Q.1) With reference to Plant and Animal cells, consider the following statements:

1. Animal cells do not have a cell wall or chloroplasts but plant cells do.
2. Plant and animal cells are both eukaryotic cells.
3. Animal and plant cells both are mostly round and irregular in shape.

Which of the above statements are correct?

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

Q.1) Solution (a)

Basic Information:

Even though all living organisms are made of cells that contain similar structures, there are differences between the structures of the cells of plants and animals.

- **Plant and animal cells are both eukaryotic cells,** so they have several features in common, such as the presence of a cell membrane, and cell organelles, like the nucleus, mitochondria and endoplasmic reticulum.
- Structures that are specific to plants are the cell wall and chloroplasts.

Major structural differences between a plant and an animal cell include:

- **Animal cells are mostly round and irregular in shape while plant cells have fixed, rectangular shapes.**
- Plant cells have a cell wall, but animals' cells do not. Cell walls provide support and give shape to plants.
- **Plant cells have chloroplasts, but animal cells do not.** Chloroplasts enable plants to perform photosynthesis to make food.
- Plant cells usually have one or more large vacuole(s), while animal cells have smaller vacuoles, if any are present. Large vacuoles help provide shape and allow the plant to store water and food for future use. The storage function plays a lesser role in animal cells, therefore the vacuoles are smaller.

Q.2) Consider the following statements and select the correct statements from the code given

below:

1. Platelets are found only in the blood of mammals.
2. Plasma is the main component of blood and consists of mainly water.
3. RBCs contain mitochondria when they are mature.
4. WBCs are the defense mechanism of the human body for fighting infections.

Choose the appropriate code:

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

Q.2) Solution (d)

Explanation:

Statement 1: Platelets are tiny blood cells that help your body form clots to stop bleeding. If one of your blood vessels gets damaged, it sends out signals to the platelets. The platelets then rush to the site of damage and form a plug (clot) to fix the damage. The process of spreading across the surface of a damaged blood vessel to stop bleeding is called adhesion. This is because when platelets get to the site of the injury, they grow sticky tentacles that help them stick (adhere) to one another. They also send out chemical signals to attract more platelets. The additional platelets pile onto the clot in a process called aggregation. **Platelets are found only in the blood of mammals.** They usually lack nuclei and are formed from bone marrow.

Statement 2: Plasma is a pale yellow mixture of water, proteins and salts. One of the functions of plasma is to act as a carrier for blood cells, nutrients, enzymes, and hormones. This is the liquid portion of the blood. **Plasma is 90 percent water and makes up more than half of total blood volume.** Other 10 percent is protein molecules, including enzymes, clotting agents, immune system components, plus other body essentials such as vitamins and hormones..

Statement 3: **Red blood cells in mammals are unique amongst vertebrates as they do not have nuclei when mature.** They do have nuclei during early phases of erythropoiesis, but extrude them during development as they mature; this provides more space for haemoglobin.

Statement 4: The WBCs, also called leukocytes, handle more complex functions. **They are the defense mechanism of the human body for fighting infections**. There are different types of WBCs with varied life cycles and distinct functions. White blood cells also produce a special protein called antibody which recognize and fight the presence of foreign elements in the body.

Q.3) Which of the following statements correctly defines innate immunity?

a) Inborn immune mechanisms that do not depend upon previous exposure to an antigen.
b) Immunity one develops in a lifetime.
c) When most of the people became immune to an infectious disease.
d) Immunity that is borrowed from another source and lasts for short time.

Q.3) Solution (a)

Explanation:

Statement 1: **Natural or innate immunity** comprises the inborn immune mechanisms that do not depend upon previous exposure to an antigen. It is present from birth and is designed to protect the host from injury or infection without previous contact with the infectious agent.

Statement 2: **Acquired immunity** is immunity you develop over your lifetime. When pathogens (germs) are introduced into your body from a vaccine or a disease, your body learns to target those germs in the future by making new antibodies. It can come from:

- a vaccine
- exposure to an infection or disease
- another person's antibodies (infection-fighting immune cells)

Statement 3: **'Herd immunity', also known as 'population immunity', is the indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection**. WHO supports achieving 'herd immunity' through vaccination, not by allowing a disease to spread through any segment of the population, as this would result in unnecessary cases and deaths.

Statement 4: **Passive immunity is "borrowed" from another source and it lasts for a short time.** For example, antibodies in a mother's breast milk give a baby temporary immunity to diseases the mother has been exposed to.

Q.4) Consider the following statements with reference to Non communicable diseases and identify the incorrect statement:

a) More people die due to communicable diseases than non-communicable diseases globally.
b) Cardiovascular diseases account for most NCD deaths.
c) Two third of all NCD deaths occur in low- and middle-income countries

d) Diabetes, cancer, heart diseases and chronic lung disease, are collectively responsible for over 70% of all deaths worldwide.

Q.4) Solution (a)

Basic Information:

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behaviours factors.

The main types of NCDs are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and diabetes.

Explanation:

Key facts about NCDs:

- **Non-communicable diseases (NCDs) kill 41 million people each year, equivalent to 71% of all deaths globally.**
- Each year, 15 million people die from a NCD between the ages of 30 and 69 years; over 85% of these "premature" deaths occur in low- and middle-income countries.
- **Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually**, followed by cancers (9.0 million), respiratory diseases (3.9million), and diabetes (1.6 million).
- These 4 groups of diseases account for over 80% of all premature NCD deaths.
- Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from a NCD.
- Detection, screening and treatment of NCDs, as well as palliative care, are key components of the response to NCDs.
- **Non-communicable diseases (NCDs), including heart disease, stroke, cancer, diabetes and chronic lung disease, are collectively responsible for almost 70% of all deaths worldwide.**
- **Almost three quarters of all NCD deaths, and 82% of the 16 million people who died prematurely, or before reaching 70 years of age, occur in low- and middle-income countries.**

Q.5) Consider the following statements with reference to Reverse vaccinology:

1. Reverse vaccinology uses the expressed genomic sequences to find new potential vaccines.
2. The major advantage for reverse vaccinology is finding vaccine targets quickly and efficiently.

