Q. 1) Consider the following statements

1. A genome contains all the information needed for an individual to develop and function.
2. Humans have 22 pairs of autosomes and 1 pair of sex chromosomes
3. Gene is the basic physical and functional unit of heredity.

Choose the correct code

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

Q.1) Solution: (d)

Explanation:

- The genome is the entire set of DNA instructions found in a cell. In humans, the genome consists of 23 pairs of chromosomes located in the cell's nucleus, as well as a small chromosome in the cell's mitochondria. A genome contains all the information needed for an individual to develop and function. **Hence statement 1 is correct.**
- Chromosomes are long molecules of DNA found in the nucleus. Chromosomes are structures that look like thread, which live in the nucleus (center) of cells. One molecule of DNA and one protein make up one chromosome. Chromosomes are different sizes, and proteins called histones allow them to pack up small enough to fit in a nucleus.
- Humans have 23 pairs of chromosomes (46 total). Chromosomes divide into 22 numbered pairs (autosomes) and one pair of sex chromosomes (X and Y). You receive one chromosome from each parent to make a pair. **Hence statement 2 is correct.**
- Gene is the basic physical and functional unit of heredity. Genes are hereditary markers from which we derive various characteristics like skin color, height, etc. More technically, each DNA molecule consists of sequences of Genes. Each gene is a particular set of instructions for specific functions. **Hence statement 3 is correct.**

Q. 2) Consider the following statements

1. Eukaryotes have a unicellular cell structure, while prokaryotes have a multicellular cell structure
2. Prokaryotes have circular DNA, while eukaryotes have linear DNA
3. Prokaryotes do not have a nucleus, while eukaryotes have a nucleus
4. Eukaryotes have cell organelles, while in prokaryotes these are absent

Choose the correct code:

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

Q.2) Solution: (b)

Explanation:

Characteristics	**Prokaryotes**	**Eukaryotes**
Cell Structure	Unicellular	Multicellular (most)
Cell Organelles	Absent	Present
DNA	Linear	Circular
Nucleus	Absent	Present
Cell Size	Small	Large

Hence option b is correct.

Q. 3) Consider the following statements

1. Gene Therapy involves altering genes inside one's body to treat diseases.
2. Gene Doping refers to altering medical reports of athletes without any genetic changes
3. Jumping genes are sequences of DNA that move from one location in the genome to another.

Choose the correct code:

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

Q.3) Solution: (a)

Explanation:

- Gene Therapy involves altering genes inside one's body to treat diseases.
- It can work by several mechanisms:
  - ✓ Replacing a disease-causing gene with a healthy copy of the gene
  - ✓ Inactivating a disease-causing gene that is not functioning properly
  - ✓ Introducing a new or modified gene into the body to help treat a disease
- There are two types of gene therapy:
  - ✓ **Somatic Gene Therapy:** Effects will not be transferred to next generation
  - ✓ **Germline Gene Therapy:** Effects transferred to next generation

Hence statement 1 is correct.

- Gene or cell doping is defined by the World Anti-Doping Agency (WADA) as "the non-therapeutic use of genes, genetic elements and/or cells that have the capacity to enhance athletic performance". **Hence statement 2 is incorrect.**
- Transposable elements (TEs), also known as "jumping genes" or transposons, are sequences of DNA that move (or jump) from one location in the genome to another. Maize geneticist Barbara McClintock discovered TEs in the 1940s, and for decades thereafter, most scientists dismissed transposons as useless or "junk" DNA. McClintock, however, was among the first researchers to suggest that these mysterious mobile elements of the genome might play some kind of regulatory role, determining which genes are turned on and when this activation takes place **Hence statement 3 is correct .**

Q. 4) Which of the following are the uses of DNA fingerprinting?

1. Anthropological Studies
2. Pedigree Analysis
3. Forensic Analysis
4. DNA Barcoding

5. Personal Identification

Choose the correct code:

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

Q.4) Solution: (d)

Explanation:

- DNA fingerprinting is a procedure that shows the hereditary cosmetics of living things. It is a strategy for finding the distinction between the satellite DNA areas in the genome.
- Sources of DNA:
  - hair
  - bone
  - teeth
  - saliva
  - blood

Uses of DNA Fingerprinting:

- ✓ **Forensic analysis:** It can be used in the identification of a

  (1) a person involved in criminal activities,

  (2) for settling paternity or maternity disputes, and

  (3) in determining relationships for immigration purposes.
- ✓ **Pedigree analysis:** It can be used for the inheritance pattern of genes through generations and for detecting inherited diseases such as Cystic Fibrosis, Haemophilia, Huntington's Disease, Sickle Cell Anaemia, etc.
- ✓ **Personal Identification:** DNA fingerprints can be used as a genetic barcode to identify individuals.
- ✓ **Anthropological studies:** It is useful in determining the origin and migration of human populations and genetic diversities.
- ✓ **DNA Barcoding:** A technique for specifying the organisms' species using a short sequence of DNA situated in the genome is termed DNA bar-coding. The barcode

DNA sequences are too short concerning the complete genome and hence cheaper.

