1. Eucoelomates are multicellular animals that contain a body cavity or coelom formed from the mesoderm or gut and also called as animals with true body cavity. E.g., animals belonging to phylum Annelida.

Pseudocoelomates are multicellular animals that contain a false fluid filled body cavity which is not formed from mesoderm or gut. E.g., animals belonging to phylum Aschelmenthes.

2. A generator is connected to the turbines, which rotates them to produce electrical energy based on electromagnetic induction in a power station.

3.

a) During the process of protein synthesis, the mRNA carries the codon, which is a sequence of three nucleotides of DNA. The tRNA carries the anticodon, which is the complimentary sequence to the particular triplet nucleotides of the DNA.

b) Any shift in the position of the nucleotides of the genes causes minor or major genetic changes called mutation. Sickle cell anaemia is a genetic disorder caused by mutation.

4.

a) Plutonium and uranium are used as fuel in a nuclear reactor for nuclear fission reaction during the production of electricity in a nuclear power plant.

b) In a nuclear power plant, nuclear energy is converted to thermal energy, and then thermal energy is converted to kinetic energy of steam. Later, the kinetic energy in steam is converted to kinetic energy in turbine, and finally this kinetic energy is converted to electrical energy.

5.

a) The two sources of stem cell in adult human beings are red bone marrow and adipose connective tissue.
b) Stem cell therapy is an advanced therapy that can be used to regenerate blood cells in blood-related conditions like thalassaemia and leukaemia.

OR

a) Erythropoietin: Anaemia; Factor VIII: Haemophilia.
b) Somatostatin: Dwarfism; Interleukin: Cancer.

Both erythropoietin and Factor VIII are proteins produced by biotechnology and they are used to treat anaemia and haemophilia respectively.
Somatostatin is a peptide hormone that can be produced through recombinant biotechnology and is used to treat dwarfism. Interleukin is a recombinant protein used to treat cancer patients.

6. Blue Revolution was introduced to increase mass production of various types of useful aquatic organisms in various water sources. Since fisheries industry has a huge potential in India, the Government of India took a lot of initiatives to promote fisheries on a larger scale. This mission also termed as Nil-Kranti-Mission (NKM-16) was started in the year 2016 and various subsidies around 50% to 100% are provided to aqua farmers and fishermen by the Government for the promotion of aquaculture of both marine and fresh water aquatic organisms. Fishes like rohu, catla, prawns, shrimps, lobsters etc., are cultured on a large scale owing to its huge export potential.

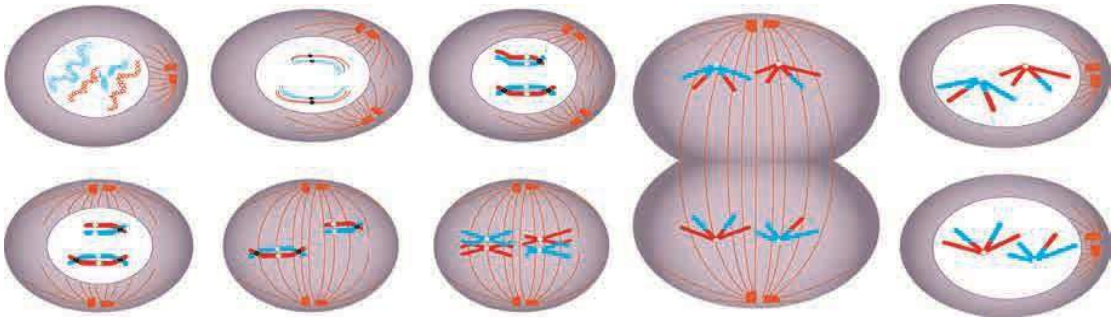
7. Continuous usage of cell phones leads to over exposure to radiation emitted by them and it is highly dangerous to children. It can lead to various physical problems like headache, fatigue, insomnia, tinnitus, forgetfulness, joint pain, vision and neurological problems etc. Due to preoccupation with the cell phones, children are also prone to psychological issues like being solitary always and not mingling with other children or elders. They become more self-centred and also less sensitive towards other children or elders. They slowly tend to lose concentration and interest in studies also.