Which of the statements given above is/are correct?

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

Q.5) Solution (c)

Basic Information:

The term "reverse vaccinology" was proposed by Rappuoli (2000) and represents a genome-based approach to vaccine development. In comparison with the conventional approach, which requires a laborious process of selection of individual components important for immunity, reverse vaccinology offers the possibility of using genomic information derived from in silico analysis of sequenced organisms. This approach can significantly reduce the time necessary for the identification of candidate vaccines, and enables systematic identification of all potential antigens of pathogens, including those which are difficult or currently impossible to culture.

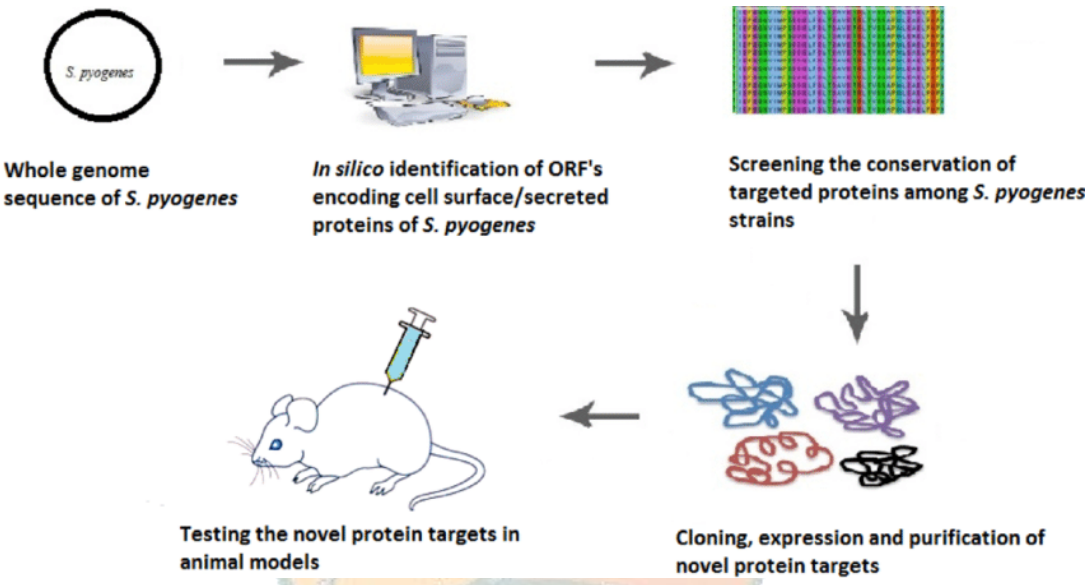
Explanation:

Reverse vaccinology uses the expressed genomic sequences to find new potential vaccines. Normal vaccines are created using the pathogenic organism. The term reverse refers to the use of expressed DNA over the purified proteins from the organism itself.

The major advantage for reverse vaccinology is finding vaccine targets quickly and efficiently. Traditional methods may take decades to unravel pathogens and antigens, diseases and immunity. Earlier, we had to do a viral culture in the laboratory to develop a vaccine, and this was time-consuming. The 'reverse vaccinology' technique has been available for the last 10 to 15 years.

Using 'reverse vaccinology', vaccinations were developed for meningococcal and staphylococcal infections all through the world, she added.

So, both statement is correct here.



Q.6) Consider the following statements about Virus:

1. Virus can only multiply inside the living cells of an organism
2. Virus are considered to borderline between living and non-living.
3. RNA viruses accumulate more genetic changes (mutations) than DNA viruses.

Which of the statements given above are correct?

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

Q.6) Solution (d)

Basic Information

Viruses are tiny infectious agents that invade host cells and cause disease. Although they are harmful, viruses also have interesting technological potential. Viruses are microscopic biological agents that invade living hosts and infect their bodies by reproducing within their cell tissue.

Not only are viruses microscopic, they are smaller than many other microbes, such as bacteria. Most viruses are only 20–400 nanometers in diameter, whereas human egg cells, for example, are about 120 micrometers in diameter, and the E. coli bacteria has a diameter of around 1 micrometer. Viruses are so small that they are best viewed using an electron microscope, which

is how they were first visualized in the 1940s.

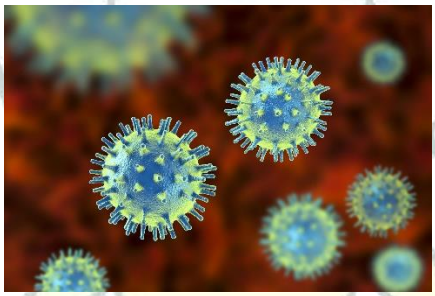
Explanation:

Statement 1: **Virus can only multiply inside the living cells of an organism.** They may use an animal, plant, or bacteria host to survive and reproduce. As such, there is some debate as to whether or not viruses should be considered living organisms. A virus that is outside of a host cell is known as a virion.

Statement 2: **Virus are considered at the borderline of living and non-living because they show characteristics of both living and non-living**. They react like non-living in free atmosphere and upon entering in body they show characteristics of living organism.

Statement 3: Like all life, viruses carry a genetic code in the form of nucleic acids — either DNA or RNA. When cells multiply, the DNA within them replicates as well, to make copies for the new cells. During replication, random errors are introduced into the new DNA, much like spelling errors when we write. Just as we can spell-check, our cells carry enzymes to 'proofread' and correct these mistakes to maintain the fidelity of our genetic material.

