

Q.1) Consider the following statements about mitochondrial DNA and Nuclear DNA?

1. Both Nuclear DNA and mitochondrial DNA are circular in shape.
2. MtDNA contains two copies per somatic cell, whereas Nuclear DNA usually has only 100-1,000 copies per somatic cell.

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.1) Solution (c)

Explanation:

Deoxyribonucleic acid (DNA) carries genetic information that is used as a set of instructions for growth and development, as well as the ultimate functioning and reproduction of living organisms. It is a nucleic acid and is one of the four major types of macromolecules that are known to be essential for all forms of life.

Within eukaryotic cells, DNA is organised into structures called chromosomes, chromosomes are duplicated through the process of **DNA Replication**, as long as each cell has its own complete set of chromosomes.

Eukaryotic organisms such as animals, plants and fungi, store the majority of their DNA inside the cell nucleus and some of their DNA in organelles such as mitochondria.

Being located in different regions of the eukaryotic cell, **there are a number of fundamental differences between mitochondrial DNA (mtDNA) and nuclear DNA (nDNA).**

	Mitochondrial DNA	Nuclear DNA
Location	Mitochondria	Cell Nucleus
Copies per somatic	100-1,000	2

cell		
Structure	Circular and closed	Linear and open ended
Membrane enclosure	Not enveloped by a membrane	Enclosed by a nuclear membrane
Genome size	1 chromosome with 16,569 base pairs	46 chromosomes with 3.3 billion base pairs
Number of genes	37 genes	20,000-25,000 genes
Method of inheritance	Maternal	Maternal and Paternal
Method of translation	Some codons do not follow universal codon pattern	Follows universal codon pattern
Method of transcription	Polycistronic	Monocistronic

Q.2) Consider the following statements regarding “Organoids” and select the incorrect statement:

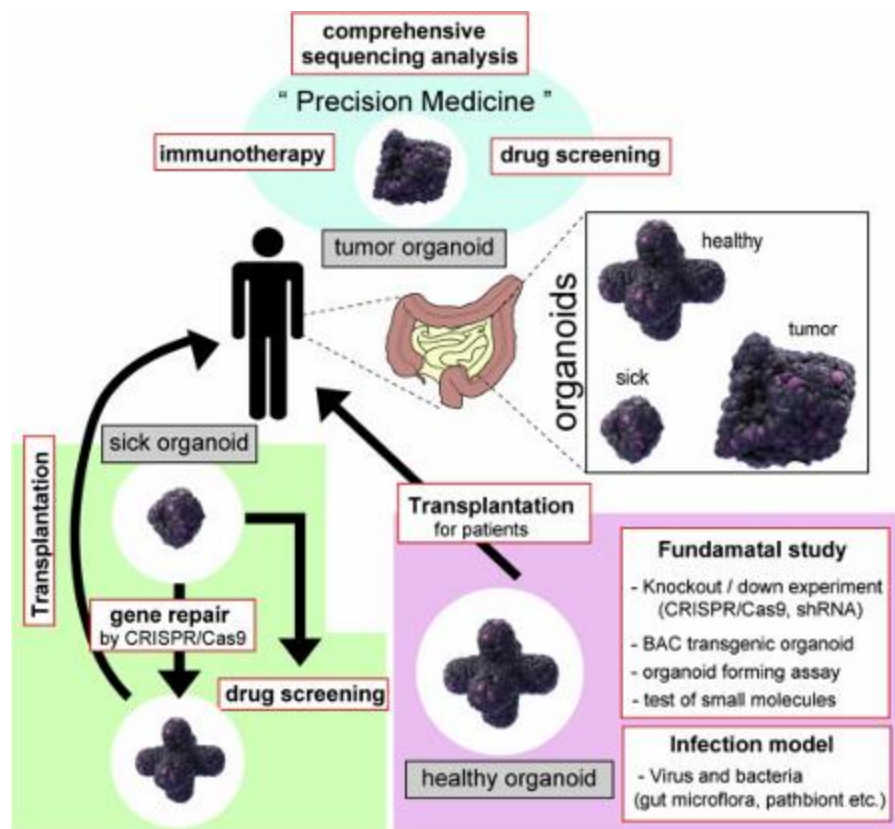
- a) They are a group of cells grown in laboratories into three-dimensional, miniature structures that mimic the cell arrangement of a fully-grown organ.
- b) Most of the organoids contain only a subset of all the cells seen in real organ, but lack blood vessels to make them fully functional.
- c) Organoids for brain cannot be developed.
- d) None.

Q.2) Solution (c)

Basic Information:

An **organoid** is a miniaturized and simplified version of an organ produced in - vitro in three

dimensions that shows realistic micro-anatomy. They are derived from one or a few cells from a tissue or induced pluripotent stem cells, which can self-organize in three-dimensional culture owing to their self-renewal and differentiation capacities.



Statement Analysis:

Statement (a)	Statement (b)	Statement (c)
Correct	Correct	Incorrect
They are tiny (typically the size of a pea) organ-like structures that do not achieve all the functional maturity of human organs but often resemble the early stages of a developing tissue.	Most organoids contain only a subset of all the cells seen in a real organ, but lack blood vessels to make them fully functional.	Brain organoids have already been developed. The largest brain organoids developed is of 4mm.

They are a group of cells grown in laboratories into three-dimensional, miniature structures that mimic the cell arrangement of a fully-grown organ.		
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Q.3) Consider the following statements about 'Genome India Project':

1. The project aims to carryout whole genome sequencing of 10,000 Indians in the first phase.
2. The project will be completed in 3 years and anyone looking for free mapping of their entire genome can sign up for it.

Which of the statements given above is/are NOT correct?