Hence option d is correct.

Q. 5) Consider the following statements about Intentional Genomic Alteration (IGA)

1. It refers to making specific changes to the genome of the organism using modern molecular technologies.
2. Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) is one of the technologies used in it.

Choose the correct code:

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

Q.5) Solution: (c)

Explanation:

- **Intentional Genomic Alteration (IGA)** refers to **making specific changes to the genome of the organism using modern molecular technologies which** are popularly referred to as **"genome editing" or "genetic engineering".**
- **Genome editing** is a group of technologies that give scientists the ability to change an organism's **Deoxyribonucleic Acid (DNA).**
- An IGA is inserted into an animal to change or alter its structure and function.
- These technologies allow genetic material to be **added, removed, or altered at particular locations** in the genome. **Hence statement 1 is correct.**
- **Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) is one of the technologies used in it.**
- It replicates natural defence mechanisms in bacteria to fight virus attacks, using a **special protein called Cas9. Hence statement 2 is correct**

Q. 6) Consider the following statements about genetic disorders

1. Thalessemia is a blood disorder that reduces the production of haemoglobin.
2. Cystic fibrosis is characterized by weakness and wasting in muscles.
3. Sickle cell anaemia is a genetic disease of the red blood cells (RBCs).
4. Spinal muscular atrophy is characterized by severe damage to the lungs and digestive system.

Choose the correct code:

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

Q.6) Solution: (c)

Explanation:

- **Thalassemia** is a blood disorder that reduces the production of haemoglobin.
- It is a genetic blood disorder that causes the body to have less haemoglobin than normal. Haemoglobin enables red blood cells to carry oxygen. Thalassemia can cause anaemia, leading to fatigue. **Hence statement 1 is correct.**
- **Cystic fibrosis** is characterized by severe damage to the lungs and digestive system.
- Cystic fibrosis is an inherited disease characterized by the buildup of thick, sticky mucus that can damage many of the body's organs. The disorder's most common signs and symptoms include progressive damage to the respiratory system and chronic digestive system problems. **Hence statement 2 is incorrect.**
- **Sickle cell anaemia** is a genetic disease of the red blood cells (RBCs).
- It is an inherited disease caused by defects, called mutations, in the beta globin gene that helps make haemoglobin. The red blood cells become hard and sticky and look like a C-shaped farm tool called a "sickle". The sickle cells die early, which causes a constant shortage of red blood cells. **Hence statement 3 is correct.**
- **Spinal muscular atrophy** is characterized by weakness and wasting in muscles.
- It is a rare genetic disease. The person suffering from this disease cannot control the movement of their muscles.
- It is caused by the loss of nerve cells that carry electrical signals from the brain to the muscles. **Hence statement 4 is incorrect.**

Q. 7) With reference to three-parent baby, consider the following statements

1. It replaces faulty DNA in the mother's egg with healthy DNA from the second woman.
2. It helps in prohibiting certain genetic diseases from being passed on to children.
3. Worlds first three parent baby was given birth in Mexico in year 2016.

Choose the correct code:

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

Q.7) Solution: (c)

Explanation:

- A three-parent baby refers to when a baby is born from the DNA of two mothers and one father.
- It replaces faulty DNA in the mother's egg with healthy DNA from the second woman through the use of assisted reproductive technologies, specifically mitochondrial manipulation technologies and in-vitro fertilization.
- It is also known as Maternal Spindle Transfer. **Hence statement 1 is correct.**
- It helps in prohibiting certain genetic diseases from being passed on to children.
- This technique specifically helps mothers who are suffering from mitochondrial disorders. **Hence statement 2 is correct.**
- The world's first three-parent baby boy was born in Mexico in 2016 to a Jordanian couple with the help a controversial new fertility technique that incorporates DNA from three people in the embryo.The 'three-parent' technique also known as Mitochondrial donation (Mitochondrial Replacement Therapy) allows parents with rare genetic mutations to have healthy babies. **Hence statement 3 is correct.**

Q. 8) Consider the following statements

1. Nuclear Fusion is the fusing of two or more lighter atoms into larger ones.
2. Nuclear Fission is the splitting of a large atom into smaller ones.
3. The energy released by the fission reaction is more than the fusion reaction.
4. Nuclear fusion occurs readily in nature, however natural nuclear fission is a rare event.