While the errors in DNA virus genomes can be corrected by the error-correcting function of cells in which they replicate, there are no enzymes in cells to correct RNA errors. **Therefore, RNA viruses accumulate more genetic changes (mutations) than DNA viruses.**



Q.7) Consider the following statements with reference to Middle East Respiratory syndrome:

1. It is a viral respiratory disease caused by a novel coronavirus.
2. Approximately 85% of reported patients with MERS-CoV infection have died
3. The virus does not seem to pass easily from person to person unless there is close contact.

Which of the statements given above are correct?

a) 1 and 2 only

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

Q.7) Solution (c)

Explanation:

Middle East respiratory syndrome (MERS) **is a viral respiratory disease caused by a novel coronavirus** (Middle East respiratory syndrome coronavirus, or MERS-CoV) that was first identified in Saudi Arabia in 2012.

- Coronaviruses are a large family of viruses that can cause diseases ranging from the common cold to Severe Acute Respiratory Syndrome (SARS).
- Typical MERS symptoms include fever, cough and shortness of breath. Pneumonia is common, but not always present. Gastrointestinal symptoms, including diarrhoea, have also been reported. Some laboratory-confirmed cases of MERS-CoV infection are reported as asymptomatic, meaning that they do not have any clinical symptoms, yet they are positive for MERS-CoV infection following a laboratory test. Most of these asymptomatic cases have been detected following aggressive contact tracing of a laboratory-confirmed case.
- **Approximately 35% of reported patients with MERS-CoV infection have died. (So, statement 2 is incorrect here.)**
- Although most of human cases of MERS-CoV infections have been attributed to human-to-human infections in health care settings, current scientific evidence suggests that dromedary camels are a major reservoir host for MERS-CoV and an animal source of MERS infection in humans. However, the exact role of dromedaries in transmission of the virus and the exact route(s) of transmission are unknown.
- **The virus does not seem to pass easily from person to person unless there is close contact, such as occurs when providing unprotected care to a patient.** Health care associated outbreaks have occurred in several countries, with the largest outbreaks seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea.

Q.8) Consider the following pairs about Hormone and their function:

Hormone **:** ***function***

1. Serotonin : stabilises mood, feeling and wellbeing.
2. Insulin : helps in regulating blood sugar level in body.
3. Adrenaline : elevates blood pressure and boosts energy supplies.

Which of the above given pairs is/are correctly matched?

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

Q.8) Solution (d)

Basic Information

Hormone, organic substance secreted by plants and animals that functions in the regulation of physiological activities and in maintaining homeostasis. Hormones carry out their functions by evoking responses from specific organs or tissues that are adapted to react to minute quantities of them. The classical view of hormones is that they are transmitted to their targets in the bloodstream after discharge from the glands that secrete them. This mode of discharge (directly into the bloodstream) is called endocrine secretion.

Explanation:

Statement 1**: Serotonin is the key hormone that stabilizes our mood, feelings of well-being, and happiness.** This hormone impacts your entire body. It enables brain cells and other nervous system cells to communicate with each other. Serotonin also helps with sleeping, eating, and digestion. Due to imbalance of this hormone, brain does not produce enough hormone to regulate mood which results in depression, weight gain, migraine etc.

Statement 2: Insulin is released by Pancreas, it is considered to be the main anabolic hormone of the body. It regulates the metabolism of carbohydrates, fats and protein by promoting the absorption of glucose from the blood into liver, fat and skeletal muscle cells. Basically, **insulin helps regulate blood sugar levels.**

Statement 3**:** Adrenaline, also known as epinephrine, is a hormone and medication which is involved in regulating visceral functions. Adrenaline is normally produced both by the adrenal glands and by a small number of neurons in the medulla oblongata**. Adrenaline increases your heart rate, elevates your blood pressure and boosts energy supplies.**

Q.9) Consider the following statements with reference to Adjuvant (ingredient used in some vaccines):

1. It is pharmacological or immunological agent that reduces the immune response of a vaccine.
2. The precise mechanisms of many adjuvants remain largely undefined.

Which of the statements given above is/are correct?

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

Q.9) Solution (b)

Basic information:

An adjuvant is an ingredient used in some vaccines that helps create a stronger immune response in people receiving the vaccine. In other words, adjuvants help vaccines work better. Some vaccines that are made from weakened or killed germs contain naturally occurring adjuvants and help the body produce a strong protective immune response. However, most vaccines developed today include just small components of germs, such as their proteins, rather than the entire virus or bacteria. Adjuvants help the body to produce an immune response strong enough to protect the person from the disease he or she is being vaccinated against. Adjuvanted vaccines can cause more local reactions (such as redness, swelling, and pain at the injection site) and more systemic reactions (such as fever, chills and body aches) than non-adjuvanted vaccines.

Adjuvants affect the immune response in various ways:

- To increase the immunogenicity of weak antigens
- To enhance speed and duration of immune response
- To stimulate and modulate humoral responses, including antibody isotype
- To stimulate cell-mediated immunity
- To improve induction of mucosal immunity
- Enhance immune responses in immunologically immature patients, particularly infants
- To decrease the dose of antigen required; reducing costs and eliminating inconvenient requirements for booster shots.

Statement 2: **The precise mechanisms of many adjuvants remain largely undefined due to the**

complexity of the immune response, but generalisations can be made to allow the design of more rational adjuvants aimed at particular arms of the immune system.

Q.10) With reference to plant tissues, consider the following statements:

1. Pholem is a plant tissue specially designed for transporting water and nutrients.
2. Xylem tissues in plants carries foods made in the leaves to all other parts of the plant.

Which of the above statements is/are correct?