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

Q.3) Solution (d)

Note: Incorrect statements are asked in the question.

Basic Information:

The Rs 238-crore Genome India project will involve 20 leading institutions including the Indian Institute of Science (IISc) in Bengaluru and few IITs.

The human genome is made of 3.2 billion DNA base pairs and between any two humans, the amount of genetic variation is about 0.1 percent. Therefore, one base pair out of every 1000 will differ between any two individuals. These genetic variations differentiate one individual from the other and play an important role in inherited traits, susceptibility to diseases, and response to drugs and help track migration and evolution patterns.

Statement Analysis:

Statement 1	Statement 2
Correct	Correct
The first stage of the project will look at samples of "10,000 persons from all over the country" to form a "grid" that will enable the development of a "reference genome".	Genome India project has been sanctioned by Department of Biotechnology (DBT) on January 16, 2020 for a period of 3 years. Anyone looking for free mapping of their entire genome can sign up for this project. Those who get their genes mapped will get a card and access to an app.

Q.4) Consider the following statements:

1. The concept of Germline gene therapy is to introduce gene modified cells into the germline that can be transmitted horizontally across generations.
2. The somatic cell gene therapy affects the targeted cells/tissue/organs in the patient, and is not passed on to subsequent generations.

Which of the above statements is/are correct?

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

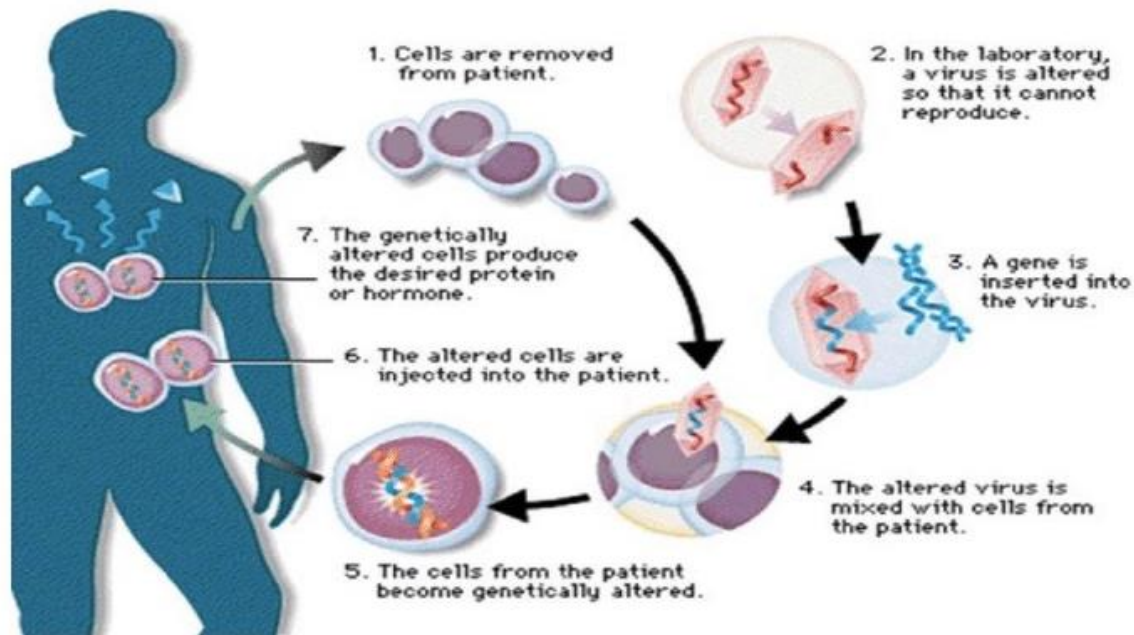
Q.4) Solution (b)

Basic Information:

Gene therapy is a technique which involves the replacement of defective genes with healthy ones in order to treat genetic disorders. It is an artificial method that introduces DNA into the

cells of the human body. The first gene therapy was successfully accomplished in the year 1989.

The simple process of gene therapy is shown in the picture.



Steps involved in gene therapy.

Basically there are two types of gene therapy;-

1. **Somatic gene therapy;** - this usually occurs in somatic cell of human body. It involves the placement of a human gene into a living person's somatic cells—cells that do not produce the eggs and sperm that in turn produce the next generation. Somatic cell gene therapy would aim to cure a disease only in the patient, not in the patient's descendants.
2. **Germline gene therapy;** - is when DNA is transferred into the cells that produce reproductive cells, eggs or sperm, in the body. This type of **therapy** allows for the correction of disease-causing **gene** variants that are certain to be passed down from generation to generation. Experimenting with this type of **therapy**, scientists injected fragments of DNA into fertilized mouse eggs. The mice grew into adults and their offspring had the new **gene**.

Statement Analysis:

Statement 1	Statement 2
Incorrect	Correct
The concept of germ-line gene therapy is to introduce gene modified cells into the Germline that can be transmitted vertically across generations . It is not yet legal in India.	The somatic cell gene Therapy affects the targeted cells/tissue/organs in the patient, and is not passed on to subsequent generations. This is legal in India.

Q.5) Consider the following statements about International campaign to abolish Nuclear weapons:

1. Nobel peace prize was given to it in 2015.
2. Its main objective is to achieve full implementation of the treaty on the prohibition of nuclear weapons.
3. It was launched in 1998 and has it's headquarter in Melbourne.

Which of the above statements is/are correct?

