UPSC Prelims Test Series 2020

Test 6: General Science

Explanations

Answer Keys:

Que	Ans	Que	Ans	Que	Ans	Que	Ans
1	D	**26**	A	**51**	C	**76**	D
2	D	**27**	A	**52**	C	**77**	B
3	D	**28**	B	**53**	A	**78**	B
4	A	**29**	C	**54**	B	**79**	C
5	C	**30**	D	**55**	C	**80**	D
6	B	**31**	A	**56**	D	**81**	B
7	B	**32**	C	**57**	C	**82**	B
8	D	**33**	C	**58**	C	**83**	C
9	D	**34**	D	**59**	A	**84**	C
10	B	**35**	B	**60**	C	**85**	B
11	B	**36**	D	**61**	D	**86**	A
12	A	**37**	D	**62**	C	**87**	A
13	D	**38**	D	**63**	D	**88**	B
14	B	**39**	D	**64**	B	**89**	A
15	C	**40**	A	**65**	D	**90**	D
16	D	**41**	D	**66**	A	**91**	D
17	A	**42**	D	**67**	C	**92**	D
18	C	**43**	C	**68**	D	**93**	A
19	A	**44**	A	**69**	B	**94**	C
20	A	**45**	A	**70**	A	**95**	A
21	A	**46**	C	**71**	A	**96**	D
22	D	**47**	D	**72**	D	**97**	B
23	B	**48**	A	**73**	D	**98**	C
24	B	**49**	D	**74**	D	**99**	D
25	C	**50**	C	**75**	D	**100**	D

Explanations:

Q1] Ans: d

Uses of Fungi:

1. Fungi can improve agricultural efficiency and sustainability.Soil microorganisms can improve the production of major crops like corn and wheat, while also reducing the environmental impact of excess fertilizers.
2. Important antibiotics, such as penicillin and the cephalosporins, can be isolated from fungi. Valuable drugs isolated from fungi include the immunosuppressant drug cyclosporine (which reduces the risk of rejection after organ transplant), the precursors of steroid hormones, and ergot alkaloids used to stop bleeding.
3. Fungi have been shown to play a significant role in bioremediation of variety of pollutants such as POPs, textile dyes, petroleum hydrocarbons, pulp and paper industry effluents, leather tanning effluents, PAHs, pesticides, PPCPs.

Q2] Ans: d

In physics, cryogenics is the production and behaviour of materials at very low temperatures.The U.S. National Institute of Standards and Technology considers the field of cryogenics as that involving temperatures below −180 °C (93 K; −292 °F). This is a logical dividing line, since the normal boiling points of the so-called permanent gases (such as helium, hydrogen, neon, nitrogen, oxygen, and normal air) lie below −180 °C while the Freon refrigerants, hydrocarbons, and other common refrigerants have boiling points above −180 °C.

Cryogenic fluids with their boiling point in kelvins.

Fluid	Boiling point (K)
Helium-3	3.19
Helium-4	4.214
Hydrogen	20.27
Neon	27.09

Nitrogen	77.09
Air	78.8
Fluorine	85.24
Argon	87.24
Oxygen	90.18
Methane	111.7

Q3] Ans: d

Fats are the slowest source of energy but the most energy-efficient form of food**. Each gram of fat supplies the body with about 9 calories, more than twice that supplied by proteins or carbohydrates**. Because fats are such an efficient form of energy, the body stores any excess energy as fat.

Foods that contain a lot of protein are called body-building foods or growing foods. Foods that contain a lot of fat or carbohydrates and perhaps only a little protein are called energy-giving foods. Foods in which the most important nutrients are vitamins or minerals are called protective foods.

Q4] Ans: a

Water-soluble vitamins		
Nutrient	**Function**	**Sources**
Thiamine (vitamin B1)	Part of an enzyme needed for energy metabolism; important to nerve function	Found in all nutritious foods in moderate amounts: pork, whole-grain or enriched breads and cereals, legumes, nuts and seeds
Riboflavin (vitamin B2)	Part of an enzyme needed for energy metabolism; important for normal vision and skin health	Milk and milk products; leafy green vegetables; whole-grain, enriched breads and cereals
Niacin	Part of an enzyme needed for energy	Meat, poultry, fish, whole-grain

(vitamin B3)	metabolism; important for nervous system, digestive system, and skin health	or enriched breads and cereals, vegetables (especially mushrooms, asparagus, and leafy green vegetables), peanut butter
Pantothenic acid	Part of an enzyme needed for energy metabolism	Widespread in foods
Biotin	Part of an enzyme needed for energy metabolism	Widespread in foods; also produced in intestinal tract by bacteria.
Pyridoxine (vitamin B6)	Part of an enzyme needed for protein metabolism; helps make red blood cells	Meat, fish, poultry, vegetables, fruits
Folic acid	Part of an enzyme needed for making DNA and new cells, especially red blood cells	Leafy green vegetables and legumes, seeds, orange juice, and liver; now added to most refined grains
Cobalamine (vitamin B12)	Part of an enzyme needed for making new cells; important to nerve function	Meat, poultry, fish, seafood, eggs, milk and milk products; not found in plant foods
Ascorbic acid (vitamin C)	Antioxidant; part of an enzyme needed for protein metabolism; important for immune system health; aids in iron absorption	Found only in fruits and vegetables, especially citrus fruits, vegetables in the cabbage family, cantaloupe, strawberries, peppers, tomatoes, potatoes, lettuce, papayas, mangoes, kiwifruit

Fat-soluble vitamins		
Nutrient	**Function**	**Sources**
Vitamin A (and	Needed for vision, healthy	Vitamin A from animal sources

its precursor*, beta-carotene) *A precursor is converted by the body to the vitamin.	skin and mucous membranes, bone and tooth growth, immune system health	(retinol): fortified milk, cheese, cream, butter, fortified margarine, eggs, liver Beta-carotene (from plant sources): Leafy, dark green vegetables; dark orange fruits (apricots, cantaloupe) and vegetables (carrots, winter squash, sweet potatoes, pumpkin)
Vitamin D	Needed for proper absorption of calcium; stored in bones	Egg yolks, liver, fatty fish, fortified milk, fortified margarine. When exposed to sunlight, the skin can make vitamin D.
Vitamin E	Antioxidant; protects cell walls	Polyunsaturated plant oils (soybean, corn, cottonseed, safflower); leafy green vegetables; wheat germ; whole-grain products; liver; egg yolks; nuts and seeds
Vitamin K	Needed for proper blood clotting	Leafy green vegetables such as kale, collard greens, and spinach; green vegetables such as broccoli, Brussels sprouts, and asparagus; also produced in intestinal tract by bacteria

Q5] Ans: c

Water absorption through the roots can be enhanced by keeping the plants under the fan. As by keeping the plants under the fan the transpiration process is boosted. Therefore, more amount of water and other minerals are absorbed by the plant roots from the soil.

Q6] Ans: b

Vitamin	Deficiencies
Vitamin A	Visual and skin changes
Vitamin B12	Anemia
Vitamin D	Bone abnormalities
Vitamin E	Neurological problems
Vitamin K	Blood clotting problems
Iron	Anemia

Q7] Ans: b

1. Hard water has no known adverse health effect, WHO says at its Geneva Conference. In addition, hard water, particularly very hard water, could provide an important supplementary contribution to total calcium and magnesium intake. The health effects of hard water are mainly due to the effects of the salts dissolved in it, primarily calcium and magnesium. To a large extent, individuals are protected from excess intakes of calcium by a tightly regulated intestinal absorption mechanism

2. In hard water, minerals such as, calcium, magnesium and iron are dissolved in it, and form deposits called scum. Scum does not wash away easily because it is difficult to dissolve. Hard water does not allow for soap to lather well, and it will leave hair dull after washing.

3. Heated hard water forms a scale of calcium and magnesium minerals that can contribute to the inefficient operation or failure of water-using appliances. Pipes can become clogged with scale that reduces water flow and ultimately requires pipe replacement. Problems with red and black stains in dishwasher and dishes.

Q8] Ans: d

Self explanatory

Q9] Ans: d

Properties of materials

1.Hardness: A material's ability to withstand friction, essentially abrasion resistance, is known as hardness.