Choose the correct code:

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

Q.8) Solution: (d)

Explanation:

- Nuclear Fusion is the fusing of two or more lighter atoms into larger ones. **Hence statement 1 is correct.**
- Nuclear Fission is the splitting of a large atom into smaller ones. **Hence statement 2 is correct.**
- The energy released by the fusion reaction is more than the fission reaction.
- The energy released by the nuclear fusion reaction is three to four times greater than the energy released by the nuclear fission reaction. **Hence statement 3 is incorrect.**
- Both nuclear fusion and fission occur in nature. Nuclear fusion powers stars, including our sun, while nuclear fission occurs in some radioactive isotopes, such as uranium-235 and plutonium-239, which decay by fission. However, natural nuclear fission is a rare event, and most fission reactions occur as a result of human activity, such as in nuclear power plants or nuclear weapons.**Hence statement 4 is correct .**
- Nuclear fission requires little energy to split two atoms whereas the nuclear fusion reaction requires extremely high energy to fuse two or more atoms.
- A nuclear fusion reaction is used in nuclear plants whereas nuclear fusion is still an experimental technique used for producing power.

Q. 9) Consider the following statements about the Genetic Engineering Appraisal Committee (GEAC)

1. It is the apex body in India that allows for the commercial release of GM crops.
2. It functions under the Ministry of Science and Technology, Government of India.
3. It is chaired by the Prime Minister and co-chaired by a representative from the Department of Biotechnology (DBT).

4. It is **responsible for the appraisal of activitie**s involving large-scale use of hazardous microorganisms and recombinants.

Choose the correct code:

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

Q.9) Solution: (d)

Explanation:

- The **Genetic Engineering Appraisal Committee (GEAC)** is the apex body in India that allows for the commercial release of GM crops. **Hence statement 1 is correct.**
- It functions under the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. **Hence statement 2 is incorrect.**
- It is chaired by the Special Secretary/Additional Secretary of MoEF&CC and co-chaired by a representative from the Department of Biotechnology (DBT). **Hence statement 3 is incorrect.**
- It is **responsible for the appraisal of activitie**s involving large-scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle. **Hence statement 4 is correct.**
- It is also responsible for the appraisal of proposals relating to the release of genetically engineered (GE) organisms and products into the environment including experimental field trials.
- It evaluates research into GM plants and recommends, or disapproves, their release into farmer fields.

Q. 10) Consider the following statements about types of radioactivity

1. Alpha decay is when a nucleus decays spontaneously by emitting an electron or a positron.
2. Beta decay is when a nucleus decays spontaneously by emitting a proton or a neutron.
3. Gamma decay is when a nucleus decays spontaneously by emitting electromagnetic radiation.

Choose the correct code:

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

Q.10) Solution: (c)

Explanation:

- Radioactivity is defined as a phenomenon where an element emits radiation due to an unstable nucleus.
- Alpha decay is when a nucleus decays spontaneously by emitting a proton or a neutron. **Hence statement 1 is incorrect.**
- Beta decay is when a nucleus decays spontaneously by emitting an electron or a positron.
- Two types of beta decay can occur.
  - ✓ One type (positive beta decay) releases a positively charged beta particle called a positron, and a neutrino;
  - ✓ The other type (negative beta decay) releases a negatively charged beta particle called an electron and an antineutrino.

  Hence statement 2 is incorrect.
- Gamma decay is when a nucleus decays spontaneously by emitting electromagnetic radiation.
- In this type of radioactivity, some unstable atomic nuclei dissipate excess energy by a spontaneous electromagnetic process.
- In the most common form of gamma decay, known as gamma emission, gamma rays (photons, or packets of electromagnetic energy, of extremely short wavelength) are radiated. **Hence statement 3 is correct.**

Q. 11) Consider the following statements about Fast Neutron Reactors

1. They contain neutron moderator materials that cause slowdown of neutrons.
2. They use fast neutrons to cause fission in their fuel.
3. They require fuel to be more highly enriched in fissile material.

