



# IASBABA

One Stop Destination for UPSC/IAS Preparation

## 60 Days Week-9 & 10 Compilation



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**Q.1) Consider the following statements with regard to virus -**

1. Virus can infect plant, bacteria and fungus.
2. Coronavirus is DNA based virus.
3. Virus lacks enzymes essential for the energy production.

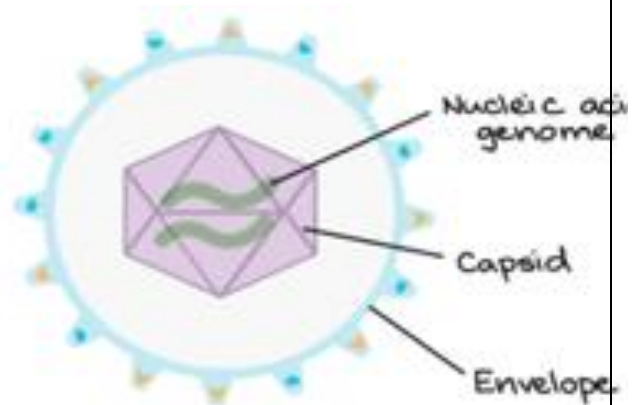
**Select the correct option -**

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

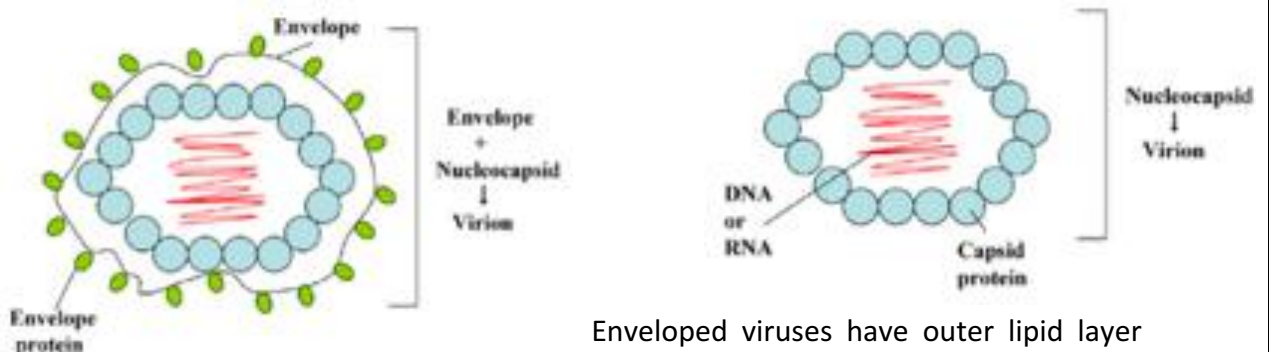
Q.1) Solution (b)

**Basics of Virus**

- Virus does not have DNA producing machinery. So it enters into the cell and uses the machinery of the cell. It does so by reprogramming the host DNA instead of producing its own DNA cell.
- Because they can't reproduce by themselves, viruses are not considered living.
- Viral particles consist of two or three parts:
  - **the genetic material made from either DNA or RNA.**
  - a protein coat, called the capsid, which surrounds and protects the genetic material
  - an envelope of lipids that surrounds the protein coat when they are outside a cell



Virus could be Enveloped viruses and naked virus depending on presence and absence of outer lipids layer.

**Enveloped viruses and naked virus**

of

They can only survive under special conditions ("wet conditions") and they are generally

transmitted in "wet" body fluids, like blood or respiratory droplets. Naked viruses can survive under harsh conditions.