2.Appearances: The appearance of an object depends on colour, hardness, texture, and lustre of its material. Materials which are made up by non-metals have dull appearance.

3. Miscibility. Solubility is a parameter used to assess how much a substance can stay in a solution without precipitation and is defined as the maximum amount of a solute that can be dissolved in a solvent under given physical conditions (pressure, temperature, pH, etc.

4.Transparency: The amount of light material allow passing through it is transparency of the material.

Q10] Ans: b

Without any greenhouse gases, much of the sun's heat would be lost, and the Earth would become a frozen wasteland with an average temperature of 0 degrees fahrenheit (-18 degrees celsius).

Life as we know it is made possible by the Greenhouse Effect. Without it our planet would be a cold and barren wasteland. The greenhouse effect is a layer of naturally occurring greenhouse gases found high in the atmosphere. These gases act like a blanket by trapping incoming and outgoing heat, which gives Earth an annual average temperature more than $20^{o}C$.

Q11] Ans: b

Bioaccumulation is the gradual accumulation of substances, such as pesticides, or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion.

Biomagnification, also known as bioamplification or biological magnification, is any concentration of a toxin, such as pesticides, in the tissues of tolerant organisms at successively higher levels in a food chain.

Persistent organic pollutants (POPs) are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of their persistence, POPs bioaccumulate with potential adverse impacts on human health and the environment.

Eutrophication (from Greek eutrophos, "well-nourished"), or hypertrophication, is when a body of water becomes overly enriched with minerals and nutrients which induce excessive growth of algae. This process may result in oxygen depletion of the water body.

Q12] Ans: a

E = h*frequency

So, if you increase the frequency of the wave, you get more energy per photon.

High frequency Gamma rays photons have maximum energy compared to other photons in the electromagnetic spectrum. It is followed by X-rays, UV rays, Light waves, Infrared, Microwaves and Radio waves.

Q13] Ans: d

1. The thyroid gland is the largest **endocrine** gland of the human body. Liver is the largest gland in our body.

2. Oxytocin makes the milk that is already in the breast flow for the current feed, and helps the baby to get the milk easily. Prolactin helps in the formation of the milk after birth of the baby.

Q14] Ans: d

Correct statements:

1. As the humidity increases, so too does the percentage of air molecules that are water molecules. Water molecules are much less massive than oxygen, nitrogen or carbon dioxide molecules, and so the greater the fraction of air that is made up of water vapor, the less mass per unit volume, and the less dense the air becomes. Higher density translates into faster sound wave travel, so sound waves travel faster at high humidity.

2. Sound travels fastest through solids. This is because molecules in a solid medium are much closer together than those in a liquid or gas, allowing sound waves to travel more quickly through the higher density.

Q15] Ans: c

Name of acid and found in

- Acetic acid is found in vinegar as well as products that contain vinegar, such as ketchup.
- Citric acid is found in citrus fruits. It is also used in jams and jellies and to add a tangy flavor to other foods.
- Lactic acid is found in milk and other dairy products.
- Ascorbic acid is vitamin C. It is found in citrus fruits as well as some other fruits and juices.
- Sulfuric acid is found in car batteries and some drain cleaners.

Name of bases and found in

- Ammonia, NH3 (fertiliser, cleaning agent)
- Sodium hydroxide, NaOH (cleaning agent, paper, pH regulator)
- Sodium carbonate, NaCO3 (paper, glass, detergent, toothpaste)
- Sodium bicarbonate, NaHCO3 (baking soda, fire extinguisher, toothpaste)
- Calcium hydroxide, or slaked lime, Ca(OH)2 (flocculant, paper)
- Calcium carbonate, CaCO3 (limestone building, blackboard chalk)
- Calcium hypochlorite, Ca(ClO)2 (sanitizer, disinfectant)
- Potassium hydroxide, KOH (alkaline batteries)
- Aluminium oxide, Al2O3 (plastic, glass, paint)
- Hydrated iron (III) oxides, Fe2O3.nH2O (rust)

Q16] Ans: d

Pole star indicates the direction to north. It raises in the north hence it is used as indicator to find directions.

Q17] Ans: a

An owl can see well in the night but not during the day because owl is a night bird and night birds have fewer cones and more rods in the retina. Since rods function in less amount of light so an owl can see well in the night.

Q18] Ans: c

Low temperature and high pressure are required to liquefy gases to liquids. There is a lot of space between the particles of a gas. On applying high pressure, the particles of gas move get so close that they start attracting each other sufficiently forming a liquid. When gas is compressed too much, heat is produced, so it is necessary to cool it. Cooling lowers the temperature of compressed gas and helps in liquefying it, Hence, a gas can be liquefied by applying high pressure and lowering the temperature (cooling).

Q19] Ans: b

Newton's first law states that, if a body is at rest or moving at a constant speed in a straight line, it will remain at rest or keep moving in a straight line at constant speed unless it is acted upon by a force. This postulate is known as the law of inertia. When the lift moves upward, blood in our body is suddenly moves. It tries to remain at rest and for that purpose it has to be moved downward (in opposite direction) and rushes towards our feet.

Newton's second law is a quantitative description of the changes that a force can produce on the motion of a body. It states that the time rate of change of the momentum of a body is equal in both magnitude and direction to the force imposed on it.

Newton's third law states that when two bodies interact, they apply forces to one another that are equal in magnitude and opposite in direction. The third law is also known as the law of action and reaction.

Q20] Ans: b

A white dwarf, also called a degenerate dwarf, is a stellar core remnant composed mostly of electron-degenerate matter. A white dwarf is very dense: its mass is comparable to that of the Sun, while its volume is comparable to that of Earth.

A black dwarf is a theoretical stellar remnant, specifically a white dwarf that has cooled sufficiently that it no longer emits significant heat or light.

Brown dwarfs are objects which are too large to be called planets and too small to be stars. They have masses that range between twice the mass of Jupiter and the lower mass limit for nuclear reactions (0.08 times the mass of our sun).

Q21] Ans: a

Correct statements about superconductors:

1. Superconductors are materials that conduct electricity with no resistance. (Zero resistance)This means that, unlike the more familiar conductors such as copper or steel, a superconductor can carry a current indefinitely without losing any energy.

2.All substances can not be converted into superconductors. Superconductor material classes include chemical elements (e.g. mercury or lead), alloys (such as niobium–titanium, germanium–niobium, and niobium nitride), ceramics (YBCO and magnesium diboride), superconducting pnictides (like fluorine-doped LaOFeAs) or organic superconductors (fullerenes and carbon nanotubes).

Q22] Ans: b

Functions of different glands in the human body

- Hypothalamus. This organ connects your endocrine system with your nervous system. Its main job is to tell your pituitary gland to start or stop making hormones.
- Pituitary gland. This is your endocrine system's master gland. It uses information it gets from your brain to tell other glands in your body what to do. It makes many important hormones, including growth hormone; prolactin, which helps breastfeeding moms make milk; and luteinizing hormone, which manages estrogen in women and testosterone in men.
- Pineal gland. It makes a chemical called melatonin that helps your body get ready to go to sleep.

- Thyroid gland. This gland makes thyroid hormone, which controls your metabolism. If this gland doesn't make enough (a condition called hypothyroidism), everything happens more slowly. Your heart rate might slow down. You could get constipated. And you might gain weight. If it makes too much (hyperthyroidism), everything speeds up. Your heart might race. You could have diarrhea. And you might lose weight without trying.
- Parathyroid. This is a set of four small glands behind your thyroid. They play a role in bone health. The glands control your levels of calcium and phosphorus.
- Thymus. This gland makes white blood cells called T-lymphocytes that fight infection and are crucial as a child's immune system develops. The thymus starts to shrink after puberty.
- Adrenals. Best known for making the "fight or flight" hormone adrenaline (also called epinephrine), these two glands also make hormones called corticosteroids. They affect your metabolism and sexual function, among other things.
- Pancreas. This organ is part of both your digestive and endocrine systems. It makes digestive enzymes that break down food. It also makes the hormones insulin and glucagon. These ensure you have the right amount of sugar in your bloodstream and your cells.
- Ovaries. In women, these organs make estrogen and progesterone. These hormones help develop breasts at puberty, regulate the menstrual cycle, and support a pregnancy.
- Testes. In men, the testes make testosterone. It helps them grow facial and body hair at puberty. It also tells the penis to grow larger and plays a role in making sperm.