Choose the correct code:

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

Q.11) Solution: (b)

Explanation:

- Fission reactors can be divided roughly into two classes, depending on the energy of the neutrons that sustain the fission chain reaction: thermal reactors and fast neutron reactors.
- Thermal reactors contain neutron **moderator** materials that slow neutrons. The moderator is often also the coolant, usually water under high pressure.
- **Fas Fast Neutron Reactors do not use neutron moderator materials to slow down neutrons as they use fast neutrons (neutrons with high energy levels) to cause fission in their fuel. In Fast Neutron Reactors, the neutrons produced by fission are not slowed down, as slowing down neutrons reduces their ability to cause fission.Hence Statement 1 is incorrect**
- **Fast Neutron Reactors use fast neutrons to cause fission in their fuel. Statement 2 is correct.**
- They require fuel to be more **highly enriched in fissile material(about 20% or more) to maintain a chain reaction** due to the relatively lower probability of fission**.They** have the potential to produce **less radioactive waste** because all fissile is fissionable with fast neutrons as the fuel is **highly enriched in fissile material**. **Hence statement 3 is correct.**

Q. 12) The function of control rods in a nuclear reactor is to

a) Absorb neutrons
b) Slow down the speed of neutrons
c) Cool down the reactor
d) Increase the speed of neutrons

Q.12) Solution: (a)

Explanation:

- Control rods are an essential safety feature in nuclear reactors. They are made of a material that can absorb neutrons, such as boron, cadmium, or hafnium. When inserted into the reactor core, they can help regulate the nuclear reaction by absorbing excess neutrons and slowing down the rate of fission.
- By absorbing neutrons, control rods can help prevent the reactor from overheating and potentially causing a nuclear meltdown. They can also be used to shut down the reactor entirely in case of an emergency.**Hence option a is correct.**
- **A moderator is a substance used to slow down fast-moving neutrons, making them more likely to cause fission in the fuel rods. The most commonly used moderator is water, but other materials such as graphite or heavy water (deuterium oxide) can also be used. By slowing down the neutrons, the moderator increases the likelihood of a successful fission reaction. Hence option b is incorrect.**
- **A coolant is a substance used to remove the heat generated by the fission reaction in the fuel rods. The most commonly used coolant is water, but other substances such as helium or liquid sodium can also be used. As the fuel rods undergo fission, they generate a large amount of heat. If this heat is not removed, the reactor can overheat and potentially lead to a meltdown. The coolant circulates through the reactor, absorbing the heat and carrying it away from the fuel rods to a heat exchanger, where it can be used to produce steam for generating electricity. Hence option c is incorrect.**
- **Speed of neutrons is slowed down and not increased in a reactor for effective reaction. Hence option d is incorrect.**

Q. 13) Consider the following statements

1. International Thermonuclear Experimental Reactor aims to build the world's largest tokamak to prove the feasibility of fission.
2. A tokamak is an experimental machine designed to harness the energy of fusion.

Choose the correct code:

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

Q.13) Solution: (b)

Explanation:

- International Thermonuclear Experimental Reactor aims to build the **world's largest tokamak to** prove the **feasibility of fusion.**
- **It** is based on fusion which is also an energy source for the Sun and stars.
- Every fusion reaction in the Sun, in which two hydrogen atoms fuse into one helium atom, releases two neutrinos.
- **It** is a collaboration of 35 nations launched in 1985 and is located in France.
- The ITER members include China, the European Union, India, Japan, South Korea, Russia, and the United States. **Hence statement 1 is incorrect.**
- A **tokamak** is an experimental machine designed to harness the energy of fusion.
- Inside a tokamak, the energy produced through the fusion of atoms is absorbed as heat in the walls of the vessel. Like a conventional power plant, a fusion power plant uses this heat to produce steam and then electricity by way of turbines and generators. **Hence statement 2 is correct.**

Q. 14) Consider the following statements

1. The strong nuclear force and weak nuclear force are part of the fundamental forces of nature.
2. The strong nuclear force is strong with a long-range and is responsible for radioactive decay.

Choose the correct code:

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

Q.14) Solution: (a)

Explanation:

- All the forces that exist in nature come under the four fundamental forces. We can differentiate the four fundamental forces based on their characteristics. The criteria of these characteristics are the force experienced by the particles, the relative strength between the force, the effectiveness of the range over the force, and dependence on the nature of the particles in which the force is acting.
- The four fundamental forces of nature are the gravitational force, the weak nuclear force, the electromagnetic force, and the strong nuclear force.
- Gravitational force is the weakest of all forces. It is weaker than a weak nuclear force, but its range is very high as it works by its masses. This force is the most intuitive and fundamental force acting on any of the bodies in this universe. If we drop a stone, it will return to its surface.
- The electromagnetic force occurs because of charges like attraction between opposite charges and repulsion between the same charges. The electromagnetic force is billions of times stronger than the gravitational force. But electromagnetic force is acting on our level by which we can tell that we live in an electromagnetic world. The attraction between opposite poles of a magnet is also caused by electromagnetic force. This force is also called the Lorentz force. **Hence statement 1 is correct.**
- The strong nuclear force is very strong but very short-range. It is responsible for holding the nuclei of atoms together. It is basically attractive but can be effectively repulsive in some circumstances.
- The weak nuclear force is very weak and has a very short range which is responsible for radioactive decay and neutrino interactions. **Hence statement 2 is incorrect.**

Q. 15) Consider the following statements about International Atomic Energy Agency

1. It is an organization within the United Nations family for cooperation in the nuclear field.
2. It was awarded the Nobel Peace Prize in 2005 for its work for a safe and peaceful world.
3. It is headquartered in Vienna, Austria.
4. It reports annually to the United Nation Security Council.

