the **norcadia** and other chemicals. Hence, these bacteria are used to clear the oil spills. These are called hydrocarbonoclastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with **oxygen** and **CO₂**, and water is formed in this process.

Quick Tip

Bacteria like *Pseudomonas* and *Alcanovorax* play a vital role in clearing oil spills through biodegradation by utilizing hydrocarbons.

(iv) Observe the given picture and answer the questions.



Questions : (a) Identify the given diagram.

Solution: The given diagram is of a Wind Turbine. It is used to convert wind energy into mechanical energy, which is then converted into electrical energy.

(b) What is the source of energy in this project?

Solution: The source of energy in this project is wind energy. The wind turbine harnesses the kinetic energy from the wind and converts it into electricity.

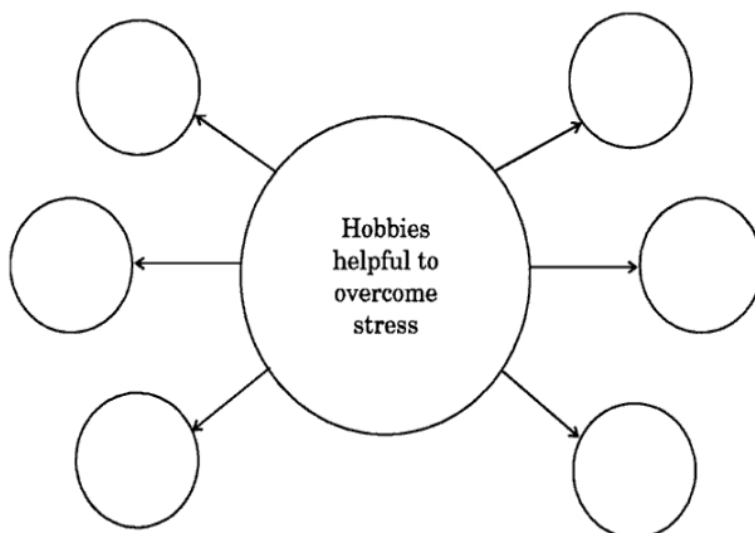
(c) Why is this source supposed to be eco-friendly?

Solution: Wind energy is considered eco-friendly because it is a renewable source of energy that does not produce harmful pollutants or greenhouse gases. It is a clean, sustainable energy source that helps reduce reliance on fossil fuels and mitigates climate change.

Quick Tip

Wind turbines are a renewable and eco-friendly source of energy that contribute to reducing carbon emissions and combating global warming.

Complete the following chart.



Solution:

[node distance=2cm and 3cm, mycircle/.style=circle, draw, text centered, minimum size=2cm, mybox/.style=rectangle, draw, text centered, minimum width=3cm, minimum height=1.5cm] [mycircle] (center) Hobbies helpful to overcome stress;
[mycircle, above left=of center] (node1) Reading Books; [mycircle, above right=of center] (node2) Listening to Music; [mycircle, below left=of center] (node3) Exercise and Yoga; [mycircle, below right=of center] (node4) Painting or Drawing; [mycircle, right=of center] (node5) Gardening; [mycircle, below=2cm of node5] (node6) Cooking;
[->] (node1) – (center); [->] (node2) – (center); [->] (node3) – (center); [->] (node4) – (center); [->] (node5) – (center); [->] (node6) – (center);

Quick Tip

Engaging in hobbies such as reading, exercise, or creative activities like painting can effectively reduce stress and improve mental well-being.

(vi) Write names of any six materials which are to be in the first aid box.

Solution: The six materials that should be in the first aid box are:

1. Bandages
2. Antiseptic solution
3. Cotton wool
4. Adhesive tape
5. Scissors
6. Tweezers

Quick Tip

A well-stocked first aid kit is essential for managing minor injuries and accidents quickly and effectively.

(vii) (a) Define vestigial organs.

Solution: Vestigial organs are anatomical structures or organs that have lost their original function through evolution. They are remnants of structures that were once functional in ancestral species but are no longer necessary or are only partially functional in the current species.

(b) Write names of any two vestigial organs in the human body.

Solution: Two examples of vestigial organs in the human body are:

1. Appendix
2. Tailbone (coccyx)

(c) Write names of those animals in which these vestigial organs are functional.

Solution: In some animals, these vestigial organs are still functional. Examples include:

1. Appendix: Functional in herbivorous animals like rabbits.
2. Tailbone: Functional in animals with tails, such as monkeys, which use them for balance and communication.

Quick Tip

Vestigial organs are remnants of evolution that provide insight into our ancestral species' biology.

(viii) Read the statements and answer accordingly :

(a) Calcareous spines are present on the body. Tube feet are used for locomotion and capturing prey also.

Identify the phylum and give one example.

Solution: The phylum is Echinodermata. One example is Starfish (Asteroidea).

(b) I live in your small intestine. Pseudocoelom is present in my thread-like body.

Identify the phylum and give one example.

Solution: The phylum is Nematoda. One example is Ascaris (a parasitic roundworm).

(c) My body is spindle-shaped. I respire with the help of gills.

Identify my class and give one example.

Solution: The class is Pisces. One example is Goldfish (Carassius auratus).

Quick Tip

Classifications like Echinodermata, Nematoda, and Pisces help categorize animals based on their distinctive features such as body structure and mode of respiration.

4. Answer any one.

(i) Answer the following questions based on the human male reproductive system:

(a) In which organ are sperms formed?

Solution: Sperms are formed in the testes.

(b) What is the length of a sperm?

Solution: The length of a sperm is approximately 50 to 60 micrometers.

(c) What is the work of vas deferens?

Solution: The vas deferens is responsible for transporting sperm from the epididymis to the urethra during ejaculation.

(d) By which type of cell division are sperms formed?

Solution: Sperms are formed through meiosis, which is a type of cell division that reduces the chromosome number by half.

(e) Name any two unpaired organs of the male reproductive system.

Solution: Two unpaired organs of the male reproductive system are:

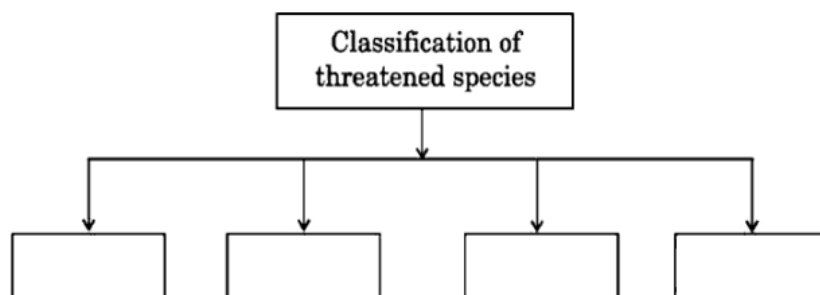
1. Testes
2. Penis

Quick Tip

The male reproductive system includes several key structures, and meiosis plays an important role in sperm formation.

(ii) Answer the following questions based on environmental conservation and biodiversity :

(a) Complete the flow chart :



Solution:

(center) Classification of Threatened Species;

(node1) Critically Endangered;

(node2) Endangered;

(node3) Vulnerable;

(node4) Lower Risk (Least Concern);

Quick Tip

The IUCN Red List classifies species based on their extinction risk, ranging from "Least Concern" to "Critically Endangered."