Q23] Ans: b

The viruses are non-cellular organism that are characterized by having an inert crystalline structure outside the living cell. They exist independently in an inactive form but once in the host cell, they take charge of cellular machinery and duplicate themselves. Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea.

Q24] Ans: b

Ozone was introduced as a bleaching chemical on industrial scale in the beginning of the 1990s. The primary driving force was to achieve full pulp brightness without using of chlorine containing chemicals. Since ozone is a powerful bleaching agent it means reduced consumption of other bleaching chemicals.

An antibacterial is an antibiotic, but as the name implies, it can only target bacteria. Antiseptics, including hydrogen peroxide, rubbing alcohol, and iodine, are mainly used to deter bacterial growth.

Freon is the cooling agent used in most air conditioning systems. Every air conditioning system needs a refrigerant (also called a coolant) that actually creates the cool air -- that's the role of Freon.

Q25] Ans: c

Examples of electromagnetic waves include radio waves, microwaves, infrared, visible light, ultraviolet, x-rays, and gamma rays.

Q26] Ans: a

1. When it comes to blood transfusion, Rh- person in incompatible with Rh+ blood due to antibodies reaction. So, Rh+ can receive blood only with Rh+ and not with Rh- person.
2. A person of 'AB' blood group has no antibodies in his blood plasma. So he is universal recipient.

Q27] Ans: a

Japanese encephalitis

1.It is transmitted to humans through bites from infected mosquitoes of the Aedes species.

2. Suramin, a drug used to treat trypanosomal disease, and diethyldithiocarbamate have shown reasonably good antiviral efficacy against Japanese encephalitis virus in vitro.Hence statement 2 is incorrect.

Japanese encephalitis (JE) is an infection of the brain caused by the Japanese encephalitis virus (JEV). While most infections result in little or no symptoms, occasional inflammation of

the brain occurs. In these cases, symptoms may include headache, vomiting, fever, confusion and seizures.

Q28] Ans: b

correct with reference to the process of advection

1. the transfer of heat or matter by the flow of a fluid, especially horizontally in the atmosphere or the sea.

2.In middle latitudes, most of diurnal variations in daily weather are caused by advection.

Advection

Earth's atmosphere is a dynamic sea of gases in constant motion and Earth's oceans contain currents that move water across the globe. Advection is a lateral or horizontal transfer of mass, heat, or other property. Accordingly, winds that blow across Earth's surface represent advectional movements of air. Advection also takes place in the ocean in the form of currents. Currently, geologists debate the presence and role of substantial advective processes in Earth's mantle.

Differential pressures and temperatures drive the mass movement of air seeking equilibrium (the lowest energy state). Advective winds move from areas of higher temperature toward areas of lower temperature. In contrast, convection, the vertical movement of mass or transfer of heat, manifests itself as air currents. Accordingly, winds are a result of advection, while air currents are a result of convection.

Although in a gaseous state, the atmosphere observes fluid-like dynamics. This is an important consideration when considering advection, because advection is usually more pronounced in the movement of fluids. For example, advection also takes place in the oceans where advection is broadened to include the lateral (horizontal) transfer of not only fluid mass and heat, but of other properties such and oxygen content and salinity.

In the atmosphere, advection is the sole process of lateral transfer of mass. In contrast, vertical transfer occurs via conduction, convection, and radiation. Just as ocean currents

permit heat transfer from areas of warm water to an area of water with cooler temperatures, advective winds allow the transfer of both sensible heat and latent heat (a function of humidity).

Although advection processes are important heat equilibration mechanisms for both the atmosphere and the oceans, the speed and volume of mass transported differs greatly between the atmosphere and oceans. The magnitude of heat transference depends on heat flux (the rate of heat transport), and flux in turn relates the transfer of heat energy in terms of area and time. Both processes contribute approximately equally because wind currents are much faster (higher rate) than ocean currents but ocean currents move substantially denser masses of molecules.

Advection is also responsible for the formation of advection fog . Advection fog usually occurs when the atmosphere is very stable so that moist (humid) air near the surface does not mix vertically with an overlying layer of drier air. The advection fog forms as warm and moist air moves horizontally along the cooler surface and the air near the surface is cooled to its dew point.

Q29] Ans: c

Main vectors and diseases they transmit

Mosquitoes

- Aedes
    - Chikungunya
    - Dengue fever
    - Lymphatic filariasis
    - Rift Valley fever
    - Yellow fever
    - Zika
- Anopheles
    - Malaria
    - Lymphatic filariasis
- Culex

- Japanese encephalitis
- Lymphatic filariasis
- West Nile fever

Sandflies

- Leishmaniasis
- Sandfly fever (phelebotomus fever)

Ticks

- Crimean-Congo haemorrhagic fever
- Lyme disease
- Relapsing fever (borreliosis)
- Rickettsial diseases (spotted fever and Q fever)
- Tick-borne encephalitis
- Tularaemia

Triatomine bugs

- Chagas disease (American trypanosomiasis)

Tsetse flies

- Sleeping sickness (African trypanosomiasis)

Fleas

- Plague (transmitted by fleas from rats to humans)
- Rickettsiosis

Black flies

- Onchocerciasis (river blindness)

Aquatic snails

- Schistosomiasis (bilharziasis)

Lice

- Typhus and louse-borne relapsing fever

Q30] Ans: b

As defined by the World Health Organization (WHO) and the Food and Agricultural Organization of the United Nations (FAO), fortification refers to "the practice of deliberately

increasing the content of an essential micronutrient, ie. vitamins and minerals (including trace elements) in a food, so as to improve the nutritional quality of the food supply and to provide a public health benefit with minimal risk to health", whereas enrichment is defined as "synonymous with fortification and refers to the addition of micronutrients to a food which are lost during processing".

Food fortification or enrichment is the process of adding micronutrients(not macronutrients) (essential trace elements and vitamins) to food.Hence statement 2 is incorrect.

Q31] Ans: a

Interferons are a group of signaling proteins made and released by host cells in response to the presence of several viruses. In a typical scenario, a virus-infected cell will release interferons causing nearby cells to heighten their anti-viral defenses.

Insulin is a hormone that is responsible for allowing glucose in the blood to enter cells, providing them with the energy to function.

Estrogens are hormones that are important for sexual and reproductive development, mainly in women. They are also referred to as female sex hormones. The term "estrogen" refers to all of the chemically similar hormones in this group, which are estrone, estradiol (primary in women of reproductive age) and estriol.

Somatostatin, also known as growth hormone-inhibiting hormone (GHIH) or by several other names, is a peptide hormone that regulates the endocrine system and affects neurotransmission and cell proliferation via interaction with G protein-coupled somatostatin receptors and inhibition of the release of numerous secondary.

Q32] Ans: c

Mitochondria are rod-shaped organelles that can be considered the power generators of the cell, converting oxygen and nutrients into adenosine triphosphate (ATP). ATP is the chemical energy "currency" of the cell that powers the cell's metabolic activities. This process is called aerobic respiration and is the reason animals breathe oxygen. Without mitochondria (singular, mitochondrion), higher animals would likely not exist because their cells would only be able to obtain energy from anaerobic respiration (in the absence of oxygen), a process much less

efficient than aerobic respiration. In fact, mitochondria enable cells to produce 15 times more ATP than they could otherwise, and complex animals, like humans, need large amounts of energy in order to survive.

Why mitochondria is passed to offspring only through mother?

A gene responsible for the elimination of paternal mitochondria in the offspring has revealed how and why mitochondria are only passed on through a mother's egg and not the father's sperm.

Mitochondria, present inside the cells of nearly all multicellular animals, plants and fungi, organelles, plays an important role in generating the energy that cells need to survive.

The findings showed that a gene CPS-6 serves as a paternal mitochondrial factor that is critical for its degradation.

Further, the enzyme that CPS-6 encodes first breaks down the interior membrane of the paternal mitochondria before moving to the space within the inner membrane to breakdown mitochondrial DNA.

CPS-6 plays a key role in initiating the self-destruction of paternal sperm, which likely benefits the embryo.