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.15) Solution: (c)

Explanation:

- **International Atomic Energy Agency** is an organization within the **United Nations** family for cooperation in the nuclear field. The IAEA was created in 1957 in response to the deep fears and expectations generated by the discoveries and diverse uses of nuclear technology. **Hence statement 1 is correct.**
- **It is** widely known as the world's **"Atoms for Peace and Development"** organization.
- It was awarded the Nobel Peace Prize in 2005 for its work for a safe and peaceful world.
- The Agency works with its Member States and multiple partners worldwide to promote the safe, secure, and peaceful use of nuclear technologies. **Hence statement 2 is correct.**
- It is headquartered in Vienna, Austria. **Hence statement 3 is correct.**
- It reports annually to the **United Nation General Assembly.**When necessary, the IAEA also reports to the UN Security Council regarding instances of members' non-compliance with safeguards and security obligations. **Hence statement 4 is incorrect.**

Q. 16) Consider the following statements about Nuclear Non-Proliferation Treaty (NPT)

1. It defines Nuclear-weapon states as those that manufactured and exploded a nuclear weapon before 1st January 1967.
2. All the members of the United Nations are members of this treaty.

Choose the correct code:

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

Q.16) Solution: (a)

Explanation:

- The Nuclear Non-Proliferation Treaty is **a multilateral treaty** aimed at limiting the spread of nuclear weapons including three elements:
  - ✓ non-proliferation

- ✓ disarmament and
- ✓ peaceful use of nuclear energy.

- According to this treaty, Nuclear-weapon states are those that manufactured and exploded a nuclear weapon before 1st January 1967.
- It requires countries to give up any present or plans to build nuclear weapons in return for access to peaceful uses of nuclear energy.
- It represents the only binding commitment in a multilateral treaty to the goal of disarmament by the nuclear-weapon States. **Hence statement 1 is correct.**
- The treaty was signed in 1968 and entered into force in 1970. Presently, it has 191 member states.
- Four UN member states have never accepted the NPT – India, Israel, Pakistan, and South Sudan. **Hence statement 2 is incorrect.**

Q. 17) Consider the following statements about Mitochondrial DNA (mt DNA)

1. It is double-stranded and circular.
2. It is not enveloped by a membrane.
3. It is inherited both maternally and paternally.

Choose the correct code:

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

Q.17) Solution: (a)

Explanation:

- Mitochondrial DNA (mt DNA) is double-stranded and circular whereas Nuclear DNA is double-stranded and linear.
- Transcription of mt DNA is polycistronic whereas transcription of nuclear DNA is monocistronic. **Hence statement 1 is correct.**
- Mitochondrial DNA is not enveloped by a membrane whereas nuclear DNA is enveloped by a membrane. **Hence statement 2 is correct .**

- Its inheritance is only by maternal so mitochondrial diseases are inherited maternally whereas the nuclear DNA gets inheritance equally from both parents. **Hence statement 3 is incorrect.**

Q. 18) Which of the following are the benefits of GM crops?

1. Increased crop yields
2. Reduced costs for food production
3. Reduced need for pesticides
4. Decreased nutrient composition
5. Resistance to pests and disease

Choose the correct code:

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

Q.18) Solution: (d)

Explanation:

In crops, genetic modification involves the manipulation of DNA instead of using controlled pollination— the conventional method to improve crops— to alter certain characteristics of the crop.

Soyabean, maize, cotton, and canola with herbicide tolerance and insect resistance are the most widely grown GM crops around the world.

The benefits of GM crops are -

- Increased crop yields
- Reduced costs for food production
- **Reduced need for pesticides(not decreased)**
- Enhanced nutrient composition
- Resistance to pests and disease
- Greater food security and medical benefits to the world's growing population.
- Increase the yield of animals for milk and meat production.

- Decrease susceptibility to disease in animals.
- Allowing plants to grow in conditions where they might not otherwise flourish.
- Increased shelf life and hence there is less fear of foods getting spoiled quickly.

Hence option d is correct.