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

Q.5) Solution (b)

Basic Information:

The International Campaign to Abolish Nuclear Weapons (ICAN) is a coalition of non-governmental organisations in one hundred countries promoting adherence to and implementation of the United Nations Treaty on the Prohibition of Nuclear Weapons.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	Correct	Incorrect

The campaign received the 2017 Nobel Peace Prize for its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons	Its main objective is to promote adherence to and full implementation of the Treaty on the Prohibition of Nuclear Weapons.	It was launched in 2007 and its head quarter is in Geneva though it was founded at Melbourne.
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Q.6) Recently, among scientific community this living creature has attracted a lot of attention due to its potential use in regenerative biology of the heart. Identify the species –

- a) Dragon flies
- b) Tardigrade
- c) Zebrafish
- d) Platypus

Q.6) Solution (c)

Explanation:

Indian researchers have identified the genes in zebrafish that can promote heart regeneration. Zebrafish is a small freshwater fish found in the tropical and subtropical regions. The fish is native to South Asia's Indo-Gangetic plains.

This fish's unique characteristics lie in its transparency during its embryonic stages, allowing observing all organs, including beating heart and blood circulation.

The zebrafish is probably one of the most important models for developmental and regenerative biology of the heart. In the last decades, the zebrafish has become increasingly important for scientific research due to its adequate regeneration capacity of almost all its organs, including the brain, heart, eye, spinal cord.

The researchers have identified cellular communication network factor 2a (ccn2a), a gene that can promote heart regeneration by enhancing cardiomyocyte proliferation in zebrafishes. Ccn2a promotes the innate regenerative response of the adult zebrafish heart and maybe a promising therapeutic target for humans.

Q.7) Consider the following statements regarding India's three stage Nuclear power

Programme

1. It was designed by Vikram Sarabhai.
2. In the first stage, fast breeder reactor (FBR) was to be used followed by pressurized heavy water reactor (PHWR).
3. The ultimate focus of the programme was enabling thorium reserves of India to be utilized for energy needs.

Which of the above statements is/are correct?

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

Q.7) Solution (c)

Basic Information:

India envisages A Three Stage Programme based on the optimum utilisation of the indigenous limited uranium and abundant thorium resources. Although we have around 25% of the world's thorium reserves, it itself is not a fissile material. It needs to undergo transmutation to U-233 in a reactor fuelled by other fissile material.

The sequential 3-stage programme is based on a closed fuel cycle, where the spent fuel of one stage is reprocessed to produce fuel for the next stage.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	Incorrect	Correct
Homi J Bhabha, the father of India's Nuclear program, devised India's Three Stage Nuclear Power Program.	In the first stage PRESSURIZED HEAVY WATER REACTORS (PHWR) was to be used in which Natural Uranium is used as a fuel and heavy water as a coolant and moderator.	The ultimate focus of the programme was enabling thorium reserves of India to be utilized for energy needs, Since India has good amount of thorium resources compared to

	<p>In the second stage fast breeder reactor is fuelled by a mixed oxide of U-238 and Pu-239 which have been recovered by reprocessing the spent fuel in the first stage.</p> <p>The Stage III reactor is based on utilizing Thorium which involves a self-sustaining series of thorium-232-uranium-233 fuelled reactors</p>	uranium.
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Q.8) Consider the following statements:

1. Mitochondrial diseases are incurable.
2. CRISPR-Cas9, the gene editing technology has been harnessed from bacteria.

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.8) Solution (c)

Basic Information:

Mitochondrial disease is a group of disorders caused by mitochondrial dysfunction. **Mitochondrial diseases are currently incurable**, although a new IVF technique of mitochondrial transfer gives families affected by mitochondrial disease the chance of having healthy children – removing affected mitochondria from an egg or embryo and replacing them with healthy ones from a donor

Gene drives dramatically increase the likelihood that a particular suite of genes will be passed onto the next generation, allowing the genes to rapidly spread through a population and override natural selection. **Since the CRISPR/Cas9 system is derived from bacteria**, it is possible to induce an immune response upon its entrance to the target cell, thus, the nanoparticles should be designed so as to eliminate or minimize immune response.

Recently, the **Nobel Prize in Chemistry for 2020** was given to two women scientists namely Emmanuelle Charpentier (France) & Jennifer A. Doudna (Germany). The Nobel Prize was given to them for the development of a method for genome editing.

Q.9) Consider the following statements:

1. Cold fusion describes a form of energy generated when hydrogen interacts with various metals like nickel and palladium.
2. Cold fusion seeks to produce nuclear energy without harmful radiation.

Which of the above statements are correct?

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

Q.9) Solution (c)

Basic Information:

Here, both statements are correct

Cold fusion offers a new energy economy based on green power from energy-dense LENR. Cold fusion means it is economically-viable to recycle all waste, restore wilderness and waterways to pristine conditions, and keep a planetary biosphere from extinction. Hydrogen isotopes Protium, Deuterium, and Tritium.

Cold fusion is also referred to as the Anomalous Heat Effect AHE, reflecting the fact that there is no definitive theory of the elusive reaction.

Statement Analysis:

Statement 1	Statement 2
Correct	Correct
Cold fusion describes a form of energy generated when hydrogen interacts with various metals like nickel and palladium.	Cold fusion seeks to produce nuclear energy without harmful radiation , complex equipment and the application of very high temperatures and pressures. But it has no conclusive theory explaining it and flies in the face of a well-established physics law that goes against easy fusion of nuclei.

Q.10) TALEN and Zinc Finger nucleases are heard in the context of

- a) Nuclear technology
- b) Gene editing
- c) Nanotechnology
- d) Defence industry

Q.10) Solution (b)

Explanation:

They are genome editing tool just like CRISPR Cas9 (which is not first gene editing tool).

TALEN (transcription activator-like effectors nuclease) which was developed in 2009 .TALENs are produced by a common type of plant bacteria. Like ZFNs, TALENs bind to and cut targeted DNA sequences. A key advantage the TALEN gene-editing method holds over ZFN is that engineering TALENs is simpler than using ZFNs.