OR

Follicle stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone are the four hormones involved in the process of menstrual cycle. The FSH helps in the follicle development in the ovary along with the oocyte and this follicle secretes the estrogen. Estrogen later facilitates development and regeneration of endometrium of the uterus in the initial and later cycles respectively. The LH initiates the ovulation process by helping the follicle along with the oocyte to burst open. The remaining follicular tissue later forms the corpus luteum that secretes progesterone. This progesterone aids with endometrial secretions during menstrual cycle.

8. Meiosis part I Stages

Prophase I **Metaphase I** **Anaphase I**
Telophase



9.

a) Forest Conservation Act (1980): Protects forest lands and prohibits its use for other purposes like illegal mining etc.

b) Wildlife Protection Act (1972): Prevents hunting and trading of endangered species. A lot of control measures for use of organs like skin, fur, etc. from such endangered animals, production and trading of articles produced from them is also mentioned in the Act.

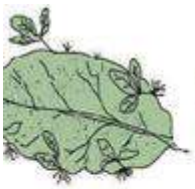
c) Environmental Conservation Act (1986): Control of polluting the environment. According to this Act, any person or industry is prohibited to release pollutants into the environment beyond the permissible limit. People who are breaching this law are punishable under law. National Green Tribunal was established to further implement this Act.

10. In order to prevent hacking of information, ATM pin, other passwords or usernames used for transaction in bank accounts to others should not be disclosed.
Avoiding fake websites especially like that of social networking sites, as they can display wrong and false information.
Illegal sale of literature, software, movies etc. through internet should be banned to prevent privacy.

11.

a. <u>Vegetative propagation</u> is a type of asexual reproduction, where different parts of the plants like the root, stem, leaf, bud are used for reproduction. In tuber plants like potato, vegetative propagation is through the eye-like structures present on the tubers. In bryophyllum, vegetative propagation takes place through the buds present on the leaf. In plants like sugarcane and grasses, vegetative propagation takes place through buds at the nodes. Vegetative propagation takes place in the roots of the root vegetables like carrot, radish.

b) Asexual reproduction methods



Budding from leaf margins - Bryophyllum

Budding from Parent hydra - Hydra

Vegetative Reproduction from eyes of the tuber - Potato

12. Biodiversity is the richness of living organisms in nature due to the presence of varieties of organisms, ecosystems and genetic variations within species.

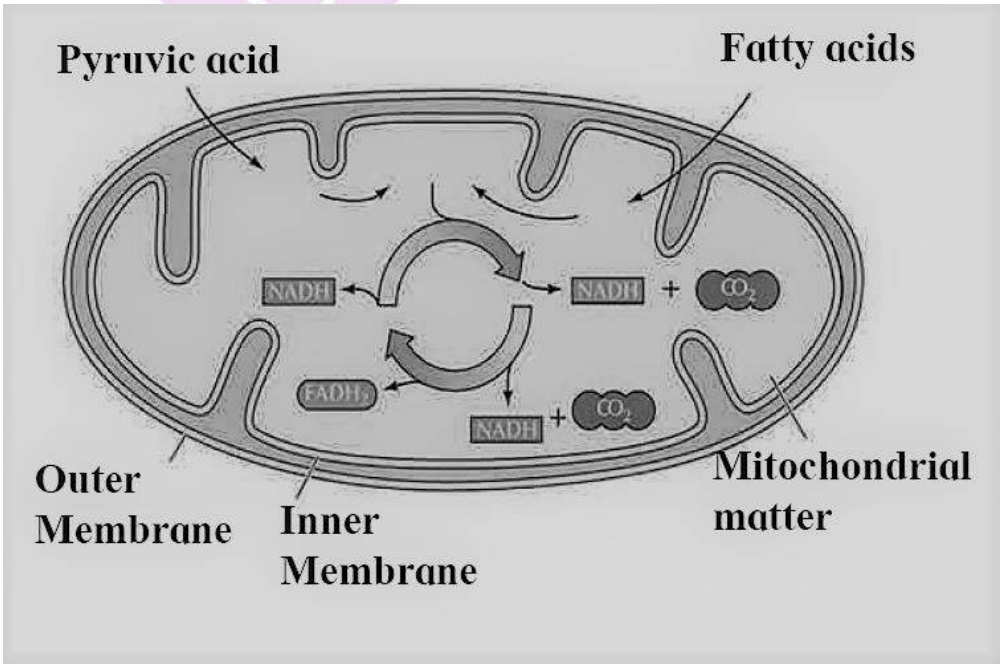
There are three levels of biodiversity.

a) Genetic diversity – Occurrence of diversity among the organisms of same species.
b) Species diversity – It is the existence of innumerable species in nature.
c) Ecosystem diversity – It is the existence of many ecosystems in each region.