Q. 19) With reference to 3-stage nuclear program, consider the following statements

1. The first stage consists of Pressurised Heavy Water Reactors (PHWRs) which use natural uranium as their fuel.
2. The second stage consists of fast breeder reactors which use a blend of plutonium and uranium oxide as their fuel
3. The third stage consists advanced heavy water reactors which use thorium as their fuel.

Choose the incorrect code

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

Q.19) Solution: (d)

Explanation:

India's three-stage nuclear power program was formulated by Homi Bhabha in the 1950s to secure the country's long-term energy independence, through the use of uranium and thorium reserves found in India.

Stage 1: Pressurised Heavy Water Reactors (PHWRs)

- The first stage comprises the setting up of Pressurised Heavy Water Reactors (PHWRs) and
- associated fuel cycle facilities.
- PHWRs use natural uranium as fuel and heavy water as moderator and coolant.
- **Hence statement 1 is correct .**

Stage 2: Fast Breeder Reactors (FBRs)

- The second stage envisages setting up of Fast Breeder Reactors (FBRs) backed by
- reprocessing plants and plutonium-based fuel fabrication plants.

- A breeder reactor is one that breeds more material for a nuclear fission reaction than it
- consumes.
- Plutonium is produced by irradiation of uranium-238
- The prototype FBR is fuelled by a blend of plutonium and uranium oxide, called MOX fuel.
- **Hence statement 2 is correct.**

Stage 3: Advanced Heavy Water Reactor (AHWR)

- The third stage is based on the thorium-uranium-233 cycle.
- Uranium-233 is obtained by irradiation of thorium
- India has one of the largest reserves of thorium.
- **Hence statement 3 is correct.**

Q. 20) Consider the following statements about the Nuclear Power Corporation of India Limited (NPCIL)

1. It is a constitutional body responsible for the design, construction, commissioning, and operation of nuclear power reactors.
2. It is under the administrative control of the Department of Atomic Energy (DAE).

Choose the correct code:

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

Q.20) Solution: (b)

Explanation:

- Nuclear Power Corporation of India Limited (NPCIL) is a Public Sector Enterprise responsible for the design, construction, commissioning, and operation of nuclear power reactors.
- It is wholly owned by the Government of India and is responsible for the generation of electricity from nuclear power.

- It is not a constitutional body as it does not derive its powers and authorities from the Constitution of India. **Hence statement 1 is incorrect.**
- It is under the administrative control of the Department of Atomic Energy (DAE). **Hence statement 2 is correct.**

Q.21) Lake Kuk, recently seen in news is located in?

a) Cameroon
b) Togo
c) Ghana
d) Nigeria

Q.21) Solution (a)

Explanation:

Lake Kuk and Nyos are crater lakes located in a region of volcanic activity known as the Cameroon Volcanic Line. The Cameroon volcanic line consists of a string of volcanoes that extend from the Atlantic Ocean into Republic of Cameroon. The volcanoes here cross the oceanic-continental boundary.

Source: CLICK HERE

Q.22) Consider the following statements about Green Fins Hub

1. It is the first-ever global marine tourism industry platform for diving and snorkelling operators worldwide.
2. It was developed by The Reef-World Foundation in partnership with the International Organization for Sustainable Development.
3. Operators will receive environmental scores based on a detailed online self-evaluation and progress made on their action plans.

Choose the INCORRECT statements

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

Q.22) Solution (c)

Explanation:

- The **Green Fins Hub** is the **first-ever global marine tourism industry** platform for diving and snorkelling operators worldwide.
- It was developed by **The Reef-World Foundation** in partnership with the **United Nations Environment Programme (UNEP).**
- Throughout every year of membership, **operators will receive environmental scores based on a detailed online self-evaluation** and progress made on their action plans. The assessment process will continue to be based on set criteria using a scoring system (0-330 point system, with a low score implying low impact of a business on coral reefs).

Source: CLICK HERE

Q.23) Which of the below given pair is/are correctly matched?

Tribe	State/UT
Narikoravan	Tamil Nadu
Kadu Kuruba	Kerala
Hatti	Himachal Pradesh
Binjiha	Madhya Pradesh

Choose the correct code:

a) Only one pair is correct
b) Only two pairs are correct
c) Only three pairs are correct
d) All pairs are correct

Q.23) Solution (b)

Explanation:

- The **Hatti tribe** in the Trans-Giri area of Sirmour district in **Himachal Pradesh.**
- The **Narikoravan** and Kurivikkaran hill tribes of **Tamil Nadu .**
- The **Binjhia** in **Chhattisgarh**, who were listed as ST in Jharkhand and Odisha but not in Chhattisgarh, were the communities newly added to the list.

