Q. 1) Consider the following statements regarding the difference between plant cells and animal cells

1. The cell wall is present only in plant cells.
2. The plastids are absent in animal cells.
3. Mitochondria is present in both plant cells and animal cells.
4. Lysosomes are present only in plant cells.

Choose the correct code

a) One statement is correct
b) Two statements are correct
c) Three statements are correct
d) Four statements are correct

Q.1) Solution: (c)

Explanation:

Plant cells	Animal cells
It has a cell wall composed of the cell membrane and cellulose.	It does not have a cell wall.
Plastids are present.	Plastids are absent.
Chloroplasts are present.	Chloroplasts are absent.
Mitochondria are present in a small number.	Mitochondria are present in a large number.
Lysosomes are absent.	Lysosomes are present.
Centrosomes are absent.	Centrosomes are present.
Vacuole is larger.	Vacuole is smaller.

Plant cells can synthesize their nutrients such as amino acids, vitamins coenzymes that are required by the plant.	Animal cells cannot synthesize their nutrients.
Centrioles are absent.	**Centrioles are present.**

Hence option c is correct.

Q.2) Which of the following is not a Type of Tissue?

a) Connective Tissue
b) Epithelial Tissue
c) Muscle Tissue
d) Pituitary Tissue

Q.2) Solution: (d)

Explanation:

Pituitary is a gland and not a type of tissue.

The pituitary gland is an endocrine gland located at the base of the brain. It secretes hormones that regulate various functions in the body. However, it is not classified as a type of tissue itself. Rather, it is an organ composed of different types of tissues, including nervous tissue and glandular epithelial tissue.

Four types of Tissues

- Epithelial Tissue: This tissue covers the surfaces of organs, lines body cavities, and forms glands. It serves as a protective barrier, absorbs and secretes substances, and facilitates sensory perception. Epithelial tissue can be further classified into simple epithelium (one layer of cells) and stratified epithelium (multiple layers of cells).
- Connective Tissue: This tissue provides support and structure to other tissues and organs. It consists of cells scattered within an extracellular matrix composed of protein fibers and ground substance. Examples of connective tissue include bone, cartilage, adipose tissue (fat), blood, and tendons.

- Muscle Tissue: Muscle tissue is responsible for movement in the body. There are three types of muscle tissue: skeletal muscle (voluntary movement and locomotion), smooth muscle (involuntary movement in organs), and cardiac muscle (found in the heart).
- Nervous Tissue: Nervous tissue is involved in the transmission and processing of information in the body. It consists of neurons (nerve cells) that transmit electrical signals and glial cells that support and protect neurons. Nervous tissue forms the brain, spinal cord, and nerves.

Q. 3) Consider the following statements regarding the functions of various cell organelles

1. The nucleus controls the activity of the cell and initiates cell division.
2. Golgi bodies are responsible for the modification and transport of materials.
3. Endoplasmic Reticulum helps in calcium storage and protein synthesis.

Choose the correct code:

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

Q.3) Solution: (d)

Explanation:

- An organelle is a subcellular structure that has one or more specific jobs to perform in the cell, much like an organ does in the body. Among the more important cell organelles are the nuclei, which store genetic information; mitochondria, which produce chemical energy; and ribosomes, which assemble proteins.
- **The nucleus** controls the activity of the cell and initiates cell division.
- It has the chromosomes or DNA which control the hereditary characteristics.
- The nucleus is covered by a double membranous nuclear membrane in a Eukaryotic Cell.
- It contains DNA, RNA, protein, nucleolus, and chromatin networks. **Hence statement 1 is correct.**
- **Golgi bodies are responsible for the** modification, packaging, and transport of materials.
- It helps in the synthesis of lysosomes and plasma membranes. **Hence statement 2 is correct.**

- **Endoplasmic Reticulum helps in** calcium storage and protein synthesis.
- It provides a surface for the synthesis of material – proteins in RER and lipids in SER. **Hence statement 3 is correct.**

Q. 4) Purines bases that are present in both DNA and RNA are composed of:

a) Cytosine and thymine
b) Adenine and thymine
c) Adenine and guanine
d) Guanine and cytosine

Q.4) Solution: (c)

Explanation:

- Purines and pyrimidines are types of nitrogenous bases that are essential components of nucleotides, the building blocks of nucleic acids like DNA and RNA.
- Purines: Purines are larger, double-ring nitrogenous bases. The two types of purines found in nucleotides are adenine (A) and guanine (G). These bases are involved in the genetic code and play a crucial role in DNA replication, transcription, and translation. In DNA, adenine pairs with thymine (T), while guanine pairs with cytosine (C). In RNA, adenine pairs with uracil (U) instead of thymine.
- Pyrimidines: Pyrimidines are smaller, single-ring nitrogenous bases. The three types of pyrimidines found in nucleotides are cytosine (C), thymine (T, found only in DNA), and uracil (U, found only in RNA). These bases also participate in the genetic code and base-pairing interactions. Cytosine pairs with guanine, thymine pairs with adenine in DNA, and uracil pairs with adenine in RNA.
- Purines and pyrimidines, when combined with a sugar molecule and a phosphate group, form nucleotides. These nucleotides then join together through phosphodiester bonds to create the backbone of DNA and RNA strands. The specific arrangement of purines and pyrimidines in the nucleic acid sequence carries the genetic information that determines the traits and characteristics of living organisms.