Following are the four measures to conserve biodiversity:

1. Establishing national parks and sanctuaries.
2. Protecting rare species of organisms.
3. Observing the rules.
4. Maintaining a record of traditional knowledge.

13.



Tri-carboxylic Acid Cycle – After both the molecules of Acetyl-CoA enter mitochondria, Acetyl part of Acetyl-CoA is completely oxidized and molecules of

CO_2, H_2O, $NADH_2$ and $FADH_2$ are derived.

OR

a) Electricity is produced from the wind energy.
b) As the wind strikes the turbine blades, the blades rotate. The axel of the turbine is connected to the electric generator through the gearbox. Rotation of the blades, in turn, drives a generator to generate electricity.
c) Wind is a renewable energy source as it is replenished naturally. Thus, wind energy is a renewable source of energy.

14.

Sr. No.	Fruit	Microbe used	Role of microbe	Name of beverage
1	Coffea arabica	Lactobacillus brevis	Separating Seeds from Fruit	Coffee
2	Theobroma cacao	Candida, Hansenula, Pichia, Saccharomyces	Separating Seeds from Fruit	Cocoa
3	Grapes	Saccharomyces cerevisiae	Fermentation of Juice	Wine
4	Apple	Saccharomyces cerevisiae	Fermentation of Juice	Cider

15. Two pieces of evidence of evolution are

1. Morphological evidence – Similarities in physical characteristics.
2. Vestigial Organs – Degenerated or underdeveloped useless organs.

The figure shows the structure of bones in the human hand, foreleg cat, patagium of bat and flipper of a whale.
Though these organs do not show any superficial similarity and widely differ in their usage in each animal, the figure shows a similarity in the structure of bones and joints in organs of each of these animals. It indicates that these animals may have a common ancestor.

OR

The figure indicates Multiple Fission which is a type of asexual reproduction in unicellular organisms.

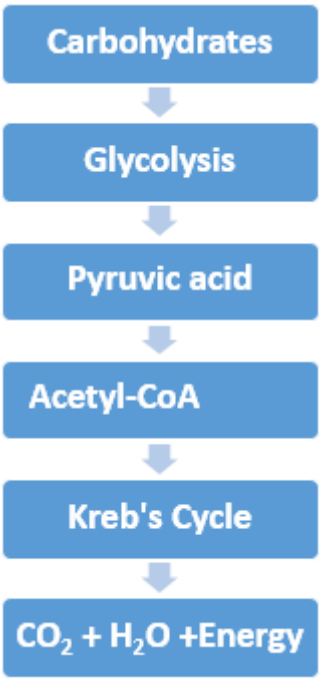
This method is adopted by amoeba and other similar protists. In the event of adverse conditions, amoeba stops the formation of pseudopodia and becomes rounded and forms protective covering called cyst around plasma membrane. Repeated nuclear divisions form many nuclei in the cyst which is followed by the

cytoplasmic division to form many amoebulae. They remain encysted till the adverse conditions persist. When the conditions become favorable, the cyst breaks open and amoebulae are released.