- **Kadu kuruba** is a scheduled tribe found in **Karnataka**
- Cabinet approved a proposal to bring the Gond community residing in 13 districts of Uttar Pradesh, under the ST list from the Scheduled Caste list.
- This includes the five subcategories of the Gond community (Dhuria, Nayak, Ojha, Pathari, and Rajgond).

Source: CLICK HERE

Q.24) Consider the following statements about International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

1. It works under the aegis of International Fund for Agricultural Development (IFAD).
2. The objective of the treaty is to recognise the contribution of farmers to the diversity of crops.
3. India is not a signatory to the treaty.

Choose the INCORRECT statements:

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

Q.24) Solution (b)

Explanation:

- It works under the aegis of the **Food and Agriculture Organisation** of the United Nations.
- It aims to conserve and sustainably use plant genetic resources for food and agriculture, and **fair and equitable sharing of the benefits arising out of their use**, in harmony with the Convention on Biological Diversity.
- **ITPGRFA is a legally binding comprehensive agreement** adopted in November, 2001 at Rome during the 31st session of Food and Agriculture Organization of the United Nations, which entered into force on June 29, 2004 and **currently has 149 Contracting Parties, including India.**

Source: CLICK HERE

Q.25) Consider the following statements about Asiatic Caracal

1. The most significant potential habitat for caracals are Rajasthan, Gujarat, Madhya Pradesh.
2. Its protection status is in endangered category under IUCN Red List.

Choose the correct statements

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

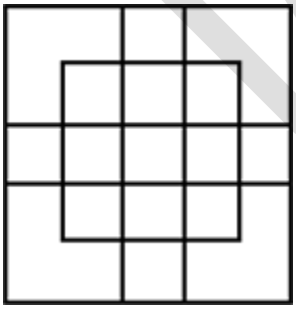
Q.25) Solution (a)

Explanation:

- They are found mostly in **Rajasthan, Gujarat and Madhya Pradesh** and are located in Kutch, the Malwa Plateau, the Aravalli hill range. Besides India, the **caracal is found in several dozen countries across Africa, the Middle East, Central and South Asia**.
- Protection Status:
  - IUCN Red List: **Least Concern**
  - Wildlife Protection Act, 1972: Schedule I
  - CITES: Appendix I

Source: CLICK HERE

Q.26) Count the number of squares in the given figure below

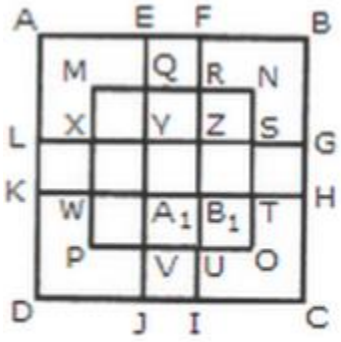


a) 21
b) 24
c) 25

d) 27

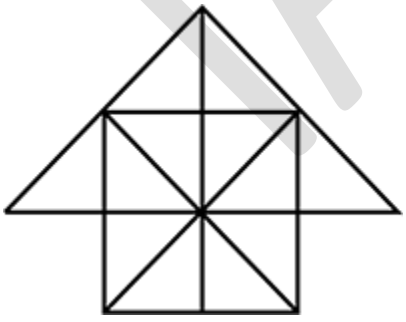
Q.26) Solution (d)

Explanation:



The simplest squares are EFRQ, MQYX, QRZY, RNSZ, LXWK, XYA1W, YZB1A1 , ZSTB1 ,SGHT, WA1 VP, A1B1UV, B1TOU and VUIJ i.e. 13 in number. The squares having two components each are AEYL, FBGZ, KA1JD and B1HCI i.e. 4 in number. The squares having four components each are MRB1 W, QNTA1 , XZUP and YSOV i.e. 4 in number. The squares having seven components each are AFB1K, EBHA1 , LZID and YGCJ i.e. 4 in number. There is only one square i.e. MNOP composed of nine components. There is only one square i.e. ABCD composed of seventeen components. There are 13+4+4+4+1+1=27 squares in the figure.

Q.27) Count the number of triangles and squares given in the figure below

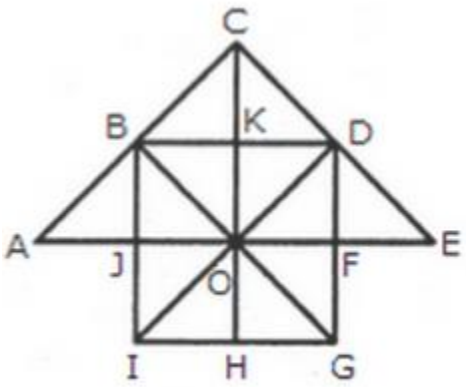


a) 26 triangles, 5 squares
b) 28 triangles, 6 squares

c) 28 triangles, 5 squares
d) 26 triangles, 6 squares

Q.27) Solution (b)