Delayed removal of paternal mitochondria causes increased embryonic lethality, demonstrating that paternal mitochondrial elimination is important for normal animal development, the researchers explained.

Shortly after a sperm penetrates an egg during fertilisation, the sperm's mitochondria are degraded while the egg's mitochondria persist.

The paternal mitochondria were found to partially self-destruct before the mitochondria were surrounded by autophagosomes, which target components within a cell and facilitate their degradation, said Qinghua Zhou from the American Association for the Advancement of Science, a US-based nonprofit organisation.

For the study, the team analysed sperm mitochondria or paternal mitochondria in Caenorhabditis elegans — a type of roundworm — during early stages of development.

Q33] Ans: c

Atoms of potassium 40 and carbon 14 are radioactive elements which are found in human body. More than half of internal radiations come from potassium 40, which enters the human body by food ingesting it. Along with the radioactive carbon 14 isotope, eight thousand atoms decay in our bodies every second: human beings are radioactive creatures!

Q34] Ans: a

Red algae are red because of the presence of the pigment phycoerythrin; this pigment reflects red light and absorbs blue light.Hence statement 1 is incorrect.

Baker's yeast is of the species Saccharomyces cerevisiae, and is the same species (but a different strain) as the kind commonly used in alcoholic fermentation, which is called brewer's yeast.

Olive oil extraction is the process of extracting the oil present in olive drupes, known as olive oil.

Saffron consists of the dried stigmas of the flowers of the crocus bulb, Crocus sativus.

Q35] Ans: b

Malaria is a life-threatening disease caused by a parasite that is transmitted through the bite of infected female Anopheles mosquitoes. The parasite that causes malaria is a microscopic, single-celled organism called Plasmodium. Hence statement 1 is incorrect.

Plasmodium falciparum primarily destroys the red blood cells which can lead to severe anaemia.

Since malaria is greatly influenced by climatic conditions because of its direct relationship with the mosquito population, it is widely assumed that its incidence is likely to increase in a future warmer world.

Q36] Ans: d

Nearsightedness (myopia) is a common vision condition in which you can see objects near to you clearly, but objects farther away are blurry. It occurs when the shape of your eye causes

light rays to bend (refract) incorrectly, focusing images in front of your retina instead of on your retina.

Q37] Ans: d

Total internal reflection, in physics, complete reflection of a ray of light within a medium such as water or glass from the surrounding surfaces back into the medium. The phenomenon occurs if the angle of incidence is greater than a certain limiting angle, called the critical angle. Mirage:

Mirage is an illusion which occurs usually in deserts on hot summer days.The mirage is caused by the total internal reflection of light at layers of air of different densities.In a desert, the sand is very hot during day time and a result the layer of air in contact with it gets heated up and becomes lighter. The lighter air rises up and the denser air from above comes down.

As a result, the successive upper layers are denser than those below them. A ray of light coming from a distant object, like the top a tree, gets refracted from a denser to a rarer medium. Consequently the refracted ray bends away from the normal until at a particular layer, the light is incident at an angle greater than the critical angle. At this stage the incident ray suffers total internal reflection and is reflected upwards. When this reflected beam of light enters the eyes of the observer, it appears as if an inverted image of the tree is seen and the sand looks like a pool of water.

The Sparkle of Diamonds:

Total internal reflection, coupled with a large index of refraction, explains why diamonds sparkle more than other materials. The critical angle for a diamond-to-air surface is only 24.4º, and so when light enters a diamond, it has trouble getting back out.

Rain Sensor: The most common rain sensor are based on the principle of total internal reflection, an infrared light is beamed at a 45 degree angle into the windshield from the interior. If the glass is wet, less light makes it back to the sensor and the wipers turn on.

Q38] Ans: d

The atom bomb is based on the principle of nuclear fission.Nuclear fission is a form of nuclear reaction where the nucleus inside an atom is split into fragments with mass and at the same time expelling a huge amount of energy.

Hydrogen bomb is based on the principle of nuclear fusion. It is the process of combination of two light nuclei to form another nuclei, It is accompanied by release of huge amounts of energy.

When a large fissile atomic nucleus such as uranium-235 or plutonium-239 absorbs a neutron, it may undergo nuclear fission. To control such a nuclear chain reaction, neutron poisons and neutron moderators can change the portion of neutrons that will go on to cause more fission.

Q39] Ans: d

Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. For example, canola oil and baking soda have pesticidal applications and are considered biopesticides. Microbial pesticides consist of a microorganism (e.g., a bacterium, fungus, virus or protozoan) as the active ingredient. Microbial pesticides can control many different kinds of pests, although each separate active ingredient is relatively specific for its target pest. For example, there are fungi that control certain weeds and other fungi that kill specific insects.

Q40] Ans: b

The human brain is the central organ of the human nervous system, and with the spinal cord makes up the central nervous system. The brain consists of the cerebrum, the brainstem and the cerebellum. The human brain has often been viewed as outstanding among mammalian brains: the most cognitively able, the largest-than-expected from body size, endowed with an overdeveloped cerebral cortex that represents over 80% of brain mass, and purportedly containing 100 billion neurons and 10× more glial cells.

The pituitary gland has two main parts, the anterior pituitary gland and the posterior pituitary gland. The gland is attached to a part of the brain (the hypothalamus) that controls its activity.

The anterior pituitary gland is connected to the brain by short blood vessels. Hence statement 2 is incorrect.

Q41] Ans: d

Bicarbonate of soda—commonly known as “baking soda”—is a wonderful household product used in baking, cleaning, and many more household activities.

BEST USES FOR BAKING SODA

FOR HEALTH

- Add baking soda to your bath water to relieve sunburned or itchy skin.
- Make a paste of baking soda and water, and apply to a burn or an insect bite for relief.
- If you crave sweets, rinse your mouth with one-teaspoon baking soda dissolved in a glass of warm water. Don’t swallow the mixture; spit it out. Your craving should disappear instantly.
- To remove pesticides, dirt, and wax from fresh fruits and vegetables, wash them in a large bowl of cool water to which you’ve added two to three tablespoons of baking soda.

IN THE KITCHEN

- Clean your refrigerator with a solution of one-teaspoon baking soda to one quart of warm water.
- Pour a cup of baking soda into the opening of your clogged drain and then add a cup of hot vinegar. After a few minutes, flush the drain with a quart of boiling water.
- To remove stains from your coffee and tea cups, wipe them with a damp sponge dipped in baking soda paste.
- Boil two inches of water in a pan with a burned bottom, turn off the heat, then add half a cup of baking soda. Let it sit overnight. In the morning it will be easy to clean.
- Sprinkle a teaspoon of baking soda on the bottom of your toaster oven to eliminate the burned smell from drippings and crumbs.

IN THE BATHROOM

- Soak toothbrushes in baking soda and warm water overnight to clean bristles.
- Keep your rubber gloves dry and smelling good by sprinkling baking soda inside them. They'll slip on more easily too!

ON CLOTHING

- To remove perspiration stains, make a thick paste of baking soda and water. Rub paste into the stain, let it sit for an hour, and then launder as usual. Find out how to remove other common stains.
- Gasoline and oil odors can be removed by putting clothes in a trash bag with baking soda for a few days before washing them.

MISCELLANEOUS USES

- Add a pinch of baking soda to boiled syrup to prevent it from crystallizing.
- Lay down a barrier of baking soda under sink-pipe openings and along basement windows to keep carpenter ants, silverfish, and roaches from invading. Roaches eat the baking soda, dehydrate, and die.
- A light baking soda paste on a damp cloth will remove bugs and tar from cars without damaging the paint. Let paste sit for a few minutes before wiping and rinsing clean.
- Sprinkling baking soda on your front steps will provide traction and melt the ice. Unlike rock salt, kitty litter, or sand, it won't damage outdoor or indoor surfaces or shoes.
- A paste of baking soda removes red sauce stains from plastic.

Q42] Ans: d

Sex-linked traits are hemophilia, red-green color blindness, congenital night blindness, some high blood pressure genes, Duchenne muscular dystrophy, and also Fragile X syndrome.