Q. 5) Consider the following statements

1. tRNA is responsible for the synthesis of mRNA and translates it into proteins in all organisms.
2. mRNA is responsible for getting genetic material to reach the ribosome and determining what kind of protein the body needs.
3. rRNA is responsible for identifying the proper protein or amino acid that the body needs to help the ribosome.

Choose the correct code:

a) 1 only
b) 2 only
c) 3 only
d) None

Q.5) Solution: (b)

Explanation:

- RNA is one of the essential nucleic acids of living organisms.
- RNA molecules are composed of phosphates, pentose sugars, and some nitrogen ring bases.
- RNA contains β-D-ribose as the sugar moiety. Guanine (G), adenine (A), cytosine (C), and uracil (U) are heterocyclic bases found in RNA.
- RNA is primarily composed of a single strand and can be folded.
- The different types of RNA are:
- tRNA (transfer RNA) is responsible for identifying the proper protein or amino acid that the body needs to help the ribosome.
- It is at the end of each amino acid.
- It is also called soluble RNA and represents the link between amino acids and messenger RNA. **Hence statement 1 is incorrect.**
- mRNA (messenger RNA) is responsible for getting genetic material to reach the ribosome and determining what kind of protein the body needs.
- It is also called messenger RNA and such mRNAs are commonly used in transcription and protein production processes. **Hence statement 2 is correct.**
- rRNA is a ribosomal component found in the cytoplasm of cells with ribosomes.

- Ribosomal RNA is required primarily to synthesize mRNA and translate it into proteins in all organisms.
- rRNA is primarily composed of cellular RNA. **Hence statement 3 is incorrect.**

Q. 6) Consider the following statements

1. Mitosis occurs in somatic cells.
2. Meiosis occurs in germ cells.
3. Mitosis maintains the chromosome number.
4. Meiosis reduces the chromosome number to half.

Choose the correct code:

a) 1, 3 and 4
b) 2, 3 and 4
c) 1, 2 and 3
d) 1, 2, 3 and 4

Q.6) Solution: (d)

Explanation:

- **The first statement is correct.** Mitosis is the process of cell division that occurs in somatic cells, which are all the non-reproductive cells of the body. It is responsible for growth, development, tissue repair, and asexual reproduction in some organisms.
- **The second statement is correct.** Meiosis is the type of cell division that occurs in germ cells, which are the reproductive cells (sperm and eggs). It is a specialized process that produces haploid cells (gametes) with half the chromosome number of the parent cell.
- **The third statement is correct.** During mitosis, the chromosomes replicate, and the replicated chromosomes are separated into two daughter cells. Each daughter cell receives the same number of chromosomes as the parent cell, maintaining the chromosome number.
- **The fourth statement is correct.** Meiosis involves two rounds of division, known as meiosis I and meiosis II. In meiosis I, the chromosome number is halved as homologous chromosomes pair up and exchange genetic material through a process called crossing over. This results in the formation of haploid cells with unique combinations of genes. In meiosis II, the sister chromatids

of each chromosome separate, resulting in the production of four haploid daughter cells, each with half the chromosome number of the parent cell.

Q. 7) Consider the following statements regarding divisions in the plant kingdom

1. Cryptogams include Gymnosperm and Angiosperm.
2. Phanerogams include Bryophyta and Peridophyta.

Choose the correct code:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.7) Solution: (d)

Explanation:

- Cryptogams and phanerogams are two sub-kingdoms of the kingdom Plantae. This classification system was introduced by A. W. Eichler in 1883.
- The **main difference** between cryptogams and phanerogams is that **Cryptogams consist of seedless plants whereas phanerogams consist of seed-bearing plants.**
- Cryptogams include Bryophyta and Peridophyta. **Hence statement 1 is incorrect.**
- Cryptogams comprise plants like algae, mosses, and ferns.
- Cryptogams are non-flowering plants, which mainly reproduce by the production of spores. They do not produce fruits.
- Phanerogams comprise gymnosperms and angiosperms. **Hence statement 2 is incorrect.**
- Gymnosperms are non-flowering plants with naked seeds (seeds are not covered by a fruit). Angiosperms are flowering plants that produce seeds covered by fruit.
- Angiosperms are the most prominent vegetation on Earth.