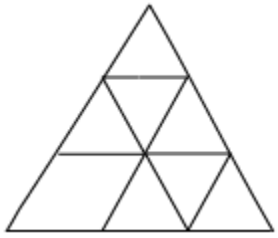
Explanation:



The simplest triangles are JBO, BKO, KDO, DFO, FGO, GHO, HIO, IJO, ABJ, BCK, CKD and DEF i.e.12 in number. The triangles composed of two components each are IBO, BDO, DGO, GIO, ABO, CDO, CBO, CBD and DEO i.e. 9 in number. The triangles composed of four components each are IBD, BDG, DGI, GIB, ACO and COE i.e. 6 in number. There is only one. triangle i.e. ACE composed of eight components. Thus, there are 12+9+6+1=28 triangles in the given figure.

Squares: The squares composed of two components each are BKOJ, KDFO, OFGH and JOHI i.e. 4 in number. There is only one square i.e. CDOB composed of four components. There is only one square i.e. BDGI composed of eight components. Thus, there are 4+1+1=6 squares in the given figure.

Q.28) How many triangles are there in this figure?



a) 9
b) 10
c) 11
d) 12

Q.28) Solution (c)

Explanation:

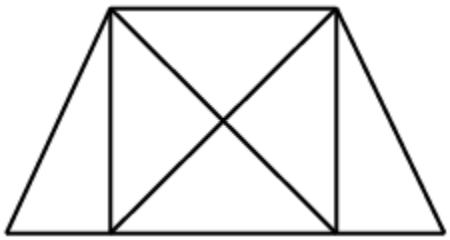
Number of large triangle = 1

Number of small triangles = 7

Number of medium sized triangles covering two rows = 3

Therefore, total number of triangles = 1 + 7 + 3 = 11

Q.29) How many triangles are there in the given figure below



a) 8
b) 10
c) 12
d) 14

Q.29) Solution (c)

Explanation:

Number of smaller triangles = 6

Number of triangles formed by combination of 3 triangles = 2

Number of larger triangles (at the diagonals) = 4

Hence, total triangles = 6 + 2 + 4 = 12

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

Passage

The initiation of financial reforms in the country the early 1990s was to a large extent, conditioned by the analysis and recommendations of various committees/Working Groups set up to address specific issues. "The process has been marked by 'gradualism' with measures being undertaken after extensive consultations with experts and market participants. From the beginning of financial reforms, India has resolved to attain standards of international best practices but to fine tune the process keeping in view the underlying institutional and operational consideration. Reform measures introduced across sectors as well as within each sector were planned on such a way so as to reinforce each other. Attempts were made to simultaneously strengthen the institutional framework while enhancing the scope for commercial decision making and market forces in an increasingly competitive framework. At the same time, the process did not lose sight of the social responsibilities of the financial sector. However, for fulfilling such objectives, rather than using administrative fiat or coercion, attempts were made to provide operational flexibility and incentives so that the desired and are attended through broad interplay of market forces.

The major aim of the reforms in the early phase of reform, known as first generation of reforms was to create an efficient, productive and profitable financial service industry operating within the environment of operating flexibility and witnessed significant changes, 'coinciding with the movement towards global integration of financial services'. The focus of the second phase of financial sector reforms starting from the second-half of the 1990s, therefore, has been the strengthening of the financial system and introduction of structural improvements.

Two brief points need to be mentioned here. First, financial reforms in the early 1990s were preceded by measures aimed at lessening the extent of financial repression. However, unlike in the later period, the earlier efforts were not part of a well-thought out and comprehensive agenda for extensive reforms. Second, financial sector reform in India was an important component of the comprehensive economic reform process initiated in the early 1990s. Whereas economic reforms in India were also initiated following an external sector crisis, unlike many other emerging market economies where economic reforms were driven by crisis followed a consensus driven patter of sequenced liberalization across the sectors. That is why despite several changes in government there has not been any reversal of direction in the financial sector reform process over the last 15 years.

Q.30) What strategy was used for accomplishing the social objectives of the financial sector?

a) Authority vested in the competent officials
b) Empowerment given to market forces

c) Provision of functional liberty and incentives
d) Use of administrative machinery

Q.30) Solution (c)

Explanation:

Refer to the following lines from the first paragraph of the passage, "At the same time, the process did not lose sight of the social responsibilities of the financial sector. However, for fulfilling such objectives, rather than using administrative fiat or coercion, attempts were made to provide operational flexibility and incentives so that the desired and are attended through broad interplay of market forces."

This makes it clear that option c is correct.