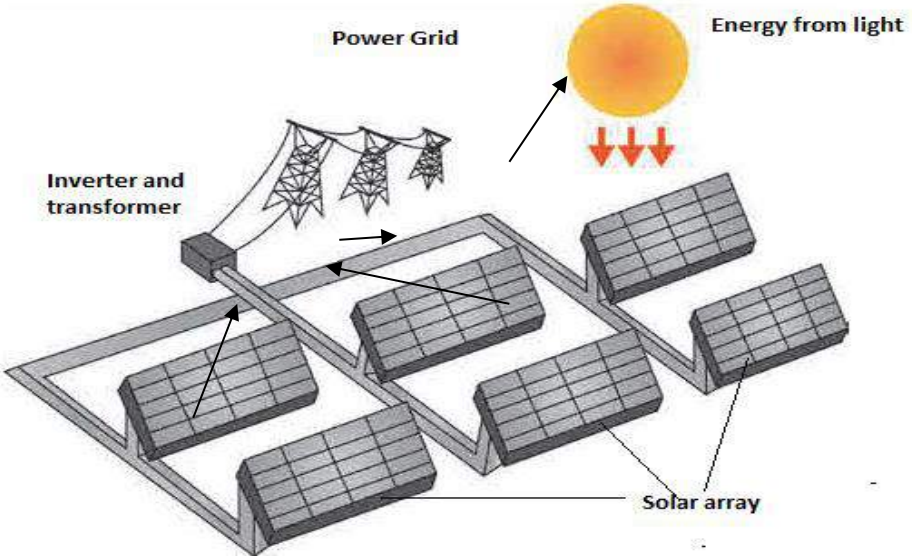
16.

a) The process of energy production through oxidation of glucose is called cellular respiration. Cellular respiration that takes place in the presence of oxygen is termed as aerobic respiration. This process involves formation of ATP molecules from glucose in the presence of oxygen.
The three main steps involved in aerobic respiration are: Glycolysis, Tri-carboxylic acid cycle, and electron-transfer chain reaction.
Glycolysis occurs in cytoplasm of the cell. Tricarboxylic acid cycle chain reactions occurring in mitochondria of the cell and Electron transfer chain reactions process occur in mitochondria, through which ATP molecules are formed
The lipids are converted to fatty acids and proteins are converted to amino acids. The fatty acids and proteins are later converted to acetyl-CoA and oxidation of acetyl-CoA takes place through Kreb's cycle to produce energy molecules.

b) Flow of products during carbohydrate oxidation through aerobic respiration:



17. a. Schematic representation of solar photovoltaic station:

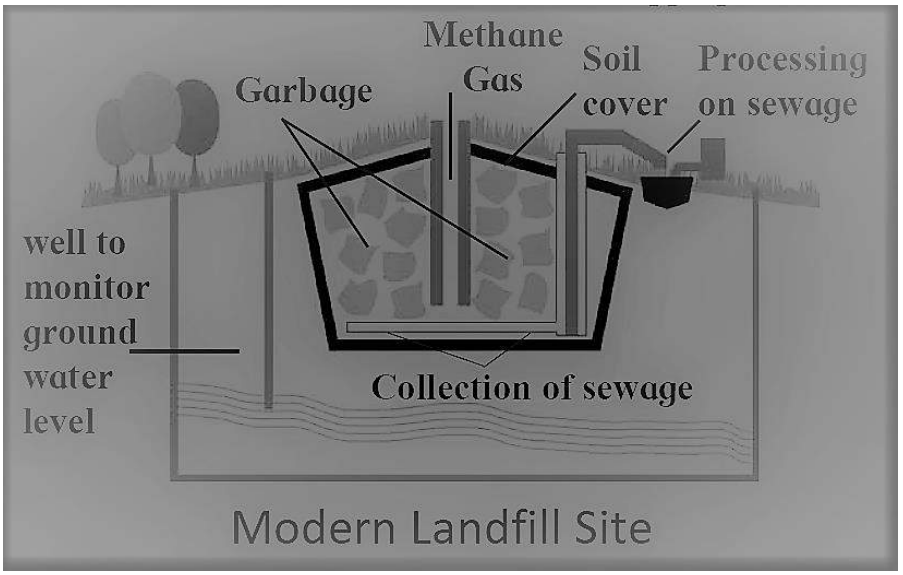


b. Energy conversion in photovoltaic cell: Electric energy can be produced directly from sunlight without the application of principle of electromagnetic induction through solar photovoltaic cells. These cells convert solar energy directly into electrical energy through the solar photovoltaic effect. The electrical energy thus produced is DC in nature. The energy has to be stored to be in batteries for later use, since the energy production is dependent on sun light.

Applications which need DC power like electric lights based on light emitting diodes can use the DC electric energy produced through solar photovoltaic cells. The DC electric energy can be converted to AC electric energy, through an inverter.

The AC electric energy thus produced is fed into a transformer for voltage and power control and then sent to the electric power grid for electricity distribution network.