The protein capsid of naked viruses is less susceptible to environmental conditions (lipid solvents, pH, temperature etc) than enveloped viruses. Example of naked virus – **norovirus, rotavirus, Human papillomavirus (HPV) and polio** etc

### **CORONAVIRUS**

- Large family of viruses, first identified in the 1960s.
- Can infect both animals and humans.
- It is **RNA based virus**.
- It causes illness ranging from the common cold to more severe respiratory illness like **SARS & MERS**.
- Almost everyone gets a coronavirus infection at least once in their life, most likely as a young child. (

### **NOVEL CORONAVIRUS – COVID-19**

- A new strain that has not been previously identified in humans.
- First detected in Wuhan, China.
- Relative of SARS
- The novel coronavirus like any other **corona virus has its genetic material as a single-stranded RNA**.
- The challenge with RNA virus as compared to DNA virus is that RNA viruses are prone to quick changes and thus continuously mutating into new forms.

### **Q.2) Consider the following statements –**

1. Hemoglobin is also found outside red blood cells.
2. The mammalian hemoglobin molecule can bind (carry) up to four oxygen molecules.
3. Largest amount of CO<sub>2</sub> produced in the cell are carried to the lungs as bicarbonate ions dissolved in the plasma.
4. Both RBC and WBC are produced in bone marrow.

### **Which of the above is/are correct?**

- a) 2 and 3 only
- b) 1, 2 and 3 only
- c) 2, 3 and 4 only
- d) All of the above

### **Q.2) Solution (d)**

### **Hemoglobin**

- Hemoglobin is the iron-containing oxygen-transport metalloprotein in the red blood cells of all vertebrates
- Hemoglobin in the blood carries oxygen from the respiratory organs (lungs or gills) to the rest of the body
- 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).
- The mammalian hemoglobin molecule can bind (carry) up to four oxygen molecules.
- Hemoglobin is involved in the transport of other gases: **It carries some of the body's respiratory carbon dioxide** as carbaminohemoglobin, in which CO<sub>2</sub> is bound to the globin protein. (Largest amount of CO<sub>2</sub> produced in the cell are carried to the lungs as bicarbonate ions dissolved in the plasma).
- **The molecule also carries the important regulatory molecule nitric oxide** bound to a globin protein thiol group, releasing it at the same time as oxygen.
- **Hemoglobin is also found outside red blood cells.** In these tissues, hemoglobin has a non-oxygen-carrying function as an antioxidant and a regulator of iron metabolism.
- A variant of the molecule, called **leghemoglobin**, is used to scavenge oxygen away from anaerobic systems, such as the nitrogen-fixing nodules of leguminous plants, before the oxygen can poison (deactivate) the system.
- Hemoglobin (Hb) is synthesized in a complex series of steps. The heme part is synthesized in a series of steps in the mitochondria and the cytosol of immature red blood cells, while the globin protein parts are synthesized by ribosomes in the cytosol.

Largest amount of CO<sub>2</sub> produced in the cell are carried to the lungs as bicarbonate ions dissolved in the plasma.

**Q.3) Consider the following elements –**

1. Carbon
2. Oxygen
3. Phosphorous
4. Nitrogen
5. Sulphur
6. Boron

**Which of the above are present in DNA?**

- a) 1, 2 and 4 only
- b) 1, 2, 3 and 4 only
- c) 1, 2, 3, 4 and 6 only
- d) 1, 2, 3, 4 and 5 only

**Q.3) Solution (b)**

DNA does not contain sulphur. It is made up of Carbon, hydrogen, oxygen and Nitrogen and phosphorous. Proteins do contain sulphur.

**Q.4) Consider the following pairs –**

Metal	Function
1. Boron	Pollen germination
2. Manganese	Component of nitrogenase
3. Molybdenum	Splitting of H <sub>2</sub> O to liberate O <sub>2</sub> during photosynthesis
4. Zinc	Needed for synthesis of auxins
5. Iron	Present in Haemoglobin molecule and attach to oxygen and carbondioxide molecules.

Which of the above are correctly

matched?