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

Q.10) Solution (d)

Explanation:

The complex tissues in a plant deal with moving nutrients and water to the leaves, while removing the products of photosynthesis from the leaves. Photosynthesis produces the sugar glucose. Modified and bound to other 6-carbon sugars, the substance becomes sucrose or a variety of other disaccharides. In this form it can be moved with small amounts of water and can be transported efficiently throughout the plant. The complex tissues of the plant aid in this overall effort to supply the roots with food as they supply the leaves with water and nutrients.

The two main forms of plant tissue used in this process are xylem and phloem. Xylem is a plant tissue specially designed for transporting water and nutrients. This plant tissue can come in several forms, depending on the species. Sometimes, the xylem plant tissue is made up of a long chain of small tubes, called vessels, which interconnect and allow water to travel through unimpeded.

Like the xylem, the phloem consist of a variety of different cell types which work together to produce a continual interconnected passageway connecting cells of the plant**. The phloem, rather than bringing water up from the roots, needs to carry sugar down to the roots and stems.** With a little water from the xylem, it can complete this process. It is further aided by companion cells, which surround the actual sieve-tube. The whole structure is then supported by phloem fibers, which give the tube shape and structure.

Q.11) Which of the following diseases are infectious?

1. Dengue
2. Chikungunya
3. Rotavirus
4. Hepatitis A

Select the correct code

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

Q.11) Solution (d)

Explanation:

Infectious diseases are diseases caused by living organisms like viruses and bacteria. They can be passed from person to person through body secretions, insects or other means. Diseases which are spread from animals to humans, such as avian influenza, are known as zoonotic diseases.

Examples of infectious diseases include SARS, influenza, the common cold, tuberculosis (TB), Dengue, Chikugunya, Rotavirus, Hepatitis A and B.

Q.12) Consider the following statements describing about particular disease

1. It is contagious and highly fatal animal diseases.
2. Mortality is close to 100 percent in it.
3. It is not a threat to human beings since it only spreads from animals to other animals.

Identify the appropriate disease:

a) Yellow fever
b) African swine fever
c) Brucellosis
d) Nipah Virus

Q.12) Solution (b)

Explanation:

Statement 1: **Yellow fever is a serious, potentially deadly flu-like disease spread by Aedes aegypti mosquitoes, which also transmit dengue and Zika viruses.** It's characterized by a high fever and jaundice. Jaundice is yellowing of the skin and eyes, which is why this disease is called yellow fever. This option is eliminated since Yellow fever is found among Humans.

Statement 2: the diseases being referred here is African swine fever, it was first detected in Africa in 1920s. It has been recently seen in Asian Countries like China, Philippines and even in India**. African Swine Fever (ASF) does not affect humans but can be catastrophic for pigs**. The current outbreak of ASF in India is the first time that the disease has been reported in the country. **ASF is a severe viral disease that affects wild and domestic pigs typically resulting in an acute haemorrhagic fever. The disease has a case fatality rate (CFR) of almost 100 per cent.** Its routes of transmission include direct contact with an infected or wild pig (alive or dead), indirect contact through ingestion of contaminated material such as food waste, feed or garbage, or through biological vectors such as ticks. The disease is characterised by sudden deaths in pigs.

Statement 3: **Brucellosis is a bacterial diseases which can spread from animals to humans mostly by unpasteurized dairy products**.

Statement 4: **Nipah Virus is a zoonotic diseases that affect both human and animals**. It was first identified in 1999 in Malaysia and Singapore. Currently no vaccine is available for its treatment.

Q.13) Which of the statements given below is/are correct differences between angiosperm and gymnosperm (two major groups of vascular seed plants)?

1. Gymnosperm are seed producing while angiosperm do not produce seeds.
2. Angiosperms are generally bisexual and rarely unisexual while gymnosperm are generally unisexual and rarely bisexual.

Select the correct code:

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

Q.13) Solution (b)

Basic information:

Angiosperms and gymnosperms are the two major groups of vascular seed plants. Angiosperms, which are flowering plants, are the largest and most diverse group within the kingdom Plantae. With around 300,000 species, they represent approximately 80 percent of all the known green plants now living. Gymnosperms are a smaller, more ancient group, and it consists of plants that produce "naked seeds" (seeds that are not protected by a fruit). There are more than 1,000 species of gymnosperms still found on Earth.

Explanation:

Statement 1: **Both Angiosperm and Gymnosperm are seed producing,** they key difference between them is how their seeds are developed. Angiosperm seeds are enclosed within an ovary (usually a fruit), while gymnosperms have no flowers or fruits, and have unenclosed or "naked" seeds on the surface of scales or leaves. Gymnosperm seeds are often configured as cones.

Statement 2: **Angiosperm are generally bisexual and rarely unisexual, while gymnosperm is generally unisexual and rarely bisexual.** Angiosperms are also the source of the world's hardwoods. Flowering plants are economically important as they serve as a source of pharmaceuticals, timber, ornamentals, fiber products, and other commercial uses, whereas gymnosperms are known for providing softwoods such as pine, fir and use to make paper, lumber, and plywood.

Q.14) Which of the following are characteristics of enzymes?

1. Enzymes are highly specific in their action
2. Enzymes activity in body is independent of body temperature and pH.
3. Enzymes are mostly protein that act as biological catalyst in body.

Select the correct code

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

Q.14) Solution (b)

Basic information

Enzymes are proteins and the properties and characteristics they exhibit reflect properties of protein. They are organic catalysts that speed up biological reactions especially in digestion and metabolism of food substances.

Statement analysis:

Statement 1: **Enzymes are much more specific in the reactions they catalyze** than inorganic catalysts. However, the degree of catalytic specificity varies from one enzyme to the other. Most intracellular enzymes work on a particular substrate while some digestive enzymes work on a comparatively wide range of substrates that are related.