Q. 8) Consider the following

1. Water
2. Light intensity
3. Wind velocity
4. Carbon dioxide
5. Pollution

Which of the given above are the factors which directly or Indirectly affect photosynthesis?

a) 2, 3, 4 and 5
b) 1, 2, 4 and 5
c) 1, 3, 4 and 5
d) 1, 2, 3, 4 and 5

Q.8) Solution: (b)

Explanation:

- Photosynthesis is the process by which plants prepare their own food while being exposed to water, chlorophyll, sunlight, and CO_2.
- This process takes place primarily in the plant's leaves. Photosynthesis is also performed by the stems of some other plants.
- Photosynthesis takes place in the chloroplast cells of leaves.
- Photosynthesis is influenced by a number of factors, including its rate and efficiency.
- Water is one of the most important factors influencing photosynthesis.
- When there is a decrease in water intake or availability, the stomata begin to close to prevent any water loss during transpiration. With the stomata closing, CO_2 intake ceases, affecting photosynthesis.
- Photosynthesis begins at low light intensities and gradually increases until it reaches its peak at the brightest time of day.
- The amount of light required by different plants varies.
- Wind velocity doesn't affect photosynthesis.
- The wind has no effect on the reactions and the rate of reactions going in the chloroplast of the leaves of the plant.

- Plants absorb carbon dioxide from the atmosphere.
- The air is so small, it acts as a limiting factor for photosynthesis.
- Experiments have been carried out to investigate the rate of photosynthesis as the concentration of CO_2 in the atmosphere increases.
- When light and temperature are not the limiting factors, increasing CO_2 concentration leads to an increase in photosynthesis rate.
- However, after a certain point, CO_2 begins to accumulate in the plant, slowing down the process. As a result, excess CO_2 inhibits photosynthesis, especially when it begins to accumulate.
- Stomata are the tiny pores on leaves, and they act as sites of gas exchange between the plant and the atmosphere.
- Pollution impacts a plant's structure reduces the size of the stomata and when gas exchange is compromised, photosynthesis slows.

Hence option b is correct.

Q. 9) Arrange the following steps involved in Transcription in a chronological order

1. Initiation
2. Termination
3. Elongation

Choose the correct code:

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

Q.9) Solution: (b)

Explanation:

- Transcription is a fundamental process in biology that involves the synthesis of RNA from a DNA template. It can be divided into three main stages: initiation, elongation, and termination.

- Initiation: The first step of transcription is initiation, where RNA polymerase recognizes and binds to a specific region on the DNA called the promoter. The promoter acts as a signal for the RNA polymerase to start transcribing the DNA into RNA. Once bound, the RNA polymerase unwinds the DNA double helix, creating a transcription bubble.
- Elongation: After initiation, the RNA polymerase moves along the DNA template strand, synthesizing a complementary RNA molecule. The enzyme adds nucleotides one by one, creating a growing RNA strand that is complementary to the DNA template strand. As the RNA polymerase progresses, the DNA helix re-forms behind it.
- Termination: The final step of transcription is termination. In this stage, the RNA polymerase reaches a specific termination sequence on the DNA. This sequence signals the polymerase to release both the newly synthesized RNA molecule and the DNA template. The RNA molecule is then free to carry out its specific function, such as being processed further or translated into a protein.
- Overall, transcription is a tightly regulated process that allows genetic information encoded in DNA to be transcribed into RNA molecules. It is a crucial step in gene expression and plays a vital role in various biological processes.

Q. 10) Consider the following statements about Red blood cells (RBCs) and White blood cells (WBCs)

1. RBCs are called erythrocytes, while WBCs are called leukocytes.
2. RBCs are small and round with a concave shape, while WBCs come in different shapes.
3. RBCs carry oxygen throughout the body, while WBCs fight off infection.
4. RBCs can be affected by leukaemia, while WBCs can be affected by anaemia.

Choose the correct code:

a) 1, 3 and 4
b) 2, 3 and 4
c) 1, 2 and 3
d) 1, 2, 3 and 4

Q.10) Solution: (c)

Explanation:

- Red blood cells (RBCs) are the most common type of blood cell.
- They are responsible for carrying oxygen from the lungs to other organs and tissues in the body. RBCs are made in the bone marrow and live for about 120 days.
- White blood cells (WBCs) are the second most common type of blood cell.
- They are responsible for fighting off infection and protecting the body from disease. WBCs are made in the bone marrow and live for about 12 days.
- RBCs are called erythrocytes, while WBCs are called leukocytes. **Hence statement 1 is correct.**
- RBCs contain haemoglobin, which gives them their red colour.
- WBCs are usually clear or pale yellow.
- RBCs are small and round with a concave shape, while WBCs come in different shapes. **Hence statement 2 is correct.**
- There are more RBCs than WBCs in the body.
- RBCs carry oxygen throughout the body, while WBCs fight off infection. **Hence statement 3 is correct.**
- Haemoglobin is the red blood cell's protein component.
- White blood cells are formed from leukocytes that have discovered antigens on foreign invaders.
- The normal red blood cell count in a microlitre of blood is between four and six million.
- The white blood cell count is normally between five thousand and ten thousand.
- RBCs can be affected by anaemia, while WBCs can be affected by leukaemia. **Hence statement 4 is incorrect.**

Q. 11) Consider the following statements about the functions of different enzymes

1. Ptyalin catalyzes the hydrolysis of starch into maltose and dextrin.
2. Pepsin is responsible for the digestion of dietary fat present in our stomach.

