Maharashtra State Board
Class X
Science and Technology Paper – II
Sample Paper 4 - Solution

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1. (A)

(1) Bacteria used to clear oil spills are called **hydrocarbonoclastic** bacteria.

(2) Pollen (All others are parts of the gynoecium.)

(3) Red panda : Rare species :: Giant squirrel : **Indeterminate species**

(4) The given symbol promotes the use of solar energy. Since solar energy is renewable, we can use this energy and replace other polluting and exhaustible fuels, thereby reducing pollution.

(5) Phylum Arthropoda

(B)

(1) Cytokinesis
During cytokinesis, a notch is formed at the equatorial plane of the cell which deepens gradually and thereby two new cells are formed.

(2) Detoxification
The process in which there is conversion of a pesticide molecule to a non-toxic compound is called detoxification.

(3) Cockroach
Cockroach belongs to Phylum Arthropoda, Class Insecta.

(4) Mirrors
Mirrors are used in a solar cooker to harvest solar energy.

(5) Smoking
Passive smoking can cause health-related issues of people in the vicinity.

2.

(1) **Differences between binary fission and multiple fission:**

Binary fission	Multiple fission
1. Nucleus divides into two parts.	1. Nucleus divides into many parts.
2. It occurs during favourable conditions.	2. It takes place mostly during unfavourable conditions.
3. It gives rise to two individuals.	3. It forms many individuals.
4. Cytoplasm divides after each nuclear division.	4. Cytoplasm does not divide after every nuclear division.
5. Example: *Euglena* divides by binary fission.	5. Example: *Plasmodium* divides by multiple fission.

(2) Biofuels are good and renewable energy sources. They are easily and abundantly available; hence, they are called reliable fuels of the future. Biofuel is available in three forms:

- Solid fuels: Coal, dung
- Liquid fuels: Alcohol, vegetable oil
- Gaseous fuels: Coal gas, gobar gas

(3) **Advantages of solar energy:**

- Eco-friendly, as it does not create pollution
- Renewable and available in plenty

Disadvantages of solar energy:

- Available only in the presence of the Sun
- Needs to be stored in batteries for use

(4)

Microbes	Function
Thiobacilli and Sulphobacilli	Convert heavy metals to compounds before leaching
Geobacter	**Convert salts of uranium to insoluble salts**
Vibrio	**Decompose PET**
Hydrocarbonoclastic bacteria	Cleaning hydrocarbon and oil pollutants

(5) **Scopes of disasters:**

- Pre-disaster phase
- Warning phase
- Emergency phase
- Rehabilitation phase
- Recovery phase
- Reconstruction phase

(6) **Role of microbes in compost production:**

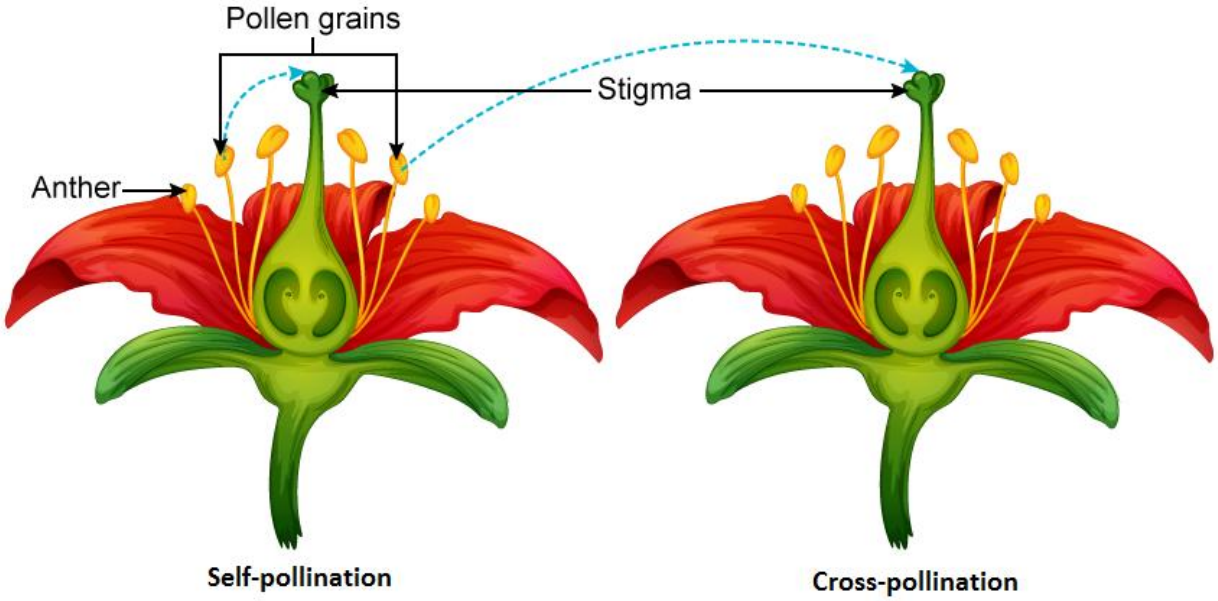
- Microbes can bring about the decomposition of organic compounds naturally.
- During biodegradation, some bacteria and fungi bring about such decomposition and release the inorganic constituents back into the nature.
- In this way, by the process of recycling, compost is formed.