Statement 2: **Since enzymes are proteins, they are averse to excessive heat. This is because enzymes get denatured when exposed to high temperatures** and that explains why very few cells can tolerate temperatures that exceed 45 degrees centigrade. Organisms that live in environment where the prevailing temperature exceeds 45 degrees centigrade either have heat-resistant enzymes or a capable of regulating their body temperature. A perfect example of an organism with heat-resistant enzymes is the blue-green algae that live in hot springs at temperatures of 100 degrees centigrade.

Enzymes operate at specific pH ranges and any alterations can adversely affect their action and efficiency. Most intracellular enzymes function best at neutral pH. Interestingly, certain digestive enzymes prefer a distinctly alkaline or acidic environment.

So, **statement 2 is incorrect here.**

Statement 3: **Enzymes are mostly proteins that acts as biological catalysts in body. Enzymes accelerate chemical reactions.** Almost all metabolic processes in the cell need enzyme catalysis in order to occur at rates fast enough to sustain life. Some enzymes are used commercially; for example, in the synthesis of antibiotics. However, enzymes in general are limited in the number of reactions they have evolved to catalyse, and by their lack of stability in organic solvents and at high temperatures.

Q.15) Consider the following statements and identify the incorrect statement:

a) India has the second largest number of tobacco users in the world
b) Kerala is known as the 'diabetes capital of India'.
c) Kala-azar is endemic to Indian subcontinent.
d) None

Q.15) Solution (d)

Explanation:

Incorrect statement is being asked here.

Statement 1: **India has the second largest tobacco-using population in the world after China.** According to WHO, tobacco kills more than 1 million people each year in India, accounting for 9.5% of all deaths.

Statement 2: **Kerala is known as diabetes capital of India as prevalence of diabetes is high** i.e. 20% which is double the national average of 8%. As compared, the prevalence in Thiruvananthapuram was 17%, in Hyderabad & New Delhi 15%, in Nagpur 4% and in Dibrugarh 3%.

Statement 3: Kala-azar is a disease caused by infection with leishmania parasite. **The disease is endemic in Indian subcontinent in 119 districts in four countries namely Bangladesh, Bhutan, India and Nepal.** India alone accounts for about 50% of the global burden of KA. Though KA is one of the most dangerous neglected tropical diseases (NTDs), it is amenable to elimination as a public health problem.

Q.16) Consider the below statements about protozoa:

1. They can be either free-living or parasitic
2. They are not found in fresh water.
3. Some examples of protozoa are Amoeba, Paramecium, Euglena and Trypanosoma.

Which of the above statements is/are correct?

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

Q.16) Solution (b)

Explanation:

Statement 1 and 3**: Protozoa is an informal term for a group of single-celled eukaryotes, either free-living or parasitic,** which feed on organic matter such as other microorganisms or organic tissues and debris. Historically, protozoans were regarded as "one-celled animals", because they often possess animal-like behaviours, such as motility and predation, and lack a cell wall, as found in plants and many algae. Although the traditional practice of grouping protozoa with

animals is no longer considered valid, the term continues to be used in a loose way to describe single-celled protists that feed by heterotrophy. **Some examples of protozoa are Amoeba, Paramecium, Euglena and Trypanosoma.**

Statement 2: **Free-living protozoans are common and often abundant in fresh, brackish and salt water, as well as in other moist environments,** such as soils and mosses. Some species thrive in extreme environments such as hot springs and hypersaline lakes and lagoons. All protozoa require a moist habitat; however, some can survive for long periods of time in dry environments, by forming resting cysts which enable the protozoa to remain dormant until conditions improve.

So, statement 2 is incorrect here.

Q.17) The term 'Superbug' is associated with

a) Computer Trojan
b) ATP
c) Virus
d) Antimicrobial resistance

Q.17) Solution (d)

Explanation:

A superbug is usually defined as a microorganism that's resistant to commonly used antibiotics – but not all superbugs are created equal. The number of different antibiotics to which it can be resistant determines the degree of the superbug.

Antimicrobial Resistance (AMR) occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result, the medicines become ineffective and infections persist in the body, increasing the risk of spread to others.

Q.18) Which of the following is/are not correct about haemoglobin:

1. It transfers oxygen from the lungs to the needy tissues of the body.
2. It is only found in Red Blood Cells.

Choose the correct code:

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

Q.18) Solution (b)

Explanation:

Haemoglobin is the iron-containing oxygen-transport metalloprotein in the red blood cells (erythrocytes) of almost all vertebrates.

- Hemoglobin in blood carries oxygen from the lungs or gills to the rest of the body (i.e. the tissues). There it releases the oxygen to permit aerobic respiration to provide energy to power the functions of the organism in the process called metabolism.
- **Hemoglobin is essential for transferring oxygen in your blood from the lungs to the tissues.**
- In mammals, the protein makes up about 96% of the red blood cells' dry content (by weight), and around 35% of the total content (including water).
- Hemoglobin is involved in the transport of other gases: It carries some of the body's respiratory carbon dioxide as carbaminohemoglobin, in which CO_2 is bound to the globin protein. (Largest amount of CO_2 produced in the cell are carried to the lungs as bicarbonate ions dissolved in the plasma).
- **Hemoglobin is also found outside red blood cells.** In these tissues, hemoglobin has a nonoxygen-carrying function as an antioxidant and a regulator of iron metabolism.