Choose the correct code:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.11) Solution: (a)

Explanation:

- Ptyalin is a form of amylase found in the saliva of humans.
- It is the most important amylolytic enzyme secreted in the mouth (buccal cavity) by the salivary glands.
- Ptyalin catalyzes the hydrolysis of starch into maltose and dextrin. **Hence statement 1 is correct.**
- Pepsin is the main gastric enzyme. It is produced by the stomach cells called "chief cells" in their inactive form they are known as pepsinogen.
- Pepsinogen is then activated by the stomach acid into its active form, known as pepsin.
- It helps in breaking down **protein** in the food into smaller particles known as peptides and amino acids.
- The first step of protein digestion occurs in the stomach, whereas digestion of carbohydrates and lipids starts in the mouth.
- Gastric Lipase is an acidic lipase secreted by the gastric chief cell in the fundic region of mucosa in the stomach.
- The optimum pH for gastric lipase is between 3-6.
- It is responsible for the digestion of dietary fat present in our stomach. **Hence statement 2 is incorrect.**

Q. 12) Consider the following

Glands	Hormones
1. Pineal	Oxytocin
2. Pituitary	Melatonin
3. Ovary	Progesterone
4. Pancreas	Insulin

How many given pairs are correctly matched?

a) One pair
b) Two pairs
c) Three pairs
d) Four pairs

Q.12) Solution: (b)

Explanation:

- The glands of the endocrine system are where hormones are produced, stored, and released. Each gland produces one or more hormones, which go on to target specific organs and tissues in the body.
- The glands of the endocrine system include the:
- While some people don't consider the hypothalamus as a gland, it produces multiple hormones that control the pituitary gland. It's also involved in regulating many functions, including sleep-wake cycles, body temperature, and appetite. It can also regulate the function of other endocrine glands.
- The pituitary gland is located below the hypothalamus. The hormones it produces affect growth and reproduction. They can also control the function of other endocrine glands.
- The pineal gland is found in the middle of your brain. It's important for your sleep-wake cycles.
- The thyroid gland is located in the front part of your neck. It's very important for metabolism.
- Parathyroid is located in the front of your neck, it is important for maintaining control of calcium levels in your bones and blood.
- Thymus is located in the upper torso, it is active until puberty and produces hormones that are important for the development of a type of white blood cell called a T cell.
- One adrenal gland can be found on top of each kidney. These glands produce hormones that are important for regulating functions such as blood pressure, heart rate, and stress response.
- The pancreas is located in your abdomen behind your stomach. Its endocrine function involves controlling blood sugar levels.

Glands	Hormones
1. Pineal	Melatonin
2. Pituitary	Oxytocin Prolactin
3. Ovary	Progesterone Estrogen
4. Pancreas	Insulin Glucagon

Hence option b is correct.

Q. 13) Consider the following statements about the functions of the renal tubules in the excretory system

1. Proximal Convoluted Tubule (PCT) enables the reabsorption of electrolytes and water.
2. The Loop of Henle maintains the osmolarity of the body fluids.

Choose the correct code:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.13) Solution: (c)

Explanation:

- Proximal Convoluted Tubule (PCT) enables the reabsorption of most electrolytes and water.
- It is lined with brush border epithelium, which increases the surface area for reabsorption.
- It also secretes potassium ions, ammonium ions, and hydrogen ions into the filtrate to maintain the body's ionic balance. **Hence statement 1 is correct.**

- The Loop of Henle maintains the osmolarity of the body fluids.
- It has two limbs: descending and ascending.
- The ascending limb is impermeable to electrolytes but permeable to electrolytes, and significantly less reabsorption of water occurs here. **Hence statement 2 is correct.**
- In Distal Convoluted Tubule (DCT), the reabsorption of water, bicarbonate ions, and sodium ions occur while potassium and sodium are secreted to regulate the ionic balance of the fluid.
- Water is reabsorbed in the collecting duct to concentrate the urine, and the secretion of ions like hydrogen and potassium also occurs here.
- The collecting duct is responsible for maintaining the pH and ionic balance of the blood.

Q. 14) Which of the following best describes how food should travel through a human digestive system?

a) Mouth → Pharynx → Buccal cavity → Oesophagus → Small intestine → Stomach → Large intestine → Anus

b) Mouth → Buccal cavity → Pharynx → Oesophagus → Stomach → Small intestine→ Large intestine → Anus

c) Mouth → Buccal cavity → Oesophagus → Pharynx → Stomach → Large intestine → Small intestine → Anus

d) Mouth → Buccal cavity → Stomach → Pharynx → Oesophagus → Small intestine → Large intestine → Anus

Q.14) Solution: (b)

Explanation:

- Mouth, Buccal Cavity, Pharynx, Oesophagus, Stomach, Small intestine, Large intestine, and Anus, is the correct order for food to go through the alimentary canal.
- The first section of the alimentary canal is the mouth. Food is consumed through the mouth.
- The palate, tongue, and teeth are all parts of the buccal cavity. Here, the food has been broken and combined with saliva.
- The pharynx serves as a common food and air channel. A muscular structure called the oesophagus transports food from the pharynx to the stomach.