Zinc finger nuclease technology: Has been used longer than any other gene-editing method. First developed in the 1990s, this approach involves the binding of a pair of ZFNs to a DNA target

Q.11) The term “Spindle Nuclear transfer” is associated with which of the following?

- a) Nuclear technology
- b) Cloning

- c) Nano technology
- d) Three parent baby

Q.11) Solution (d)

Explanation:

In 2016, the birth of world's 1st three parent baby child was announced here, human offspring produced is from the genetic material of one man and two women through the use of assisted reproductive technologies, specifically mitochondrial manipulation (or replacement) technologies and three-person in vitro fertilization (IVF). **This specialized IVF procedure is called "Spindle Nuclear Transfer".**

Mitochondria which provide energy to our cells are critically important for proper functioning of the body, when they fail to do so cells starves for energy which proves devastating.

Mitochondria are inherited from our mothers, so women with with so-called "defective" mitochondrial genes pass that faulty mtDNA on to their biological children. Those with no or mild symptoms—who might not even know they carry unhealthy mitochondria—can unexpectedly have a child with a more severe mitochondrial disease, or be unable to carry a baby to term at all. Even if a pregnancy is successful, the child may suffer from one or many forms of mitochondrial disease, which can lead to serious disability; early deaths are not uncommon in these children. To solve this problem this three parent IVF procedure is done in **which the mother, the father and a woman who donates eggs are involved.**

In 2015, the United Kingdom became the first country to expressly legalize mitochondrial donation—but only for preventing heritable diseases.

Q.12) Which of the following diseases are genetic diseases?

- 1. Sickle cell anaemia
- 2. Down syndrome
- 3. Huntington diseases
- 4. Breast cancer

Select the correct answer using the code given below:

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

Q.12) Solution (d)

Basic Information:

A genetic disease is any disease caused by an abnormality in the genetic makeup of an individual. The genetic abnormality can range from minuscule to major -- from a discrete mutation in a single base in the DNA of a single gene to a gross chromosomal abnormality involving the addition or subtraction of an entire chromosome or set of chromosomes.

Some people inherit genetic disorders from the parents, while acquired changes or mutations in a pre-existing gene or group of genes cause other genetic diseases. Genetic mutations can occur either randomly or due to some environmental exposure.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	Correct	Correct	Correct
<p>Sickle cell anaemia is a genetic disease of the red blood cells (RBCs).</p> <p>Normally, RBCs are shaped like discs, which gives them the flexibility to travel through even the smallest blood vessels.</p> <p>However, with this disease, the RBCs have an abnormal crescent shape resembling a sickle. This makes them</p>	<p>Down syndrome is a condition in which a child is born with an extra copy of their 21st chromosome — hence its other name, trisomy 21.</p> <p>It causes a distinct facial appearance, intellectual disability and developmental delays. It may be associated with thyroid or heart disease.</p>	<p>Huntington diseases is an inherited condition in which nerve cells in the brain break down over time.</p> <p>It causes uncontrolled movements, emotional problems, and loss of thinking ability (cognition). Adult-onset Huntington disease, the most common form of this disorder, usually appears in a person's thirties or forties</p>	<p>In breast cancer, the cancer forms in the cells of breasts.</p> <p>It commonly occurs in women but can also occur in men.</p> <p>The most common cause of hereditary breast cancer is an inherited mutation in the BRCA1 or BRCA2 gene.</p>

<p>sticky and rigid and prone to getting trapped in small vessels, which blocks blood from reaching different parts of the body. This can cause pain and tissue damage.</p>			
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Q.13) With reference to International Atomic energy Agency (IAEA), consider the following statements?

1. Its headquarter is in Rome
2. Its objective is to promote the peaceful use of nuclear energy, and to inhibit its use for any military purpose, including nuclear weapons
3. It reports both to United Nation General Assembly and UN Security council

Select the correct answer using the code below:

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

Q.13) Solution (b)

Basic Information:

The IAEA is the international centre for cooperation in the nuclear/atomic field. It is a UN agency. It works with its member countries and many partners to promote peaceful uses of nuclear technologies.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	Correct	Correct

Set up as the world's "Atoms for Peace" organization in 1957 within the United Nations family. Its headquarter is in Vienna, not Rome.	Its objective is to promote the peaceful use of nuclear energy, and to inhibit its use for any military purpose, including nuclear weapons	Though established independently of the United Nations through its own international treaty, the IAEA Statute, the IAEA reports to both the United Nations General Assembly and Security Council.
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Q.14) The Department of Atomic energy functions under:

- a) Prime Minister of India
- b) Ministry of earth sciences
- c) Ministry of Power
- d) Principal scientific adviser to PM

Q.14) Solution (a)

Explanation:

The Department of Atomic Energy (DAE) came into being on August 3, 1954 **under the direct charge of the Prime Minister** through a Presidential Order. According to the Resolution constituting the AEC, the Secretary to the Government of India in the Department of Atomic Energy is ex-officio Chairman of the Atomic Energy Commission.

Its headquarter is in Mumbai.

DAE has been engaged in the development of nuclear power technology, applications of radiation technologies in the fields of agriculture, medicine, industry and basic research.

Q.15) Consider the following statements:

1. Ht-Bt cotton can tolerate Glyphosate, a herbicide variety, whose action kill only the weeds (Pink Bollworm), not the crop.
2. Bt brinjal sowing is not allowed commercially by GEAC
3. Genetic Engineering Appraisal Committee (GEAC) functions under Ministry of Agriculture and Fisheries.

Select the correct answer using the code below:

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

Q.15) Solution (c)

Basic Information:

GM is a technology that involves inserting DNA into the genome of an organism.