Q43] Ans: c

Properties of plants is/are seen in cold areas:

Plant adaptations

In order for plants to survive in cold environments they have had to adapt to the extreme conditions found there. These unique adaptations include:

- **Cushion plants** - these are compact, low growing plants. These characteristics help them to survive in cold and windy conditions. They trap airborne dust and use it as a source of nutrients.
- **Arctic poppy** - this has a hairy stem to retain heat. The flower can track the sun in the sky to maximise the amount of sunlight it receives so that it can increase photosynthesis.
- **Cotton grass** - this grass has small seeds that can easily be dispersed by the wind to ensure its survival. Cotton grass grows and produces seeds quickly as soon as the temperature increases.
- **Lichen** - this organism does not need soil to grow. It grows very slowly, can withstand very cold temperatures and survives beneath snow.
- Plant cells don't freeze because they produce high concentration of monosaccharides.
- Reverse death mechanism to safeguard the roots of the plant which may help it to regrow.

Q44] Ans: a

Green pigment of leaf - Chlorophyll.

It has Magnesium (Mg) involved in the structure. Plastids are present in leaf which makes it green to appear.

Q45] Ans: a

The Sun is the main energy source for satellites, which is why all satellites have solar panel arrays mounted on them. Each array contains thousands of small solar cells which are made of silicon – a material that allows sunlight to be turned into electrical current.

Q46] Ans: c

Antibiotic-resistant bacteria can spread to humans through food and direct contact with animals. hospitals and then carry antibiotic- resistant bacteria. These can spread to other patients via unclean hands or contaminated objects.

Q47] Ans: b

Self-explanatory

Q48] Ans: a

Infrasound is the range of sound pitches that are below human hearing bottom limits (under 20 Hz). Ultrasound is pitches over the human range of hearing. Many animals can hear infrasound, however, like whales, elephants, rhinos, hippos, giraffes,alligators, squid/cuttlefish/octopi, and evenpigeons.

Ultrasound (it has a frequency above 20,000 Hz, the upper limit of human hearing). However animals, such as dogs, bats, and dolphins, can hear these very high-pitched sounds.

Q49] Ans: d

The factors that affect reaction rates are:

- Surface area of a solid reactant.
- **Concentration** or pressure of a reactant.
- **Temperature**.
- Nature of the reactants.
- Presence/absence of a catalyst.

Q50] Ans: c

The Tyndall effect is light scattering by particles in a colloid or in a very fine suspension. Under the Tyndall effect, the longer wavelengths are more transmitted while the shorter wavelengths are more diffusely reflected via scattering. The Tyndall effect is seen when light-scattering particulate matter is dispersed in an otherwise light-transmitting medium, when the diameter of an individual particle is the range of roughly between 40 and 900 nm, i.e. somewhat below or near the wavelengths of visible light (400–750 nm).It is particularly

applicable to colloidal mixtures and fine suspensions; for example, the Tyndall effect is used in nephelometers to determine the size and density of particles in aerosols and other colloidal matter.

Q51] Ans: c

The communicable diseases are classified into seven types according to the nature of their causative agent.

(1) Viral Diseases : These are caused by viruses. They include chickenpox, smallpox, influenza, common cold, measles, mumps, polio, rabies, yellow fever, and sinus infections. The viruses are named after the disease they cause.

(2) Rickettsial Diseases : These are caused by rickettsias, the obligate intracellular parasitic organisms. They include Rocky Mountain spotted fever, typh's fever, trench fever and Q fever.

(3) Bacterial Diseases : These are caused by bacteria. They include diphtheria, scarlet fever, tetanus, typhoid fever, tuberculosis, anthrax, cholera, food poisoning, and meningitis.

(4) Spirochaetal Diseases : These are caused by spirochaetes, the long, spiral, corkscrew-shaped bacteria. They cause syphilis.

(5) Protozoan Diseases : These are caused by protists. They include amoebic dysentery, malaria, kala-azar, oriental sore and sleeping sickness.

(6) Fungal Diseases : These are caused by fungi, the non-green heterotrophic organisms. They include ringworm and athlete's foot.

(7) Helminthes Diseases : These are caused by helminthes, i.e., flatworms and roundworms. They include liverrot, schistosomiasis, taeniasis and cysticercosis produced by flatworms; and ascariasis, enterobiasis, filariasis (elephantiasis), trichinosis, Guinea worm disease and hookworm disease caused by roundworms.

Q52] Ans: c

An analgesic or painkiller is any member of the group of drugs used to achieve analgesia, relief from pain.

An antipyretic is a substance that reduces fever. Antipyretics cause the hypothalamus to override a prostaglandin-induced increase in temperature. The body then works to lower the temperature, which results in a reduction in fever.

Tranquilizer, also spelled Tranquillizer, drug that is used to reduce anxiety, fear, tension, agitation, and related states of mental disturbance.

Q53] Ans: a

Stainless steel is an alloy of Iron with a minimum of 10.5% Chromium.Stainless steel also contains varying amounts of Carbon, Silicon and Manganese. Other elements such as Nickel and Molybdenum may be added to impart other useful properties such as enhanced formability and increased corrosion resistance.

Q54] Ans: b

Catalyst in chemical reaction:

1.Alter the rate of reaction

2. are only needed in very small amounts. Hence statement 2 is incorrect.

3. A catalyst is not destroyed or changed during a reaction, so it can be used again. Hence statement 3 is incorrect.

4.Can be reused in the same reaction

5. Catalysts typically speed up a reaction by reducing the activation energy or changing the reaction mechanism. Hence statement 5 is incorrect.

Catalyst

A catalyst is a substance that speeds up the rate of a chemical reaction but is not consumed during the course of the reaction. A catalyst will appear in the steps of a reaction mechanism, but it will not appear in the overall chemical reaction (as it is not a reactant or product). Generally, catalysts alter the mechanism of the reaction in a substantial way such that the new barriers along the reaction coordinate are significantly lower. By lowering the activation energy, the rate constant is greatly increased (at the same temperature) relative to the uncatalyzed reaction.

Q55] Ans: c

Sublimation is the transition of a substance directly from the solid to the gas phase, without passing through the intermediate liquid phase.

Distillation is the process of separating the components or substances from a liquid mixture by using selective boiling and condensation.

Crystallization is defined as a process by which a chemical is converted from a liquid solution into a solid crystalline state.

Filtration is a process used to separate solids from liquids or gases using a filter medium that allows the fluid to pass through but not the solid.

Q56] Ans: d

Although the concentration of the ozone in the ozone layer is very small, it is vitally important to life because it absorbs biologically harmful ultraviolet (UV) radiation coming from the sun.

Q57] Ans: c

BASIS FOR COMPARISON	PLANT CELL	ANIMAL CELL
Meaning	The fundamental and functional unit of Kingdom Plantae of the Eukaryotic cells, having true nucleus along with the many organelles, specially the cell wall, chloroplast and the vacuoles.	Animal cells are also the basic unit of life of Kingdom Animalia of the Eukaryotic cells, having all the necessary organelles with specified functions.
Cell Size	Usually larger, which is fixed.	Smaller in size and irregular.
Cell Shape	Rectangular.	Round.
Enclosed by	A plant cell is enclosed by rigid cell wall along with the plasma	The animal cell is enclosed by a flexible, thin plasma membrane

BASIS FOR COMPARISON	PLANT CELL	ANIMAL CELL
	membrane.	only.
Nucleus	Present and lies on one side of the cell.	Present and lies in the centre of the cell wall.
Centrosomes/Centrioles	Absent	Present
Plastids	Present with chloroplast in them.	Plastids are absent.
Cilia	Absent.	Usually present.
Glyoxysomes	May be present.	Absent.
Plasmodesmata	Present.	Absent.
Desmosomes/Tight junction	Absent.	Present.
Mitochondria	Present in fewer number.	Present in large number.
Vacuoles	Only one huge vacuole.	Animal cells contain many in numbers.
Lysosomes	Rarely noticed in plant cells.	Present.
Chloroplast	Plant cell contains chloroplast, which they use in storing energy.	Animal cells lack chloroplast and use mitochondria for energy storing purpose.
Reserve food	Present as starch.	Present as glycogen.