- The upper left portion of the abdomen contains a muscular pouch called the stomach. It breaks down proteins into smaller molecules while churning the food. The longest section of the alimentary canal is the small intestine. Here, food digestion is completed. This is also the region where food absorption happens.
- In the large intestine, the undigested food is compressed into faeces, which are eventually expelled through the anus.

Hence option b is correct.

Q. 15) Which of the following is not a part of the respiratory zone of the respiratory tract?

a) Alveolar duct
b) Air sacs
c) Terminal bronchioles
d) Respiratory bronchioles

Q.15) Solution: (c)

Explanation:

- Starting from the trachea to the terminal bronchioles, the entire stretch of the respiratory passageway constitutes the conducting zone as it conducts air to the lungs and there is no gaseous exchange occurring at these regions of the respiratory tract.
- The terminal bronchioles divide into respiratory bronchioles which divide 1-3 times and produce 2-3 alveolar ducts.
- Each alveolar duct expands to form an atrium which further leads to an air sac or alveolus.
- The respiratory passageway from the respiratory bronchioles to the alveoli constitutes the respiratory zone.

Hence option c is correct.

Q. 16) Consider the following statements

1. Cerebrum is known as the major brain while the cerebellum is known as the little brain.
2. Cerebrum is part of the hindbrain whereas the cerebellum is part of the forebrain.

3. Cerebrum contributes the 85 per cent and the cerebellum contributes 10 per cent of the weight of the brain.

Choose the correct code:

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

Q.16) Solution: (c)

Explanation:

- Cerebrum is known as the major brain while the cerebellum is known as the little brain. **Hence statement 1 is correct.**
- Cerebrum is the largest portion of the brain. It encloses two lateral ventricles.
- It controls voluntary actions, memory and intelligence.
- Cerebellum is the second largest portion of the brain. It has no ventricles.
- It modulates and moderates voluntary actions initiated in the cerebrum.
- Cerebrum is part of the forebrain whereas the cerebellum is part of the hindbrain. **Hence statement 2 is incorrect.**
- Cerebrum contributes the 85 per cent and the cerebellum contributes 10 per cent of the weight of the brain. **Hence statement 3 is correct.**

Q. 17) Consider the following statements

1. Glucose is an example of a monosaccharide.
2. Starch is an example of a polysaccharide.
3. Lactose is an example of an oligosaccharide.

Choose the correct code:

a) 1 only
b) 2 only
c) 3 only

d) None

Q.17) Solution: (a)

Explanation:

- Monosaccharides are single sugar molecules which act as the building blocks of disaccharides and polysaccharides.
- Monosaccharides are the simplest form of carbohydrates. These monosaccharides are composed of C, H and O atoms.
- Examples: Glyceraldehyde, Erythrose, Pentose, and Glucose. **Hence statement 1 is correct.**
- Disaccharides are sugar molecules composed of two monosaccharides. Therefore every disaccharide is composed of two chemical rings.
- The bond between two monosaccharides is called a glycosidic bond. Disaccharides are also simple sugars.
- Examples: Lactose, Sucrose, and Maltose. **Hence statement 2 is incorrect.**
- A polysaccharide is a carbohydrate made out of a number of monosaccharides linked via glycosidic bonds.
- Polysaccharides are chains of monosaccharides. Therefore, every polysaccharide is composed of several chemical rings.
- Examples: Starch and Cellulose. **Hence statement 3 is incorrect.**

Q. 18) Consider the following statements about bone marrow

1. It is the soft, fatty tissue inside of bone cavities.
2. It is responsible for creating red blood cells only.

Choose the correct code:

a) 1 only

b) 2 only

c) Both 1 and 2

d) Neither 1 nor 2

Q.18) Solution: (a)

Explanation:

- Bone marrow is the soft, fatty tissue inside of bone cavities.
- The components of blood including red and white blood cells and platelets form inside of your bone marrow. **Hence statement 1 is correct.**
- Bone marrow makes nearly all the components of your blood.
- It's responsible for creating billions of red blood cells daily, along with white blood cells and platelets.
- Bone marrow also stores fat that turns into energy as needed. **Hence statement 2 is incorrect.**

Q. 19) Consider the following statements regarding the Nobel Prize for Physiology 2022

1. It was awarded to David Julius and Ardem Patapoutian.
2. It was awarded for research in the field of genomes of extinct hominins and human evolution.