To produce a GM plant, new DNA is transferred into plant cells. Usually, the cells are then grown in tissue culture where they develop into plants. The seeds produced by these plants will inherit the new DNA.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Correct	Correct	Incorrect
Ht-Bt cotton can tolerate Glyphosate, a herbicide variety, whose action kill only the weeds (Pink Bollworm), not the crop. It is an unauthorised GM crop.	Bt brinjal sowing is not allowed commercially by GEAC.	Genetic Engineering Appraisal Committee (GEAC) established under Environment Protection Act 1986. GEAC is the apex body which allows for commercial release of any GM crop in India. GEAC functions under Ministry of Environment, Forest and Climate Change (MoEFCC).

Q.16) Consider the following statements:

1. Fission is the process by which the sun and other stars generate light and heat.
2. Fusion is the splitting of a heavy, unstable nucleus into two lighter nuclei.

Which of the above statements is/are correct?

- a) Statement 1 is correct only
- b) Statement 2 is correct only
- c) Both the statements are correct
- d) Both the statements are incorrect

Q.16) Solution (d)

Basic Information:

Both the statements are incorrect

The word fusion means "a merging of separate elements into a unified whole". Nuclear fusion refers to the "union of atomic nuclei to form heavier nuclei resulting in the release of enormous amounts of energy." Fusion takes place when two low-mass isotopes, typically isotopes of hydrogen, unite under conditions of extreme pressure and temperature.

Nuclear fission takes place when a large, somewhat unstable isotope (atoms with the same number of protons but different number of neutrons) is bombarded by high-speed particles, usually neutrons. These neutrons are accelerated and then slammed into the unstable isotope, causing it to fission, or break into smaller particles.

Statement Analysis:

Statement 1	Statement 2
Incorrect	Incorrect
Fusion is the process by which the sun and other stars generate light and heat. It is a nuclear process, where energy is produced by smashing together light atoms..	Fission is the splitting of a heavy, unstable nucleus into two lighter nuclei.

Q.17) Consider the following statements:

1. Kaiga Atomic Power Station is located in Tamil Nadu.
2. Nuclear power is the fifth-largest source of electricity in India after coal, gas, hydroelectricity and wind power.
3. India has uranium supply agreement with Mongolia.

Which of the above statements is/are correct?

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

Q.17) Solution (c)

Basic Information:

Nuclear power plants are a type of power plant that use the process of nuclear fission in order to generate electricity. They do this by using nuclear reactors in combination with the Rankine cycle, where the heat generated by the reactor converts water into steam, which spins a turbine and a generator.

Statement Analysis:

Statement 1	Statement 2	Statement 3
Incorrect	Correct	Correct
<p>Kaiga Nuclear power plant is a nuclear power generating station situated at Kaiga, near the river Kali, in Uttara Kannada district of Karnataka, India.</p> <p>The plant has been in operation since March 2000 and is operated by the Nuclear Power Corporation of India.</p>	<p>Nuclear power is the fifth-largest source of electricity in India after coal, gas, hydroelectricity and wind power. As of November 2020, India has 22 nuclear reactors in operation in 7 nuclear power plants, with a total installed capacity of 6,780 MW.</p>	<p>India has uranium supply agreements with Russia, Mongolia, Kazakhstan, Argentina and Namibia.</p>

Q.18) Which of the following countries have signed civil nuclear cooperation agreement with India?

1. USA
2. Russia
3. Japan
4. Czech Republic

Select the correct code:

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

Q.18) Solution (d)

Basic Information:

Nuclear cooperation has brought a new dimension to India's diplomacy in the 21st century. India's status as a responsible nuclear power is predicated upon the civil relationships in the nuclear domain that it has established with major powers. This, despite not being a signatory to the Non-Proliferation Treaty and operating outside the ambit of the Nuclear Suppliers Group.

India is the only country with known nuclear weapons which is not a party to the Non-Proliferation Treaty (NPT) but is still allowed to carry out nuclear commerce with the rest of the world

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Correct	Correct	Correct	Correct
123 agreement' (also known as US-India Civil Nuclear Agreement) was signed in 2008.	India has also uranium supply agreements with Russia along with Civil nuclear cooperation	There was no civil nuclear cooperation agreement with Japan, and after six years of negotiations a full nuclear cooperation	India has civil nuclear cooperation agreement with Czech republic, Namibia along with 12 other nations

	agreements.	agreement was signed in November 2016.	
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Q.19) Select the correct statements from the following:

1. World Association of Nuclear Operators (WANO) is a not for profit, international organisation with a mission to maximise the safety and reliability of the world's commercial nuclear power plants.
2. China and USA have ratified Comprehensive Nuclear Test Ban Treaty (CTBT)

Choose from the below given options:

- a) 1 only
- b) 2 only
- c) Both 1 and 2
- d) Neither 1 not 2

Q.19) Solution (a)

Basic Information:

- World Association of Nuclear Operators was established on 15 May 1989 following the nuclear accident at Chernobyl (Ukraine). After the accident, nuclear operators worldwide began to work together through WANO to improve safety, reliability and prevent recurrences.
- Comprehensive Nuclear Test Ban Treaty is multilateral treaty banning all nuclear explosions for both military and civilian purposes. It was negotiated at the Conference on Disarmament in Geneva and was opened for signature in 1996.

Statement Analysis:

Statement 1	Statement 2
Correct	Incorrect

World Association of Nuclear Operators (WANO) is a not for profit, international organisation with a mission to maximise the safety and reliability of the world's commercial nuclear power plants.

Comprehensive Nuclear Test Ban Treaty can only come into force after it is ratified by eight countries with nuclear technology capacity, namely China, Egypt, India, Iran, Israel, North Korea, Pakistan and the United States.