Q.19) Which among the following disease is latest to be eliminated from India according to WHO?

a) Trachoma
b) Polio
c) Small Pox
d) Yaws

Q.19) Solution (d)

Explanation:

Trachoma is a disease caused by poor environmental and personal hygiene and inadequate access to water and sanitation. It affects the conjunctiva which lines the inside of the eyelids. Repeated infections can cause scarring, leading to in-turning of the eyelashes and eyelids. This further causes damage to the cornea and blindness. The disease is found to be affecting the population in certain pockets of north Indian states like Gujarat, Rajasthan, Punjab, Haryana, Uttar Pradesh and the Nicobar Islands. **Indian Ministry of Health and Female welfare declared that India is free from it in December 2017, but it is yet to be Validated by WHO.**

Polio is a highly infectious — but preventable — disease that is 99.9% eradicated**. On March 27, 2014, India and the entire WHO South-East Asia Region were officially declared as being polio-free.**

The 1974 smallpox epidemic of India was one of the worst smallpox epidemics of the 20th century and occurred three years before smallpox was eradicated. Small pox has been eliminated across the world, after one last outbreak in Somalia in the late 1980s**. India eradicated smallpox in April 1977.**

Yaws is a chronic infection that affects mainly the skin, bone and cartilage. This disease occurs mainly in poor communities in warm, humid, tropical areas. It mainly affects children below age of 15. **India was declared free from this diseases in 2016.**

Q.20) With reference to Corona Virus, consider the following statements?

1. It is RNA based Virus.
2. It was first detected in Wuhan
3. SARS-CoV-2 has spike proteins which contain a receptor-binding domain (RBD).

Which of the statements given above is/are *incorrect*?

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

Q.20) Solution (d)

Explanation:

Coronaviruses are a specific family of viruses, with some of them causing less-severe damage, such as the common cold, and others causing respiratory and intestinal diseases. A coronavirus has many "regularly arranged" protrusions on its surface, because of which the entire virus

particle looks like an emperor's crown, hence the name "coronavirus".

Apart from human beings, coronaviruses can affect mammals including pigs, cattle, cats, dogs, martens, camels, hedgehogs and some birds. So far, there are four known disease-causing coronaviruses, among which the best known are the SARS corona virus and the Middle East Respiratory Syndrome (MERS) coronavirus, both of which can cause severe respiratory diseases. **The Covid -19 was 1st detected in Wuhan (China).**

A receptor-binding domain (RBD) is a key part of a virus located on its 'spike' domain that allows it to dock to body receptors to gain entry into cells and lead to infection. These are also the primary targets in the prevention and treatment of viral infections, including SARS-CoV-2 – the virus that causes COVID-19.

Coronaviruses are spherical shaped and consist of a core of genetic material (RNA) surrounded by an envelope with mushroom shaped protein spikes. These spikes binds and fuses to human cells allowing the virus to gain entry and replicate itself inside the body.

Coronaviruses are spherical shaped and consist of a core of genetic material (RNA) surrounded by an envelope with mushroom shaped protein spikes.

Q.21) Consider the following statements regarding Indian Rhino Vision 2020.

1. It is a joint programme of Assam Forest Department, Worldwide Fund for Nature (WWF) India, and the International Rhino Foundation.
2. Its goal is to achieve a rhino population to 3,000 in seven protected areas in Assam.

Which of the above statements IS/are correct?

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

Q.21) Solution (c)

Basic Information:

Indian Rhino Vision 2020

Two adult one-horned rhinos were translocated from Pobitora Wildlife Sanctuary to Manas National Park under the aegis of the IRV 2020.

- It is a joint programme of Assam Forest Department, Worldwide Fund for Nature (WWF) India, and the International Rhino Foundation.
- It was designed by Rhino Task Force 2005.

Goal:

- To achieve a rhino population to 3,000 in seven protected areas in Assam.
- To reduce the risk to the rhino population from poachers by spreading the population in multiple parks.

Q.22) Which of the following species of dolphins is/are endangered?

1. Ganges dolphin
2. Irrawaddy dolphins
3. Indus river dolphins

Select the correct answer using the code below:

a) 1 and 2 only
b) 3 only
c) 1 and 3 only
d) All of the above

Q.22) Solution (d)

Statement Analysis:

Statement 1: The Ganges river dolphin has been recognized by the government of India as its National Aquatic Animal.

- It inhabits the Ganges-Brahmaputra- Meghna and Karnaphuli-Sangu river systems of Nepal, India, and Bangladesh .
- It is among the four freshwater dolphins found in the world – the other three are found in the Yangtze River (China), the 'bhulan' of the Indus (Pakistan) and the 'boto' of the Amazon River (Latin America).
- It is listed by the IUCN **as endangered** on their Red List of Threatened Species

Statement 2: Irrawaddy dolphins (Orcaella brevirostris) are found in coastal areas in South and Southeast Asia, and in three rivers: the Irrawaddy (Myanmar), the Mahakam (Indonesian

Borneo) and the Mekong (China). **They are 'Endangered'** as per the IUCN Red List.

Statement 3: Indus river dolphin:-

- Indus river dolphins are believed to have originated in the ancient Tethys Sea.
- Today, they can only be found in the lower parts of the Indus River in Pakistan and in River Beas, a tributary of the Indus River in Punjab, India.
- It is listed by the IUCN **as endangered** on their Red List of Threatened Species

Q.23) Consider the following statements regarding the National Tiger Conservation Authority:

1. It is a statutory body under the Ministry of Environment, Forests and Climate Change.
2. It was established in 1975 following a recommendation of tiger task force constituted by then PM.
1. It is responsible for implementation of project tiger to protect endangered tigers.