BASIS FOR COMPARISON	PLANT CELL	ANIMAL CELL
Synthesis of nutrients	They can synthesize all amino acids, vitamins and coenzymes.	They are not able to synthesize any amino acids, vitamins and coenzymes required by them.
Cytokinesis	Occurs by cell plate only.	Occurs by furrowing or constrictions.
Hypotonic/Hypertonic Solutions	Plant cell does not burst if placed in hypotonic solution.	Animal cells burst in hypertonic solution as they do not have the cell wall.

Q58] Ans: c

The cell membrane (plasma membrane (PM) or cytoplasmic membrane) is a biological membrane that separates the interior of all cells from the outside environment (the extracellular space) which protects the cell from its environment.

Cell membrane consists of a lipid bilayer, including cholesterols (a lipid component) that sit between phospholipids to maintain their fluidity under various temperature, in combination with membrane proteins such as integral proteins, and peripheral proteins that go across inside and outside of the membrane serving as membrane transporter, and loosely attached to the outer (peripheral) side of the cell membrane acting as several kinds of enzymes shaping the cell, respectively.

The cell membrane controls the movement of substances in and out of cells and organelles. In this way, it is selectively permeable to ions and organic molecules. In addition, cell membranes are involved in a variety of cellular processes such as cell adhesion, ion conductivity and cell signalling and serve as the attachment surface for several extracellular structures, including the cell wall, the carbohydrate layer called the glycocalyx, and the intracellular network of protein fibers called the cytoskeleton. In the field of synthetic biology, cell membranes can be artificially reassembled.

Because the interior of the phospholipid bilayer is occupied by hydrophobic fatty acid chains, the membrane is impermeable to water-soluble molecules, including ions and most biological molecules. Hence statement 3 is incorrect.

Q59] Ans: a

Correct statements about viruses.

1. Viruses are tiny, non-cellular entities that usually can be seen only with an electron microscope. Their genomes contain either DNA or RNA—never both—and they replicate either by using the replication proteins of a host cell or by using proteins encoded in the viral genome.

2. Each virus is a nucleic acid (RNA or DNA) surrounded by a coating, referred to as an envelope or capsid. Hence statement 2 is incorrect.

3.RNA is a genetic material of some viruses

Q60] Ans: c

Apparent weight is lessened by buoyancy, which occurs when an object is immersed in a fluid (a liquid or a gas). For example, an object immersed in water weighs less, according to a spring balance, than the same object in air. The apparent weight of a floating object is zero.

Archimedes' principle states that, when a body is partially or completely immersed in a fluid, it experiences an apparent loss in weight that is equal to the weight of the fluid displaced by the immersed part of the body.

Q61] Ans: d

When Sun light reaches the Earth atmosphere it may encounter with water molecule, dust particle or air particle. Since light waves are incredibly small even smaller than one millionth of a meter, so light interact with tiniest gas molecule, so they get scattered(bounced). Scattering depends on how large the molecule was compared to the wavelength size.

Small particles compared to their wavelength will scratch a blue light more strongly than a red light. As Earth’s atmosphere is mainly made up of Oxygen and Nitrogen the Blues will scatter sunlight in more directions than red. So this creates the blue sky that we see.

The red light waves have the least amount of scattering. So, when you see Sunrise or, Sunset the sunlight is actually travelling in a longer path through the atmosphere and it will scattered through a large no. of air molecules.

Q62] Ans: c

Uses of a concave mirror:

1. In torch, search light, head lights etc. concave mirror is used as reflector.
2. It is used as dentist's head mirror.

Uses of a convex mirror:

1. It is used as reflector in street lamps.
2. It is used as a rear view mirror in vehicles.

Q63] Ans: d

1. Optical fiber is used by many telecommunications companies to transmit telephone signals, Internet communication and cable television signals.
2. The best example of this sensor is the inside temperature measurement of the aircraft jet engine that uses a fiber to transmit a radiation into a radiation pyrometer, which is located outside of the engine. In the same way, these sensors can also be used to measure the internal temperature of the transformers
3.Optical fibers are also widely used in illumination applications. They are used as light guides in medical and other applications where bright light needs to be shone on a target without a clear line-of-sight path. In some buildings, optical fibers route sunlight from the roof to other parts of the building.
4. Endoscopes use optical fibres to produce an image of inside the body. A doctor can insert a bundle of optical fibres into the body. Some carry light into the body, and some carry light reflected off internal body surfaces back out.

Optical fibers typically include a core surrounded by a transparent cladding material with a lower index of refraction. Light is kept in the core by the phenomenon of total internal reflection which causes the fiber to act as a waveguide. Fibers that support many propagation

paths or transverse modes are called multi-mode fibers, while those that support a single mode are called single-mode fibers (SMF).

Multi-mode fibers generally have a wider core diameter and are used for short-distance communication links and for applications where high power must be transmitted. Single-mode fibers are used for most communication links longer than 1,000 meters (3,300 ft).

Q64] Ans: b

In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in static pressure or a decrease in the fluid's potential energy.

Pascal's law states that increase in pressure at a point in the enclosed liquid in equilibrium is transmitted equally in all directions in liquid and to the Walls of the container. The working of hydraulic lift, hydraulic press and hydraulic brakes are based on Pascal's law.

Archimedes' principle states that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces.

In nonideal fluid dynamics, the Hagen–Poiseuille equation, also known as the Hagen–Poiseuille law, Poiseuille law or Poiseuille equation, is a physical law that gives the pressure drop in an incompressible and Newtonian fluid in laminar flow flowing through a long cylindrical pipe of constant cross section.

Q65] Ans: d

Centrifugation is a technique used for the separation of particles from a solution according to their size, shape, density, viscosity of the medium and rotor speed.

1. In laboratories performing biochemical analyses on body fluids, centrifuges are routinely used to separate blood cells from serum/plasma, to separate sediment from urine, to measure the volume fraction of erythrocytes in blood (the hematocrit), and to separate bound from free components in protein binding.

2. Centrifugation is the technique used in washing machines to squeeze out water from wet clothes while drying. This is because in centrifugation the solution or wet clothes are simply

spinned very fast and because of this the water comes out very easily and then the clothes are dried.

3. The process of centrifugation is used in dairies to separate cream from milk .

Q66] Ans: a

Iodine deficiency disorders (IDDs), include endemic goiter, hypothyroidism, cretinism, decreased fertility rate, increased infant mortality, and mental retardation.

Congenital iodine deficiency syndrome, previously known as cretinism, is a condition associated with iodine deficiency and goiter, commonly characterised by mental deficiency, deafness, squint, disorders of stance and gait and stunted growth due to hypothyroidism.

Q67] Ans: c

The dough, which is used for making foods such as dosa and idli is also **fermented** by bacteria. The puffed-up appearance of dough is due to the production of **CO2 gas**.

Fermentation is a metabolic process that produces chemical changes in organic substrates through the action of enzymes. In biochemistry, it is narrowly defined as the extraction of energy from carbohydrates in the absence of respiration. In the context of food production, it may more broadly refer to any process in which the activity of microorganisms brings about a desirable change to a foodstuff or beverage.

Q68] Ans: d

An optical illusion is characterized by visually perceived images that are deceptive or misleading. The information gathered by the eye is processed by the brain to give a perception that does not tally with a physical measurement of the stimulus source.

1. Mirage, in optics, the deceptive appearance of a distant object or objects caused by the bending of light rays (refraction) in layers of air of varying density.

2. Heat energy radiated by the earth changes the density of the atmospheric layers continuously. This changing density of the air layers near the ground affects its refractive index. Due to the refraction of light rays from the star, path of these rays goes on varying. Hence the eye some times receives more light with the result that the star appears brighter

and sometimes it receives only a few rays or no rays which make the star appear fainter. The brighter and fainter appearance of the star with varying time is called the twinkling of the stars.
3. The primary cause of a blue sky and orange/red sunsets or sunrises is scattering by the gas molecules that make up our atmosphere.
4. The ocean looks blue because red, orange and yellow (long wavelength light) are absorbed more strongly by water than is blue (short wavelength light). So when white light from the sun enters the ocean, it is mostly the blue that gets returned
5.Halo around Sun: an optical phenomena is produced by light interacting with ice crystals suspended in the atmosphere.