Choose the correct code:

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.19) Solution: (b)

Explanation:

- The **Nobel Prize for Physiology 2021** was awarded to **David Julius** and **Ardem Patapoutian** for their **discoveries of receptors for temperature and touch.**
- The **Nobel Prize for Physiology 2022 was** awarded to **Swedish geneticist Svante Paabo. Hence statement 1 is incorrect.**
- It was awarded for **research in the field of genomes of extinct hominins and human evolution. Hence statement 2 is correct.**
- Key Highlights of Svante Paabo's Research are:

- Homo sapiens, **first appeared in Africa approximately 300,000 years ago,** while the closest known relatives, **Neanderthals**, **developed outside Africa and populated Europe and Western Asia** from around 400,000 years until 30,000 years ago, at which point they went extinct.
- After sequencing Neanderthals' genes it is found that **archaic gene sequences from our extinct relatives influence the physiology of present-day humans.**
- E.g., the **Denisovan version of the gene EPAS1** confers an advantage for **survival at high altitudes** and is common among **present-day Tibetans.**
- In 2008, a 40,000-year-old fragment from a finger bone was discovered in the **Denisova cave in the southern part of Siberia.**
- The DNA Sequencing of this bone led to the **discovery of a previously unknown hominin, which was given the name Denisova.**
- The **ancestors of modern humans, Neanderthals and Denisovans co-existed for about 20,000 years,** during which they not only interacted with each other **but also inter-bred.**
- In modern-day humans of European or Asian descent, approximately 1-4% of the genome originates from the Neanderthals.
- Further, gene flow also occurred between Denisova and Homo sapiens. This relationship was first seen in populations in Melanesia and other parts of South East Asia, where individuals carry up to 6% Denisova DNA.
- **Novel Methodology** is **not easy to amplify and sequence ancient DNA** because it is highly fragmented and full of contamination from microbes like fungi and bacteria. Over time, DNA tends to degrade and become chemically modified.
- Therefore, **Paabo decided to study mitochondrial DNA from Neanderthals.**
- Mitochondria, popularly called the powerhouse of the cell, is an organelle inside the cell that has its DNA.
- Although the mitochondrial genome is small and only contains a fraction of genetic information in the cell, it is present in thousands of copies. This increases the chance of its **successful sequencing.**

Q. 20) Consider the following statements

1. Sodium helps in proper fluid balance, nerve transmission, and muscle contraction.
2. Calcium helps in nerve functioning, blood clotting, and blood pressure.

3. Phosphorus helps in maintaining the health of bones and teeth.

Choose the correct code:

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

Q.20) Solution: (d)

Explanation:

- Sodium helps in proper fluid balance, nerve transmission, and muscle contraction.
- It is found in table salt, soy sauce; large amounts in processed foods; small amounts in milk, bread, vegetables, and unprocessed meats. **Hence statement 1 is correct.**
- Calcium helps in nerve functioning, blood clotting, and blood pressure.
- It is important for healthy bones and teeth; helps muscles relax and contract.
- It is found in milk and milk products; canned fish with bones (salmon, sardines); fortified tofu and fortified soy milk; greens (broccoli, mustard greens); legumes. **Hence statement 2 is correct.**
- Phosphorus helps in maintaining the health of bones and teeth.
- **It is found in** meat, fish, poultry, eggs, and milk. **Hence statement 3 is correct.**

Q.21) With reference to 'Depleted uranium munitions', consider the following statements

1. Depleted uranium is radioactive and widely used in weapons as it can easily penetrate armour plating due to high density
2. They are not classified as nuclear weapons as per the International Coalition to Ban Uranium Weapons
3. Depleted uranium munitions were first deployed in World War 2 by United States of America against Japan

Choose the correct answer using the code given below

a) 1 and 2 only
b) 2 only

c) 2 and 3 only

d) 3 only

Q.21) Solution (a)

Explanation:

- In comparison to enriched uranium, **depleted uranium is much less radioactive(but still radioactive)** and is incapable of generating a nuclear reaction. However, **due to its high density — it's more dense than lead** — depleted uranium is widely used in weapons as it can **easily penetrate armour plating**. **Statement 1 is correct**
- **They are not classified as nuclear weapons**, as per the International Coalition to Ban Uranium Weapons. **Statement 2 is correct**
- **Depleted uranium munitions were used in the 1991 Gulf War to destroy T-72 tanks in Iraq**. These weapons were again used in the 1999 NATO bombing of Yugoslavia and then during the 2003 invasion of Iraq. **Statement 3 is incorrect**

Source: CLICK HERE

Q.22) Consider the following statements with respect to 'Biotransformation Technology'

1. It is the world's first technology that ensures polyolefins fully biodegrade in an open environment causing no microplastics.
2. Plastics made using this technology are given a pre-programmed time during which it functions like conventional plastics and turns into bioavailable wax after expiry

Select the correct statement(s)

a) 1 only

b) 2 only

c) Both 1 and 2

d) Neither 1 nor 2

Q.22) Solution (c)

Explanation:

- Biotransformation technology is a novel approach to ensure plastics that escape refuse streams are processed efficiently and broken down. This **biotransformation technology is the world's first that ensures polyolefins fully biodegrade in an open environment causing no microplastics**. **Statement 1 is correct**
- Plastics made using this technology are **given a pre-programmed time during which it looks and functions like conventional plastics**. After expiry and exposure to the external environment, it **self-destructs and biotransforms into bioavailable wax**. This wax is then consumed by microorganisms, converting waste into **water, CO2, and biomass**. **Statement 2 is correct**

Source: CLICK HERE

Q.23) 'Vedic heritage portal' seen in news recently was developed by

a) Centre for Cultural Resources and Training
b) Indira Gandhi National Centre for the Arts
c) Rashtriya Sanskrit Vidyapeetha
d) Indian Council of Historical Research (ICHR)

Q.23) Solution (b)

Explanation:

Vedic heritage portal was developed by the Indira Gandhi National Centre for the Arts. The portal will be a one-stop solution for the user, who would like to search for any information regarding the Vedic heritage. The audio-visual recording of four Vedas has been uploaded on the Vedic Heritage portal. The objective of the portal is to secure knowledge from ancient scriptures and manuscripts for future generations through technology.