Q.20) Consider the following statements about International Thermonuclear Experimental Reactor (ITER):

1. It is a collaboration of 133 nations launched in 1985
2. it is located in France
3. Its goal is to demonstrate the scientific and technological feasibility of fusion energy for peaceful use.
4. India is not a member of it.

Select the Incorrect code:

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

Q.20) Solution (a)

Basic Information:

ITER is international nuclear fusion research and engineering megaproject, which will be the world's largest magnetic confinement plasma physics experiment. It aims to build the world's largest tokamak to prove the feasibility of fusion as a large-scale and carbon-free source of energy.

The 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.

Statement Analysis:

Statement 1	Statement 2	Statement 3	Statement 4
Incorrect	Correct	Correct	Incorrect
It is a collaboration of 35 nations launched in 1985, not 133.	It is located in France.	Its goal is to demonstrate the scientific and technological feasibility of fusion energy for peaceful use.	The ITER members include China, the European Union, India , Japan, South Korea, Russia and the United States

Q.21) With reference to International Barcode of Life (iBOL), consider the following statements:

1. It is a research alliance involving nations to enable expansion of the global DNA reference database.
2. It is a Canadian not-for-profit corporation.
3. It signed a MoU with Zoological Survey of India (ZSI) for further efforts in DNA barcoding.

Which of the statements given above is/are correct?

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

Q.21) Solution (d)

Statement 1	Statement 2	Statement 3
Correct	Correct	Correct
iBOL is a research alliance involving nations that have committed both human and financial resources to enable expansion of the global	iBOL is a Canadian not-for-profit corporation which was established in 2008. iBOL maintains	Zoological Survey of India (ZSI) and iBOL have come together for further efforts in DNA barcoding, a methodology for rapidly and accurately identifying species by

reference database. Its objective is to transform biodiversity science by building the DNA barcode reference libraries, the sequencing facilities, the informatics platforms, and the analytical protocols.	the Barcode of Life Data System (BOLD).	sequencing a short segment of standardized gene regions and comparing individual sequences to a reference database. The MoU will enable ZSI to participate at the Global level programmes like Bioscan and Planetary Biodiversity Mission.
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Q.22) Recently the asafoetida (Heeng) cultivation was introduced in India for the first time in which of the following?

- Neora valley, West Bengal
- Lahaul valley, Himachal Pradesh
- Araku valley, Andhra Pradesh
- Narmada valley, Gujarat

Q.22) Solution (b)

Heeng is one of the widely used spices in Indian cuisine but the spice is not produced in the country. India imports around 1,200 tons of raw heeng annually from Afghanistan, Iran and Uzbekistan. India has taken up Heeng cultivation for the first-ever time, in an attempt to become self-reliant in the production of the spice and curb its imports.

- It is endemic to Iran and Afghanistan, which are also the main global suppliers of it. It thrives in dry and cold desert conditions.
- The first **Heeng (Asafoetida) plantation was done in the cold and dry region of Lahaul valley in Himachal Pradesh.**
- CSIR constituent laboratory, Institute of Himalayan Bioresource Technology (IHBT), Palampur, recently made history by introducing Heeng cultivation in Indian Himalayan region.

Q.23) With reference to ESG Funds, which of the following statements is/are correct?

- These are portfolios of equities and/or bonds for which economical, social and governance factors have been integrated into the investment process.

2. It is a kind of mutual fund and is regulated by Securities and Exchange Board of India (SEBI).
3. The first ESG mutual fund was launched by the Yes Bank.

Select the correct answer using the code given below:

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

Q.23) Solution (b)

Statement 1	Statement 2	Statement 3
Incorrect	Correct	Incorrect
<p>ESG funds are portfolios of equities and/or bonds for which environmental, social and governance factors have been integrated into the investment process. This means the equities and bonds contained in the fund have passed stringent tests over how sustainable the company or government is regarding its ESG criteria. Its investing is used synonymously with sustainable investing or socially responsible investing.</p>	<p>ESG is a combination of three words - Environment, Social and Governance. The ESG fund focuses on companies with environment-friendly practices, ethical business practices and an employee-friendly record. It is a kind of mutual fund and is regulated by Securities and Exchange Board of India (SEBI).</p>	<p>The first ESG mutual fund was launched by the State Bank of India - SBI Magnum Equity ESG Fund.</p>

Q.24) Which of the following country is *NOT* a member of Collective Security Treaty Organisation (CSTO)?

- a) Armenia
- b) Kazakhstan
- c) Kyrgyzstan

d) Uzbekistan

Q.24) Solution (d)

- Russian Navy along with Collective Security Treaty Organisation (CSTO) members has begun military exercises in the central waters of the Caspian Sea north of the Azerbaijani capital Baku.
- CSTO is an intergovernmental military alliance that was signed on 15 May 1992. This is also referred to as the “Tashkent Pact” or “Tashkent Treaty”.
- Current CSTO members are **Armenia, Belarus, Kazakhstan, Kyrgyzstan, the Russian Federation and Tajikistan**. Afghanistan and Serbia hold observer status in the CSTO.

Q.25) Recently discovered two new species of pipeworts, Eriocaulonparvicephalum & Eriocaulonkaraavalense are from which of the following region?

- a) Eastern Himalayas
- b) Andaman and Nicobar islands
- c) Western Ghats
- d) Sundarban National Park

Q.25) Solution (c)

- Scientists from Agharkar Research Institute, Pune have **recently discovered two new species of pipeworts from the Western Ghats of Maharashtra & Karnataka**.
- Researchers have named the species found in Maharashtra as Eriocaulonparvicephalum for its distinct minute inflorescence size. Karnataka counterpart has been named Eriocaulonkaraavalense indicating the Karaavali coastal region in the state.
- Pipeworts is a type of wetland plant belongs to genus Eriocaulon.
- Some of the previously-discovered plant species have medicinal values. They also have anti-inflammatory, anti-bacterial and anti-cancerous properties.
- Some 111 species exist in India, most of which are endemic to the Western Ghats and eastern Himalayas.