Which of the statements give above is/are correct?

a) 1 and 2 only
b) 2 and 3 only
c) 1 and 3 only
d) All of the above

Q.23) Solution (c)

Basic Information:

National Tiger Conservation Authority:

- It was **established in December 2005** following a recommendation of the Tiger Task Force which was constituted by the Prime Minister of India for reorganised management of Project Tiger and the many Tiger Reserves in India.
- The Wildlife Protection Act of 1972 was amended in 2006 to provide for its constitution.
- It is responsible for implementation of the Project Tiger to protect endangered tigers.
- It is a statutory body under the Ministry of Environment, Forests and Climate Change.
- Composition:
    - The Inspector General of Forest will be ex-officio Member Secretary

- 8 experts having qualifications and experience in wildlife conservation and welfare of people including tribals
- 3 Members of Parliament (2 from Lok sabha and 1 from Rajya Sabha)
- Functions:
  - Lay down normative standards, guidelines for tiger conservation in the Tiger Reserves, National Parks and Sanctuaries.
  - Provide information on protection measures.
  - Facilitate and support tiger reserve management in the States through eco-development and people's participation

Q.24) Recently 'Umngot river' was in news , it flows through which of the following states of India?

a) Meghalaya
b) Maharashtra
c) Karnataka
d) Madhya Pradesh

Q.24) Solution (a)

Basics –

Umngot River

- It is considered India's clearest river.
- Umngot **flows through Dawki, a town in West Jaintia Hills district, Meghalaya.**
- The river is the natural boundary between Ri Pnar (of Jaintia Hills) and Hima Khyrim (of Khasi Hills).
- Dawki Bridge is a suspension bridge over the Umngot River.

Q.25) Consider the following statements regarding Asia Pacific Trade Agreement.

1. It was formerly known as the Bangkok Agreement and was signed in 1975
2. It is a preferential trade agreement between Countries of Asia pacific.
3. It is also the ONLY operational trade agreement which links India and China.

Which of the statements given above is/are correct?

a) 1 and 2 only
b) 3 only
c) 2 and 3 only
d) All of the above

Q.25) Solution (c)

Basic Information:

Asia Pacific Trade Agreement:

The Asia Pacific Trade Agreement or APTA (formerly the Bangkok Agreement) signed in 1975, is an initiative under the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP) for trade expansion through exchange of tariff concessions among developing country members of the Asia Pacific Region.

- **APTA is also the ONLY operational trade agreement which links India and China,**
- it is also ***oldest Preferential trade agreement between asia pacific countries***
- The six member countries are Bangladesh, China, India, Laos, Korea and Sri Lanka.

Q.26) Consider the following pairs:

	GI Tags	**:**	**States**
1.	Kohbar Art	:	Jharkhand
2.	Chokuwa rice	:	Bihar
3.	Telia Rumal	:	Andhra Pradesh

Which of the pairs given above is/are correctly matched?

a) 1 only
b) 2 and 3 only
c) 3 only
d) All of the above

Q.26) Solution (a)

Explanation:

• **Darjeeling Green, White Tea -**	**West Bengal**
• **Gamosa, Chokuwa rice -**	**Assam**
• **Sohrai and Kohbar Art -**	**Jharkhand**
• **Khola chilli -**	**Goa**
• **Chak-Hao, Black rice -**	**Manipur**
• **Kovilpatti Kadalai Mittai -**	**Tamil Nadu**
• **Thanjavur Netti and Arumbavur Wood carving -**	**Tamil Nadu**
• **Sohrai Khovar Painting -**	**Jharkhand**
• **Telia Rumal -**	**Telangana**
• **Shahi Lichi & Zardalu Mango –**	**Bihar**

Q.27) Consider the following statements about World Cities Culture forum:

1. World Cities Culture Forum is a network of local governments and cultural sector leaders from 40 world cities.
2. WCCF enables the policy makers of member cities to share research and intelligence, while exploring the vital role of culture in prosperity.

Which of the above statements is/are correct?

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

Q.27) Solution (c)

Explanation:

World Cities Culture Forum

- The World Cities Culture Forum is a network of local governments and cultural sector leaders from 40 world cities.
- The World Cities Culture Forum was established in London in 2012 with eight cities (London, New York City, Tokyo, Shanghai, Paris, Istanbul, Sydney and Johannesburg) convened by the Mayor of London.
- The WCCF enables the policy makers of member cities to share research and intelligence, while exploring the vital role of culture in prosperity. Forum members collaborate via a program of events including themed symposia, regional summits and workshops.
- The World Cities Culture report is published by the forum every three years, with data and details on innovative projects from cities across the world.

Q.28) Which of the following is listed under rare diseases list of India?

a) Sickle cell anemia
b) Typhoid
c) Hepatitis B
d) Blood cancer

Q.28) Solution (a)

Explanation –

Rare disease' is defined as a health condition of low prevalence that affects a small number of people when compared with other prevalent diseases in the general population.

While there is no universally accepted definition of rare diseases, countries typically arrive at their own descriptions, taking into consideration disease prevalence, its severity and the existence of alternative therapeutic options.

- India does not have a definition of rare diseases because there is a lack of epidemiological data on their incidence and prevalence. According to the policy, rare diseases include genetic diseases, rare cancers, infectious tropical diseases, and degenerative diseases.

- **In India, Haemophilia, Thalassemia, Sickle cell anaemia and Primary Immuno Deficiency in children, auto-immune diseases, Lysosomal storage disorders such as Pompe disease and Gaucher's disease are in the rare diseases list.**

Q.29) The 'SATAT' initiative is related to which of the following?

a) Promotion of compressed bio gas a green transport fuel
b) Conservation of forest resources in tribal belts
c) Conservation of petroleum and diesel
d) Promotion of start-ups in renewable energy

Q.29) Solution (a)

Basic Information:

Sustainable Alternative Towards Affordable Transportation (SATAT) initiative

- It aims to promote Compressed Bio-Gas as an alternative, green transport fuel thus providing a Sustainable Alternative Towards Affordable Transportation as a developmental effort that would benefit both vehicle-users as well as farmers and entrepreneurs.
- It has the potential to boost availability of more affordable transport fuels, better use of agricultural residue, cattle dung and municipal solid waste, as well as to provide an additional revenue source to farmers.
- Government of India, under the SATAT initiatives envisages setting up of 5000 CBG plants by 2023-24 with production target of 15 MMT, facilitating the creation of new employment opportunities and enhancing farmers' income towards further invigorating the rural economy.