Q69] Ans: b

Potassium permanganate is a point-of-entry treatment method that oxidizes dissolved iron, manganese, and hydrogen sulfide into solid particles that are filtered out of the water. It can also be used to control iron bacteria growth in wells

Q70] Ans: a

DNA fingerprinting was invented in 1984 by Professor Sir Alec Jeffreys after he realised you could detect variations in human DNA, in the form of these minisatellites. DNA fingerprinting is a technique that simultaneously detects lots of minisatellites in the genome to produce a

pattern unique to an individual. This is a DNA fingerprint. The probability of having two people with the same DNA fingerprint that are not identical twins is very small. Just like one's actual fingerprint, one's DNA fingerprint is something one is born with, it is unique to a person.

DNA fingerprinting can be used to help confirm whether two people are related to one another and is commonly used to provide evidence that someone is, or is not, the biological parent of a child. DNA fingerprinting can also be used to identify victims of crime or major disasters and help bring separated families back together.

DNA fingerprinting is used to diagnose inherited disorders in both prenatal and newborn babies in hospitals around the world. These disorders may include cystic fibrosis, hemophilia, Huntington's disease, familial Alzheimer's, sickle cell anemia, thalassemia, and many others.

Archaeogenetics is the study of ancient DNA using various molecular genetic methods and DNA resources. This form of genetic analysis can be applied to human, animal, and plant specimens.

Q71] Ans: a

Not every plant grows from a seed. Some plants, like ferns and mosses, grow from spores. Other plants use asexual vegetative reproduction and grow new plants from rhizomes or tubers. We can also use techniques like grafting or take cuttings to make new plants. Figs ,Pine plants are reproduced through seeds.

Q72] Ans: d

Blood transfusion has been and continues to be a possible source of disease transmission. A myriad of agents can potentially be transmitted through blood transfusions, including bacteria, viruses, and parasites. Of these, bacteria are the most commonly transmitted.

Q73] Ans: d

Epidermal cells on the aerial parts of the plant often secrete a waxy, water-resistant layer on their outer surface. This aids in protection against loss of water, mechanical injury and invasion by parasitic fungi

Q74] Ans: d

Transpiration is the process of water movement through a plant and its evaporation from aerial parts, such as leaves, stems and flowers. Water is necessary for plants but only a small amount of water taken up by the roots is used for growth and metabolism.

1. It's pulling action helps in absorption and transportation of water in the plant. It supplies water for photosynthesis.
2. Water and mineral nutrients are absorbed by roots from the soil. Nutrients are transported along with water to the entire plant via the vascular tissue called xylem. Transpiration generates a force which pulls up water absorbed by the roots from the soil, to reach the stem and leaves.
3. Transpiration produces a tension or 'pull' on the water in the xylem vessels by the leaves.Providing water to keep cells turgid in order to support the plant.

Q75] Ans: d

Algae can be used as

1. Algae have been used as human food for thousands of years in all parts of the world. The most commonly consumed macroalgae include the red algae Porphyra (nori, kim, laver), Asparagopsis taxiformis (limu), Gracilaria,Chondrus crispus (Irish moss) and Palmaria palmata (dulse), the kelps Laminaria (kombu), Undaria (wakame) and Macrocystis, and the green algae Caulerpa racemosa,Codium and Ulva.
2. Algae fuel, algal biofuel, or algal oil is an alternative to liquid fossil fuels that uses algae as its source of energy-rich oils. Also, algae fuels are an alternative to commonly known biofuel sources, such as corn and sugarcane.
3. Algae can be used as a fertilizer because it is a living organism. When algae is used as a fertilizer, it quickly begins to break down releasing its abundant nitrogen source. As a result, algae can act as an excellent fertilizer that can be used to help grow crops efficiently.
4. The fatty acid content in algae makes it a well-known bioactive compound which is very useful in the pharmaceutical industry. Algae could be used to make complex, targeted cancer drugs, their photosynthetic organelles, chloroplasts make it more helpful.

Q76] Ans: d

Chlorination is the process of adding chlorine to drinking water to disinfect it and kill germs. Different processes can be used to achieve safe levels of chlorine in drinking water. Chlorine is available as compressed elemental gas, sodium hypochlorite solution (NaOCl) or solid calcium hypochlorite (Ca(OCl)2

Q77] Ans: b

The general structure of the mammalian characteristic are:

- **Mammals are endothermic vertebrates.**
- Have hair and fur on the body
- Have mammary glands
- Four chambered hearts
- Have sebaceous (fat secreting glands), sudoriferus (sweat), and scent glands.
- Have heterodont dentation (different types of teeth)
- Possess diaphragm
- Possess one single jaw bone
- Have three small bones in the middle of the ear

Conspicuous characteristic of mammals

The conspicuous characteristics of mammals help you to identify any species in the world as mammals. They are as follows:

- Mammals can be easily identified by their external ears.
- Females have the milk secreting organs to feed their young ones so they are easily identified by the mammary glands.
- Seat, ears and hair glands help to distinguish between the male and female mammals.
- Mammals posses teeth.
- During development the mammals use their placenta
- **Some mammals are found to be egg laying and mammals with pouch.Hence statement 2 is incorrect.**
- Hair and fur on the body also helps to identify the mammals class easily

- Mammals have a single heart with multiple arteries.

Q78] Ans: b

Osmosis is the spontaneous net movement of solvent molecules through a selectively permeable membrane into a region of higher solute concentration, in the direction that tends to equalize the solute concentrations on the two sides.

Why touch me not plants shrinking and gaining turgidity is an odd option with respect to processes of Osmosis?

The movement of plants caused by touch stimulus is known as Thigmonasty. In this mechanosensory response, water within the cells and other cell contents apply a certain amount of force against the cell walls of the plant; this is called **turgor pressure**.

It is due to turgor pressure that the leaves of this plant stay upright unless disturbed externally. Now, when you touch or shake the leaves (known as **seismonastic movements**), the swollen base of the leaf stalk (called the 'pulvinus'), which contains certain contractile proteins, is activated.

The mechanism that makes mimosa pudica leaves to close

When disturbed externally, certain regions of the plant trigger a release of various chemicals, including potassium ions, within the body of the plant. These chemicals make water and electrolytes flow/diffuse out of the cell, resulting in a loss of cell pressure. This causes the cell to collapse, which squeezes the leaves shut. Stimuli, in the form of touch, is sometimes transmitted to neighboring leaves as well, causing something like this to happen:

Q79] Ans: c

Ice floats on water because it is less dense than water.

When water freezes into its solid form, its molecules are able to form more stable hydrogen bonds locking them into positions. Because the molecules are not moving, they're not able to form as many hydrogen bonds with other water molecules. This leads to ice water molecules not being as close together as in the case of liquid water, thus reducing its density.

Most substances in their solid form are more dense than their liquid forms. The opposite is true in water. This property of water is somewhat unusual and rare.
Water is actually most dense at 4ºC. At any temperature below or above 4ºC, water becomes less dense.

Q80] Ans: d

a) An analgesic or painkiller is any member of the group of drugs used to achieve analgesia, relief from pain. Analgesic drugs act in various ways on the peripheral and central nervous systems. They are distinct from anesthetics, which temporarily affect, and in some instances completely eliminate, sensation.
b) Antiseptics are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis, or putrefaction.
c) Antihistamines are drugs which treat allergic rhinitis and other allergies. Typically people take antihistamines as an inexpensive, generic, over-the-counter drug that can provide relief from nasal congestion, sneezing, or hives caused by pollen, dust mites, or animal allergy with few side effects.
d) Tranquilizer, also spelled Tranquillizer, drug that is used to reduce anxiety, fear, tension, agitation, and related states of mental disturbance.

Q81] Ans: b

Vegetable oils and animal fats are the traditional materials that are saponified. These greasy materials, triesters called triglycerides, are mixtures derived from diverse fatty acids.

Q82] Ans: b

Acid rain is a rain or any other form of precipitation that is unusually acidic, meaning that it has elevated levels of hydrogen ions (low pH). It can have harmful effects on plants, aquatic animals and infrastructure.
Acid rain is caused by emissions of sulfur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids. Nitrogen oxides can also be produced

naturally by lightning strikes, and sulfur dioxide is produced by volcanic eruptions. Carbonic acid is not associated with acid rain. Hence statement 1 is wrong.