Q.26) With reference to SVAMITVA scheme consider the following statements:

1. It aims to provide an integrated property validation solution for rural India.

2. It is a centrally sponsored scheme.
3. Rural inhabited area would be mapped using drone by Indian Institute of Surveying and Mapping (IISM).

Which of the statements given above is/are correct?

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

Q.26) Solution (a)

Statement 1	Statement 2	Statement 3
Correct	Incorrect	Incorrect
The SVAMITVA (Survey of Villages and Mapping with Improved Technology in Village Areas) scheme aims to provide an integrated property validation solution for rural India , engaging the latest Drone Surveying technology, for demarcating the inhabitant (Aabadi) land in rural areas.	It is a Central Sector Scheme (100% by Union Government) implemented by Union Ministry of Panchayat Raj.	It aims to update the 'record-of-rights' in the revenue/property registers and issue property cards to the property owners in rural areas. Rural inhabited area would be mapped by Survey of India using drone.

Q.27) India's first Multi-Modal Logistic Park is coming up in which of the following State?

- a) Uttar Pradesh
- b) Madhya Pradesh
- c) Assam
- d) Kerala

Q.27) Solution (c)

- The **Multi Modal Logistic Park (MMLP) at Jogighopa in Assam** is the country's first international Multi-Modal Logistic Park under the Bharatmala Project of the Ministry of Road, Transport and Highways, Government of India.

Q.28) With reference to Global Nitrous Oxide (N₂O) Budget, consider the following statements:

1. It is an international collaboration between the International Nitrogen Initiative (INI) and United Nations Environment Programme (UNEP).
2. Highest growth rates in N₂O emissions come from western industrialized economies.

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.28) Solution (d)

Nitrous Oxide (N₂O) is a long-lived greenhouse gas (GHG) and an ozone-depleting substance. It is the third most important GHG, leading human-driven climate change, after carbon dioxide and methane.

Human emissions of N₂O increased by 30 per cent between 1980 and 2016. N₂O global concentration levels have increased from 270 parts per billion (ppb) in 1750 to 331 ppb in 2018, a jump of 20 per cent.

Statement 1	Statement 2
Incorrect	Incorrect
The Global N₂O Budget was conducted through an international collaboration between the International Nitrogen Initiative (INI) and the Global Carbon Project of Future Earth, a partner of the World Climate Research Programme. They	Dominant cause of increase is use of Nitrogen fertilizers in agriculture, including organic fertilizers from manure produced by livestock. Agricultural production contributed almost 70% to global anthropogenic N₂O emission (2007-2016). Highest growth rates in emissions come from emerging economies, particularly Brazil, China, and India, where there have

have also created a new activity and international consortium of scientists to establish and improve global N2O budget, trends and variability.

been large increases in crop production and livestock numbers. Emissions from Europe have decreased over the past two decades through policies to limit excess of fertilizer applications.

Q.29) The first-ever Ministerial Meeting of the G-20 Anti-Corruption Working Group (ACWG) was hosted by which of the following G20 member?

- a) Saudi Arabia
- b) Australia
- c) Japan
- d) France

Q.29) Solution (a)

- G-20 Anti-Corruption Working Group was established in June 2010 at the Toronto Summit of G-20.
- Its objective is to prepare comprehensive recommendations on how the G20 could continue to make practical and valuable contributions to international efforts to combat corruption.
- It is responsible for updating and implementing the G20 Anti-corruption Action Plan.
- It actively works with the World Bank Group, the Organisation for Economic Cooperation and Development (OECD), and other important Organisations.
- **Saudi Arabia hosted the first-ever Ministerial Meeting of the G-20 Anti-Corruption Working Group (ACWG) virtually in 2020.**

Q.30) Which of the following is/are benefits of Aquaponics?

1. It is water efficient.
2. It allows continuous production of food.
3. Its products alone are enough to ensure a balanced diet.
4. No reliance on mined and manufactured fertilizers.
5. It can be used on non-arable land.

Select the correct answer using the code given below:

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

Q.30) Solution (c)

- Aquaponics is an ecologically sustainable model that combines Hydroponics with Aquaculture i.e. it is a combination of aquaculture, which is growing fish and other aquatic animals, and hydroponics.
- With Aquaponics both fish and plants can grow in one integrated ecosystem. Fish waste from the aquaculture portion of the system is broken down by bacteria into dissolved nutrients that plants utilize to grow in a hydroponic unit.
- A pilot Aquaponics facility developed by Centre for Development of Advanced Computing (C-DAC), Mohali at Guru Angad Dev Veterinary University (GADVASU), Ludhiana.

Benefits of Aquaponics	Limitations of Aquaponics
i. It uses less than 10% of the water normally required for fish farming and plant production.	i. The very high initial start-up costs compared to both hydroponics and soil production systems.
ii. There is no toxic run-off from either hydroponics or aquaculture and creates little waste.	ii. It requires deep expertise in the natural world - knowledge of fish, bacteria and plant production.
iii. It can be used on non-arable land such as deserts, degraded soil or salty, sandy islands.	iii. It has fewer management options (an issue developed ahead) compared with stand-alone aquaculture or hydroponics;
iv. It allows continuous production of food and produces both a protein and vegetable crop.	iv. Mistakes managing the system can quickly cause its collapse;
v. Both fish and plants can be used for consumption and income generation.	v. Daily management is needed, which means the organization is crucial;
vi. All natural fertilizer sources from fish waste and no reliance on mined and manufactured fertilizers.	vi. It's energy demand, which means it has energy costs;
vii. Produce is free of pesticides and	vii. Fish feed needs to be purchased on a regular basis;

herbicides. It saves labour and time.	viii. The products of aquaponics alone aren't enough to ensure a balanced diet;
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Read the following three passages and answer the questions that follow each passage. Your answer to these questions should be based on passage only.