(7) **Effects of excessive use of social media and technology:**

- Excessive use of social media and modern technology disturbs social health.
- It also affects the physical and mental health of the people.
- There is an increase in cybercrime.
- People waste their time by watching useless and obscene material.
- Violence develops by watching few weird cartoon serials.
- There is an increased dependency on machines and people lose self-reliance.

3.

(1) Cross-pollination is a process which involves the transfer of pollen of one flower to the stigma of another flower on the same plant or different plants of the same species.



(2)

- In nuclear power plants, neutrons are bombarded on an atom of uranium-235.
- This converts uranium-235 to its isotope U-236.
- U-236 is very unstable and immediately forms atoms of barium and krypton by nuclear fission. This forms three neutrons and 200 MeV energy.
- In a similar way, three more uranium-235 atoms are subjected to nuclear fission which then releases energy.
- The neutrons released are again used for further nuclear fission reactions.
- In this way, nuclear fission reactions are carried out in a controlled manner in nuclear power plants.

(3) Classification of grasshopper:

- Kingdom: Animalia
- Sub-kingdom: Non-chordata
- Phylum: Arthropoda
- Class: Insecta

Characters:

- Organ-system grade organisation
- Bilateral symmetry

(4) Connecting links:

Some living organisms possess some characters in them which are distinctive features of one or more groups or phyla. Such individuals connect these two groups by sharing the characters of both, and hence, they are known as connecting links.

Examples:

- Peripatus is the connecting link between Annelida and Arthropoda as it shows characters of both animal phyla.
- It shows a segmented body, thin cuticle and parapodia-like organs like annelids.
- It shows tracheal respiration and open circulatory system similar to arthropods.
- Duck billed platypus is a connecting link between reptiles and mammals.
- It lays eggs like reptiles but shows the presence of mammary glands and hair like mammals.
- Lung fish is a connecting link between fish and amphibians.
- Although it is a fish, it respires with the help of lungs just like amphibians.
- Connecting links indicate the direction and hierarchy of evolution.

(5) Need for conservation of the environment: (Any three points)

- To maintain clean, pollution-free air, water and land
- To conserve natural resources
- To maintain a balance in nature
- To solve natural and artificial problems
- To protect and conserve biodiversity
- To give a quality and sustainable life for future generations

(6) Significance of mitosis: (Any three points)

- For growth of the body
- For restoration of the emaciated body
- For wound healing
- For the formation of blood cells

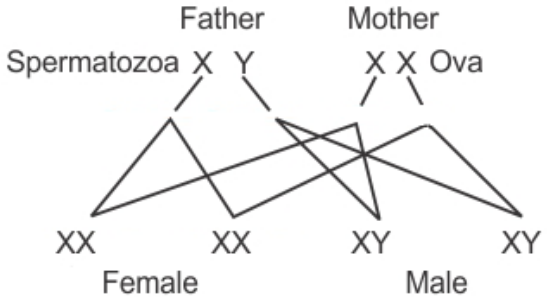
(7) Objectives of mock drill: (Any three points)

- To evaluate the responses of people to the disaster
- To improve coordination between various departments of disaster control
- To identify one's own abilities if a disaster approaches
- To improve the ability of quick response to disaster and taking rapid action
- To check the competency of planned actions
- To identify the possible errors and risks while dealing with disasters

4.

(1)

(a) From the given diagram, it is seen that there are two types of sperms produced by males.

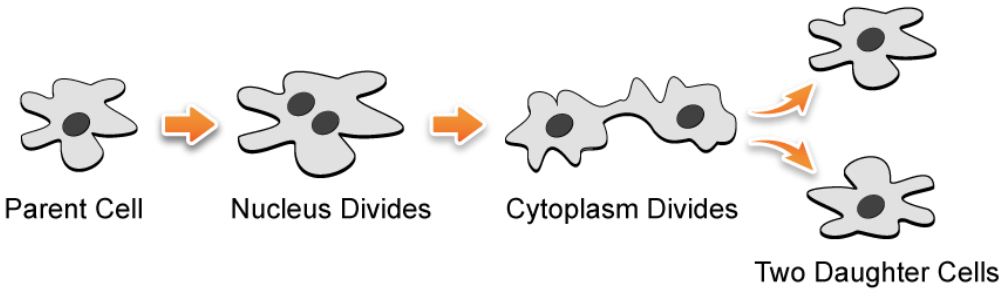


- One sperm has an X chromosome, while the other has a Y chromosome. The mother has all X-bearing oocytes.
  Thus, the sperm which fertilises the oocyte decides the sex of the child.
- If an X-bearing sperm fertilises the oocyte, a daughter is born. If a Y-bearing sperm fertilises the oocyte, a son is born.

Hence, the gender of the child is determined by the male partner of a couple.

(b) Daughters give a lot of joy; it is not only the boy!
Save the girl child.

(c) Binary fission in *Amoeba:*



(2)

(a) Rohu possess a vertebral column and hence belongs to sub-phylum Vertebrata.
(b) Rohu belongs to Class Pisces.
(c) Rohu respires with the help of gills.
(d) In Rohu, the exoskeleton is made of scales, while the endoskeleton is made of bones.
(e) The caudal fin in Rohu is used in steering and changing the direction during swimming.