The pH of pure water is 7; however, there are always impurities in rainwater because it stays in equilibrium with carbon dioxide in the atmosphere. Carbon dioxide is weakly acidic, so it causes rainwater to be naturally acidic as well. This leads to a calculation of a pH of around 5.7 for rainwater, according to Harvard University. Hence statement 2 is wrong.

Acid rain has been shown to have adverse impacts on forests, freshwaters and soils, killing insect and aquatic life-forms, causing paint to peel, corrosion of steel structures such as bridges, and weathering of stone buildings (yellowing of Taj Mahal.)and statues as well as having impacts on human health. Statement 3 is right.

Q83] Ans: c

Xylem flow is unidirectional and phloem flow is bidirectional because xylem transport water from soil to leaves and phloem transfers the food synthesized in leaves to all the parts of plants wherever it is necessary.Hence statement 3 is incorrect.

Non-vascular plants do not have a wide variety of specialized tissue types. Mosses and leafy liverworts have structures called phyllids that look like leaves, but are not true leaves because they are single sheets of cells with no internal air spaces, no cuticle or stomata and no xylem or phloem.

Q84] Ans: c

The tissue that is most frequently donated and transplanted is the cornea. The cornea is a contact lens sized, clear piece of tissue in the front of the eye.

Q85] Ans: b

Black from inside and white from outside. white colour doesn't absorb the heat because its the characteristic of the white colour to reflect the heat. black absorbs more heat than other colour and also it emits more heat that absorbed.

Q86] Ans: a Self explanatory

Q87] Ans: a

Litmus is a water-soluble mixture of different dyes extracted from lichens. It is often adsorbed onto filter paper to produce one of the oldest forms of pH indicator, used to test materials for acidity.

Q88] Ans: b

Acid rain is caused by emissions of sulfur dioxide and nitrogen oxide, which react with the water molecules in the atmosphere to produce acids(Sulphuric acid & Nitric acid).

Q89] Ans: a

Refer explanation of Q74.

Q90] **Ans: d**

New plants can grow from older plants, through the method of vegetative propagation such as grafting and budding. It is a form of asexual reproduction seen in plants. Here only a single plant is involved and the offspring that arises is identical, both genetically and morphologically to the parent plant.

Vegetative propagation occurs through vegetative plant structures. In non-vascular plants, the vegetative reproductive structures are gemmae and spores whereas, in vascular plants, the roots, stems, leaves, and nodes are the structures that are involved in the propagation.

Types of Vegetative Propagation

Vegetative Propagation by Roots

In this process, new plants grow out of the modified roots called tubers. Some plant roots also develop adventitious buds. These buds grow and form new plants/sprouts under the right conditions. These sprouts can be separated from the parent plant and when planted in other areas, new plants are formed. Example – Sweet potato, Dahlia etc.

Vegetative Propagation by Stems

Vegetative propagation occurs through stems when new plants arise from the nodes. This is where buds are formed, which grow into new plants. Stems that grow horizontally on the ground are called runners. As these runners grow, buds are formed at the nodes, which later develop the roots and shoots, resulting in the formation of a new plant. Example – Cyanodon; Mint etc.

The round, swollen part of the underground stem is called a bulb. Within the bulb lies the organ for vegetative propagation such as the central shoot that grows into a new plant. Bulbs have a bud surrounded by layers of fleshy leaves. A few examples include Onions, Garlic, and Tulips etc.

In plants like potatoes, stem tubers are found. This part is the swollen apical part containing many nodes or eyes. Every eye has buds. New plants originate from these buds.

Vegetative Propagation by Leaf

Plants like Bryophyllum, Begonia etc., have adventitious buds coming out from the notches of the leaves. These buds develop into new plants.

Cutting

It is the most common method employed by gardeners to grow new plants. A portion of the stem is cut and planted in the soil, which develops roots and further grows into a new plant.

Grafting

In grafting, two closely related plants are used to produce a new plant that has the desired, combined traits of both the parent plants. One plant is the stock, where the root system is taken and the other is the Scion, where the shoot system is used. The scion is attached to the stock of the second plant in this method of artificial vegetative propagation. Grafting is used in a variety of plants like roses, apples, avocado etc.

Budding

In this method, a bud with a small portion of bark is taken from the desired plant. This is inserted into a small slit that is made in the bark of the other plant. Both the plants are tied together and the buds are not allowed to dry.

Q91] Ans: d

Natural preservatives include rosemary and oregano extract, hops, salt, sugar, vinegar, alcohol, diatomaceous earth and castor oil.

High sugar concentrations cause the bacterium to lose water by osmosis and it doesn't have any cellular machinery to pump it back in against the osmotic gradient. Without enough water, the bacteria can't grow or divide.

Salt has been used as a preservative for ages, and works to preserve food in two ways:

- **Salt** dries **food**. **Salt** draws water out of **food** and dehydrates it.
- **Salt** kills microbes. High **salt** is toxic to most (not all) microbes because of the effect of osmolarity, or water pressure.

When food comes into contact with air, oil oxidises and starts to go bad. Oil slows down this oxidation process and keeps microorganisms from coming into contact with the food.

Q92] Ans: d

Dry ice is the solid form of carbon dioxide. It is used primarily as a cooling agent. Its advantages include lower temperature than that of water ice and not leaving any residue.

Carbon dioxide extinguishes work by displacing oxygen, or taking away the oxygen element of the fire triangle. The carbon dioxide is also very cold as it comes out of the extinguisher, so it cools the fuel as well.It generally does not harm electrical equipment.

Q93] Ans: a

Foodborne, commonly called food poisoning, and waterborne illnesses are conditions caused by eating or drinking food or water that is contaminated by microbes or the toxins they produce.

Hepatitis A is a contagious liver disease that results from infection with the Hepatitis A virus. Objects, food, or drinks contaminated by the feces, or stool, of an infected person.

The cholera bacterium is usually found in water or food sources that have been contaminated by feces (poop) from a person infected with cholera.

The bacteria that cause typhoid fever spread through contaminated food or water and occasionally through direct contact with someone who is infected.

The polio virus usually enters the environment in the feces of someone who is infected. In areas with poor sanitation, the virus easily spreads from feces into the water supply, or, by touch, into food. In addition, because polio is so contagious, direct contact with a person infected with the virus can cause polio.

Q94] Ans: c

Self-explanatory

Q95] Ans: c

Sodium-potassium pump, in cellular physiology, a protein that has been identified in many cells that maintains the internal concentration of potassium ions [K+] higher than that in the surrounding medium (blood, body fluid, water) and maintains the internal concentration of sodium ions [Na+] lower than that of the surrounding medium. The pump, which has adenosine-triphosphatase (ATPase) activity, traverses the cell membrane and is activated by external [K+] and internal [Na+]. This enzyme uses metabolic energy to transport (pump) Na+ outward and K+ inward. The resting potential of cells and related bioelectric phenomena such as the action potential depend on the steady state difference in concentrations of Na+ and K+ maintained by the pump.

Q96] Ans: d

The material used for fuse elements must be of low melting point, low ohmic loss, high conductivity (or low resistivity), low cost and free from detraction. The material used for making fuse element has a low melting point such as tin, lead, or zinc.

Q97] Ans: b

Potato chip bags are not full of air, but of nitrogen gas. This is done to prevent the chips from oxidizing, which is part of what makes them go stale.

Q98] Ans: c

Lithotrophs are a diverse group of organisms using inorganic substrate (usually of mineral origin) to obtain reducing equivalents for use in biosynthesis (e.g., carbon dioxide fixation) or energy conservation (i.e., ATP production) via aerobic or anaerobic respiration.

Q99] Ans: d

Polytetrafluoroethylene PTFE (Teflon) is best known for its use in coating non-stick frying pans and other cookware, as it is hydrophobic and possesses fairly high heat resistance. It is very non-reactive, and so is often used in containers and pipework for reactive and corrosive chemicals. When used as a lubricant, PTFE can reduce friction, wear, and energy consumption of machinery. (PTFE) is a synthetic fluoropolymer of tetrafluoroethylene .It is commonly used as a graft material in surgical interventions.

Q100] Ans: d

Eels are actually fish (albeit typically longer) and are flatter than snakes. As marine animals and unlike reptiles, eels breathe underwater with their gills and fins, and therefore cannot survive outside of water.