Passage 1

The casual horrors and real disasters are thrown at newspaper reader without discrimination. In the contemporary arrangements for circulating the news, an important element, evaluation is always weak and often wanting entirely. There is no point anywhere along the line somewhere someone put his foot down for certain and says, "This is important and that does not amount to row of beans; deserves no one's attention, and should travel the wires no farther". The junk is dressed up to look as meaningful as the real news.

Q.31) The writer of the above passage

- a) seems to be happy with the contemporary arrangements for circulating news
- b) is shocked by the casual stories about horrors and disasters reported in the newspapers
- c) wants better evaluation of news before publication
- d) wants to put his foot down on news stories

Q.31) Solution (c)

Option a is wrong and option b does not give the whole idea of the passage. Option d is also wrong as it is not mentioned in the passage but option c explains the whole idea of the passage. Hence option c is the correct answer.

Passage 2

Internet banking is the term used for new age banking system. Internet banking is also called as online banking and it is an outgrowth of PC banking. Internet banking uses the internet as the delivery channel by which to conduct banking activity, for example, transferring funds, paying bills, viewing checking and savings account balances, paying mortgages and purchasing financial instruments and certificates of deposits. Internet banking is a result of explored possibility to use internet application in one of the various domains of commerce. It is difficult to infer whether the internet tool has been applied for convenience of bankers or for the customers' convenience. But ultimately it contributes in increasing the efficiency of the banking operation as well providing more convenience to customers. Without even interacting with the bankers,

customers transact from one corner of the country to another corner.

There are many advantages of online banking. It is convenient, it isn't bound by operational timings, there are no geographical barriers and the services can be offered at a minuscule cost. Electronic banking has experienced explosive growth and has transformed traditional practices in banking

Q.32) Which of the following is not an advantage of online banking?

- a) It is convenient.
- b) It is bound by operational timings.
- c) The services can be offered at a minimum cost.
- d) There is no geographical barrier.

Q.32) Solution (b)

In evident from the 2nd sentence of the 2nd paragraph of the passage that one of the advantages of internet banking is that it is not bound by operational timings and which is exactly opposite to what the option B says.

Passage 3

Harold a professional man who had worked in an office for many years had a fearful dream. In it, he found himself in a land where small slug-like animals with slimy tentacles lived on people's bodies. The people tolerated the loathsome creatures because after many years they grew into elephants which then became the nation's system of transport, carrying everyone wherever he wanted to go. Harold suddenly realised that he himself was covered with these things, and he woke up screaming. In a vivid sequence of pictures this dream dramatized for Harold what he had never been able to put in to words; he saw himself as letting society feed on his body in his early years so that it would carry him when he retired. He later threw off the "security bug" and took up freelance work.

Q.33) In his dream Harold found the loathsome creatures

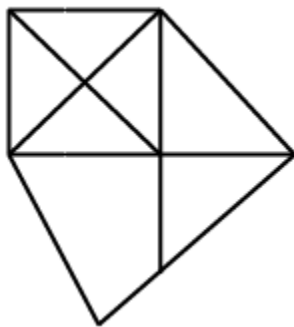
- a) In his village
- b) In his own house
- c) In a different land
- d) In his office

Q.33) Solution (c)

He found himself in a land where small slug like animal.....

'a land' refers to unknown piece of land.

Q.34) How many triangles are there in the given figure?



- a) 12
- b) 13
- c) 14
- d) 15

Q.34) Solution (b)

Triangles at the diagonal of the square = 4

Triangles formed by combining 2 triangles (at the right) = 1

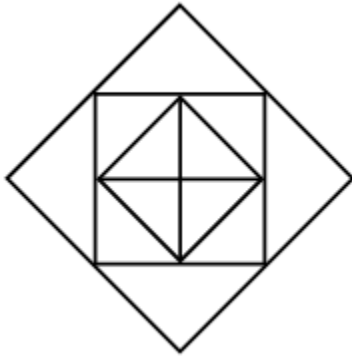
Triangles formed by combining 1 triangles and 1 quadrilateral (at the bottom) = 1

Triangles formed by combining 3 triangles = 1

Smaller triangles = 6

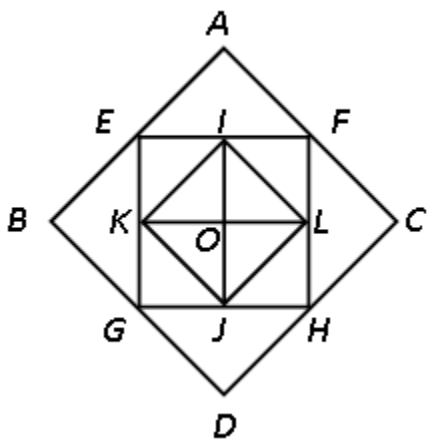
Thus, total triangles = 4 + 1 + 1 + 1 + 6 = 13

Q.35) How many triangles are there in this figure?



- a) 11
- b) 15
- c) 16
- d) 18

Q.35) Solution (c)



Small triangles = (AEF, AEG, GDH, CFH), (IEK, IFL, JLH, JKG), (IOK, IOL, JOL, KOJ)

Big triangles = IKL, JKL, IJK, IJL

Thus, total triangles = 16