Source: CLICK HERE

Q.24) Consider the following statements about 'Aravalli Green Wall Project'

1. The project funded by World Bank is a major initiative to green the 5 km buffer area around Aravalli Hills
2. The project will involve planting exotic species of trees and shrubs on scrubland, wasteland and degraded forest land
3. The project covers states of Gujarat, Madhya Pradesh, Haryana and Delhi - where the Aravalli hills landscape is spread across

Choose the correct answer using the code given below

a) 1 only
b) 2 and 3 only
c) 1 and 3 only
d) None of the above

Q.24) Solution (d)

Explanation:

- The project is a major initiative to **green the 5 km buffer area around Aravalli Hill**. The **Aravalli Green Wall Project is part of the Union Environment Ministry's** vision to create green corridors across the country to combat land degradation and desertification. **It is not funded by World Bank**. **Statement 1 is incorrect**
- The project will involve **planting native species of trees and shrubs on scrubland, wasteland and degraded forest land**, along with rejuvenating and restoring surface water bodies such as ponds, lakes and streams. The project will also focus on agroforestry and pasture development to enhance the livelihoods of local communities. **Statement 2 is incorrect**
- The project covers states of **Haryana, Rajasthan, Gujarat and Delhi - where the Aravalli hills landscape span over 6 million hectares of land**. **Statement 3 is incorrect**

Source: CLICK HERE

Q.25) Consider the following statements with respect to 'Low-temperature thermal desalination Technology'

1. It is a process under which the warm surface seawater is flash evaporated at high pressure and the vapour is condensed with cold deep seawater
2. This technique exploits the difference in temperature of nearly 15°C in the ocean water at the surface and at depths of about 60 feet

Select the INCORRECT statement(s)

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.25) Solution (c)

Explanation:

- The LTTD is a process under which the **warm surface seawater is flash evaporated at low pressure and the vapour is condensed with cold deep seawater**. The pressured water vapourises and is trapped in tubes or a chamber. Cold water plumbed from the ocean depths is passed over these tubes and the vapour condenses into fresh water and the resulting salt is diverted away. **Statement 1 is incorrect**
- LTTD which stands for Low-Temperature Thermal Desalination **exploits the difference in temperature (nearly 15°C) in the ocean water at the surface and at depths of about 600 feet**. **Statement 2 is incorrect**

Source: CLICK HERE

Q.26) Akarsh and Manoj started a business with Rs. 1500 and Rs. 2500 and got a profit of Rs. 800. Half of the profit is shared equally the remaining is shared according to their investment. Find their profits respectively.

a) 400 and 400
b) 500 and 300

c) 300 and 500

d) 350 and 450

Q.26) Solution (d)

Explanation:

The ratio of investment of Akarsh and Manoj = 1500: 2500

⇒ 15: 25

⇒ 3: 5

According to the question, Profit shared equally = 800/2 = Rs. 400

Share of Akarsh and Manoj = Rs. 200 and Rs. 200

Remaining profit = 800 - 400 = Rs. 400

Share of profit of Akarsh according to investment = 400 × (3/8) ⇒ Rs. 150

Share of profit of Manoj according to investment = 400 × (5/8) ⇒ Rs. 250

Total share of Akarsh = 200 + 150 = Rs. 350

Total share of Manoj = 200 + 250 = Rs. 450

∴ The profit of Akarsh and Manoj are Rs. 350 and Rs. 450 respectively.

Q.27) If a sales man gets successive gain of 15% and 20% then his actual gain?

a) 35%

b) 38%

c) 41%

d) 5%

Q.27) Solution (b)

Explanation:

We have Gain 1 = 15% and gain 2 = 20%.

Then to find the overall gain

We need to use the formula for successive gains as Total gain = a + b + ab/100

Hence, total gain = 20 + 15 + 15 × 20/100

⇒ 20 + 15 + 3

⇒ 38

Q.28) On an Rs.10, 000 payment order, a person has a choice between 3 successive discounts of 10%, 10% and 30% and 3 successive discounts of 40%, 5% and 5%. By choosing the better one he can save (in Rupees)

a) 3550
b) 4330
c) 4585
d) 4780

Q.28) Solution (c)

Explanation:

Given there are successive discounts, second discount is to be applied on first discounted amount and third discount on second discounted amount and so on.