Q.30) With reference to "Thwaite Glaciers" consider the following statements:

1. It is located in western coast of Greenland.
2. Thwaites's melting contributes 4% to global sea level rise each year.

Which of the above statements is/are correct?

a) 1 only

b) 2 only
c) Both 1 and 2
d) Neither 1 and 2

Q.30) Solution (b)

Basic Information:

In news: Researchers at Sweden's University of Gothenburg are now saying that fears related to the melting of **Antarctica's Thwaites Glacier** are worse than previously thought, owing to the supply of warm water flowing underneath at a rate underestimated in the past.

- The Thwaites Glacier is 120 km wide at its broadest, fast-moving, and melting fast over the years.
- Because of its size (1.9 lakh square km), it contains enough water to raise the world sea level by more than half a metre.
- Studies have found the amount of ice flowing out of it has nearly doubled over the past 30 years.
- **Today, Thwaites's melting already contributes 4% to global sea level rise each year.**
- It is estimated that it would collapse into the sea in 200-900 years.
- Thwaites is important for Antarctica as it slows the ice behind it from freely flowing into the ocean.
- Because of the risk it faces — and poses — Thwaites is often called the Doomsday Glacier.

Hence only statement 2 is correct

Q.31) A shopkeeper sells steel plates at the rate of Rs 45 each and earns a commission of 4%. He also sells copper utensils at the rate of Rs 80 each and earns a commission of 20%. How much amount of commission will he earn in two weeks, if he sells 10 steel plates and 6 copper utensils a day?

a) Rs 1,890
b) Rs 1,950
c) Rs 1,596
d) Rs 2,050

Q.31) Solution (c)

Commission on 1 steel plate = 45*4/100

Commission on 1 copper utensil = 80*20/100

= 10*45*4/100 + 6*80*20/100 = 18 + 96 = 114

Therefore, the commission earned in 2 weeks = Rs 114*14 = Rs 1,596

Q.32) From a container of milk, 5 litres of milk is replaced with 5 litres of water. This process is repeated. Thus in two attempts, the ratio of milk and water became 81:19. The initial amount of milk in the container was

a) 50 litres
b) 45 litres
c) 40 litres
d) 25 litres

Q.32) Solution (a)

Remaining milk = Initial concentration (1 - Quantity taken out/Total quantity)

Concentration of milk in the final mixture = 81/(81+19) = 81/100

Let initially, milk in the container = x litres

81 = 100(1-5/x)2

81/100 = (1-5/x)2

(1-5/x)2 = (9/10)2

1-5/x = 9/10

On solving, x = 50 litres

Therefore, the initial quantity of milk in the container was 50 litres.

Read the following passage and the answer the items that follow. Your answers to these items should be based on the passages only.

The whole biosphere, like the individual organisms that live inside it, exists in a chemically

dynamic state. In this homeostatic system, a great number of organic compounds are synthesized, transformed, and decomposed continuously; together, these processes constitute the major parts of the carbon cycle. For the smooth operation of this cycle, degradation is just as important as synthesis: the green plants produce great quantities of polymers, such as cellulose, and innumerable other compounds like alkaloids, terpenes, and flavonoids, that green plants cannot use as sources of energy during respiration. The release of the carbon in these compounds for recycling depends almost entirely on the action of both aerobic and anaerobic bacteria and certain types of fungi. Some bacteria and fungi possess the unique and extremely important biochemical asset of being able to catalyze the oxidation of numerous inert products, thereby initiating reaction sequences that produce carbon dioxide and so return much carbon to a form that actively enters into life cycles once again.

Q.33) The passage contains information that would answer which of the following questions about the carbon cycle?

1. What are some of the compounds that are broken down in the carbon cycle?
2. Why are some compounds that are involved in the carbon cycle less reactive than others?
3. What role do bacteria and fungi play in the carbon cycles?

Choose the correct code

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

Q.33) Solution (d)

In the passage it is information about the compounds that are broken down in the carbon cycle and the role bacteria and fungi play in the carbon cycle are clearly mentioned.

Q.34) Which of the following is the primary reason that degradation is as important as synthesis to the smooth operation of the carbon cycle as implied by the author?

a) Most of the polymers and organic compounds found in the plant kingdom are chemically unstable.
b) The synthesis of some organic material deprives life processes of an energy source.
c) Decomposition permits the recycling of carbon that would otherwise be fixed in certain substances.

d) Many organisms cannot use plants as a source of food, but can feed on bacteria and Fungi.

Q.34) Solution (c)

From the passage it can be inferred that that degradation is as important as synthesis to the smooth operation of the carbon cycle as decomposition permits the recycling of carbon that would otherwise be fixed in certain substances.

Q.35) The author's contention about the importance of bacteria and fungi in the production of energy for life processes would be most clearly strengthened if which of the following were found to be true?

a) Both aerobes and anaerobes provide sources of energy through the decomposition of organic material.
b) Most compounds containing carbon are unavailable as energy sources except to some bacteria and fungi.
c) Bacteria and fungi break down inert material in ways that do not involve oxidation.
d) Many compounds remain inert, even in the presence of bacteria and fungi.

Q.35) Solution (b)

Some bacteria and fungi possess the unique and extremely important biochemical asset of being able to catalyze the oxidation of numerous inert products, thereby initiating reaction sequences that produce carbon dioxide and so return much carbon to a form that actively enters life cycles once again.