18. a)



b) Modern landfill sites are formed by digging large pits in open spaces away from the residential area. These pits are lined up with plastic sheets to prevent leaching of harmful toxic materials that can pollute the soil.

c) The pit is filled with compressed waste and is covered with layers of soil, leafy waste, sawdust and specific biochemical. At some places, bioreactors are mixed. The filled pit is sealed with soil slurry.

d) Microbes present in the soil and the top layers decompose the waste in the pit and form best quality compost after a few days. Thus, the sites not only take care of waste disposal but also provides the high-grade compost which can be used further. Also, these sites can be reused after removal of compost. Thus, these sites are useful for effective waste management.

19.

a) There are two types of cell division – mitosis and meiosis.
b) The figure shows the process of cell division by the method of mitosis.
c) Somatic cells and stem cells divide using mitosis.
d) Mitosis is completed through two main steps – karyokinesis (nuclear division) and cytokinesis (cytoplasmic division). Karyokinesis is completed through 4 steps – Prophase, Metaphase, Anaphase and Telophase. Cytoplasm is divided and two new daughter cells are formed. A notch is formed at the equatorial plane of the cell which deepens gradually and two new cells are formed. Thus, cytokinesis is completed.
e) Mitosis is necessary for the growth of the body, restoration of the emaciated body, wound healing, formation of blood cells, etc.

20. a) Ductility and malleability properties are used for giving shapes to metals. Ductility is the property of developing metals into wires. For example: Gold is the most ductile metal. One gram of gold can be drawn into a wire of length 2 Km.
Malleability is the property to draw a metal into sheets. Example: gold and silver are the most malleable metals. These two properties gives different shapes to metals without breaking.

b) The natural form of copper is Copper Sulphide. Its chemical formula is Cu_2S. Copper can be extracted from it just by heating the ore that is, Cu_2S. In presence of heat and oxygen, Copper Sulphide gets converted to Copper Oxide and Sulphur dioxide.

$$2Cu_2S + 3O_2 \xrightarrow{heat} 2Cu_2O\ (s) + 2SO_2\ (g)$$

$$2Cu_2O + Cu_2S \xrightarrow{heat} 6Cu\ (s) + SO_2\ (g)$$

21. It is not possible to group elements based on their physical properties alone.
Examples:

1. The physical properties of metals prove that they have high melting points. While metals like Cesium and Gallium have low melting points such that they even melt by the heat of our palms.
2. Iodine is the only lustrous non-metal.
3. The non-metal carbon can exists in various forms. Diamond, one of the allotrope of Carbon is hardest substance that have highest boiling and melting points while another allotrope Graphite is a conductor.
4. Bromine is a non-metal that exists in liquid form at room temperature.
5. Alkali metals like Lithium, Sodium and Potassium are very soft and can be cut with a knife.

22. Calcium Carbonate reacts vigorously with water and produces Slaked Lime or Calcium Oxide with the release of heat. Hence when the beaker is touched, we feel the heat.

$$CaO + H_2O \longrightarrow Ca(OH)_3 + \text{heat}$$

23. When Silver Bromide is kept under sunlight, it absorbs heat energy and decompose into Silver and Bromine separately. It represents the endothermic reaction as it intakes heat energy.

24. The aqueous solution of Barium chloride when combined with sodium sulphate results in double displacement reaction thereby producing Sodium chloride and Barium sulphate. As a result, it forms white precipitate at the bottom of the beaker.

25. Magnesium in presence of oxygen burns out with dazzling white flame and leaves a white precipitate in the plate. This white powder is nothing but the magnesium oxide formed due to the reaction between Mg and O_2.

26. In case if Rani's body took that action as a normal action, then it will be the work of nerves to carry the signals to brain. Tissues have dense nerves which run throughout the body. Before responding to an action, this thinking tissue in the skull receives signals from all over the body. After receiving signal, the brain instructs the nerves and tissues on how to react to this situation. By the time it happens, Rani's hand will be burnt more.

27. The process mentioned in the question is called as Grafting. By this process, rather than sowing seeds we can produce a new plant from a live plant. After sowing the grafted part, we have to cover it with earth and keep a weight above it to keep it under the earth. After a month, we can find new roots have arrived from the grafted portion. Later, we can cut this portion and plant it separately.