Solving first choice of discounts:

Amount after first discount = 90 % of 10000 (10% is the discount) = 0.90 × 10000 = Rs.9000 Amount after second discount = 90% of 9000 (10% discount and 9000 is amount after first discount) = 0.90 × 9000 = Rs.8100

Amount after third discount = 70% of 8100 (30% discount and 8100 is amount after second discount) = 0.70 × 8100 = Rs.5670

Total savings = 10000 - 5670 = Rs.4330

Solving second choice of discounts:

Amount after first discount = 60 % of 10000 (40% is the discount) = 0.60 × 10000 = Rs.6000 Amount after second discount = 95% of 6000 (5% discount and 6000 is amount after first discount) = 0.95 × 6000 = Rs.5700

Amount after third discount = 95% of 5700 (5% discount and 5700 is amount after second discount) = 0.95 × 5700 = Rs.5415

Total savings = 10000 - 5415 = Rs.4585

Maximum amount can be saved by second choice i.e. Rs.4585

Q.29) A fuel dealer mixes two brands of fuel which cost in the ratio 2 : 3. A solution containing 30% brand A and remaining brand B yields profit of 10% when sold at Rs. 297. What is cost of brand B?

a) 354
b) 300
c) 262
d) 220

Q.29) Solution (b)

Explanation:

Ratio of cost of brand A and brand B fuel = 2 : 3

Percentage of brand A in new solution = 30%

Percentage of brand B in new solution = (100 - 30)% = 70%

Concept used: CP = SP × [(100)/(100 + profit%)]

Individual cost × Quantity = Total cost

Calculation:

CP of of solution = Rs. 297 × 100/(100+10)

⇒ Rs. 297 × (100/110) ⇒ Rs. 270

Let the cost of brand A and brand B be 2y and 3y respectively

So, 2y × 30% + 3y × 70% = 270

⇒ 0.6y + 2.1y = 270

⇒ 2.7y = 270

⇒ y = 100

Cost of Brand B = 3 × 100 ⇒ Rs. 300

∴ Cost of brand B is Rs. 300

Read the following passage and answer the questions that follow each passage. Your answer to these questions should be based on passage only.

Passage

Around the world, capital cities are disgorging bureaucrats. In the post-colonial fervor of the 20th century, coastal capitals picked by trade-focused empires were spurned for "regionally neutral" new ones. But decamping wholesale is costly and unpopular; governments these days prefer piecemeal dispersal. The trend reflects how the world has changed. In past eras, when information travelled at a snail's pace, civil servants had to cluster together. But now desk-workers can ping emails and video-chat around the world. Travel for face-to-face meetings may be unavoidable, but transport links, too, have improved.

Proponents of moving civil servants around promise countless benefits. It disperses the risk that a terrorist attack or natural disaster will cripple an entire government. Wonks in the sticks will be inspired by new ideas that walled-off capitals cannot conjure up. Autonomous regulators perform best far from the pressure and lobbying of the big city. Some even hail a cure for ascendant cynicism and populism. The unloved bureaucrats of faraway capitals will become as popular as firefighters once they mix with regular folk.

Beyond these sunny visions, dispersing central-government functions usually has three specific aims: to improve the lives of both civil servants and those living in clogged capitals; to save money; and to redress regional imbalances. The trouble is that these goals are not always realised.

The first aim—improving living conditions has a long pedigree. After the Second World War Britain moved thousands of civil servants to "agreeable English country towns" as London was rebuilt. But swapping the capital for somewhere smaller is not always agreeable. Attrition rates can exceed 80%. The second reason to pack bureaucrats off is to save money. Office space costs far more in capitals. Agencies that are moved elsewhere can often recruit better workers on lower salaries than in capitals, where well-paying multinationals mop up talent.

The third reason to shift is to rebalance regional inequality. Norway treats federal jobs as a resource every region deserves to enjoy, like profits from oil. Where government jobs go, private ones follow. Sometimes the aim is to fulfill the potential of a country's second-tier cities. Unlike poor, remote places, bigger cities can make the most of relocated government agencies, linking them to local universities and businesses and supplying a better-educated workforce. The decision in 1946 to set up America's Centres for Disease Control in Atlanta rather than Washington D.C. has transformed the city into a hub for health-sector research and business.

The dilemma is obvious. Pick small, poor towns, and areas of high unemployment get new jobs, but it is hard to attract the most qualified workers; opt for larger cities with infrastructure and better-qualified residents, and the country's most deprived areas see little benefit. Others contend that decentralisation begets corruption by making government agencies less accountable. A study in America found that state-government corruption is worse when the state capital is isolated—journalists, who tend to live in the bigger cities, become less watchful of those in power.

Q.30) The "dilemma" mentioned in the passage refers to:

a) keeping government agencies in the largest city with good infrastructure or moving them to a remote area with few amenities
b) concentrating on decongesting large cities or focusing on boosting employment in relatively larger cities
c) encouraging private enterprises to relocate to smaller towns or not incentivising them in order to keep government costs in those towns low
d) relocating government agencies to boost growth in remote areas with poor amenities or to relatively larger cities with good amenities

Q.30) Solution (d)

Explanation:

Paragraph 6 explains the dilemma. Small, poor towns = new jobs in areas of high employment, but it is hard to attract the most qualified workers; Larger cities = infrastructure and better-qualified residents, but deprived areas do not benefit.

Option d simply paraphrases this.