- 1, 4 and 5 only
- 1, 2, 4 and 5 only
- 1 and 4 only
- All of the above

**Q.4) Solution (c)**

Metal	Function
1. Boron	Pollen germination
2. Manganese	Splitting of H <sub>2</sub> O to liberate O <sub>2</sub> during photosynthesis
3. Molybdenum	Component of nitrogenase
4. Zinc	Needed for synthesis of auxins
5. Iron	Present in Haemoglobin molecule and attach to oxygen molecules (NOT carbondioxide molecules).

Haemoglobin carries some of the body's

respiratory carbon dioxide as carbaminohemoglobin, in which CO<sub>2</sub> is bound to the globin protein.

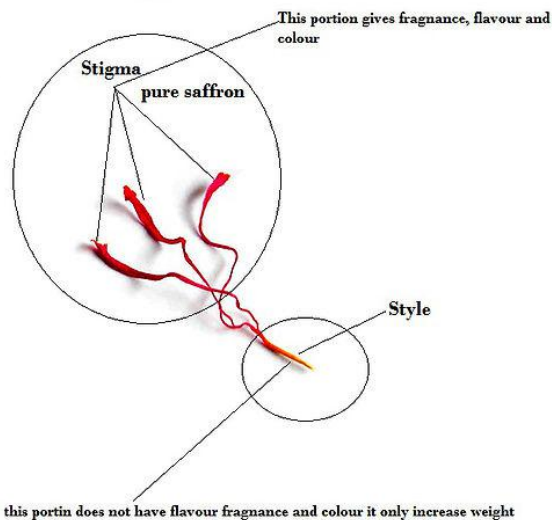
**Q.5) Saffron is which part of the flower?**

- Stigma
- Style
- Sepal
- filament



**Q.5) Solution (a)**

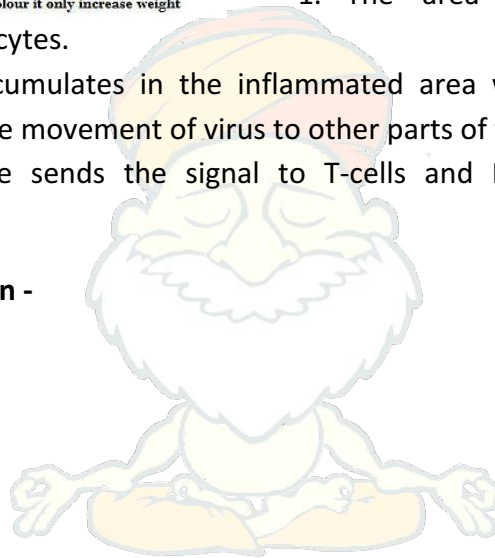
Saffron is stigma of flower.

**Q.6) In which of the following ways inflammation can help in fighting infection?**

1. The area of infection gets more accessible to leucocytes.
2. Plasma protein accumulates in the inflamed area which creates a protective layer, restricting the movement of virus to other parts of the body.
3. Inflamed tissue sends the signal to T-cells and B-cells to initiate immune response.

**Selected the correct option -**

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

**Q.6) Solution (a)****Inflammation**

Inflammation is part of the body's defense mechanism and plays a role in the healing process. When the body detects damage or pathogens, cells of the immune system travel to the site of injury or infection and cause inflammation. Cytokines are produced when innate immune defenses are activated. The rapid release of cytokines at the site of infection initiates new responses with far-reaching consequences that include inflammation.

**Inflammation and immune response**

- Tissues accumulate plasma proteins, leading to a buildup of fluid those results in swelling.
- Small blood vessels enlarge to enable leukocytes and plasma proteins to reach the injury site more easily.

- The body releases neutrophils, a type of white blood cell, or leukocyte, which move toward the affected area. Leukocytes contain molecules that can help fight pathogens.

**Statement 2** is completely imaginary and incorrect.

**Statement 3 is also incorrect.** Anti-bodies when binds with antigens, signals are sent to T-cells and B-cells to initiate immune response.

**Q.7) Which of the following statement (s) is/are correct about "convalescent plasma therapy" ?**

1. It was applied for the first time in case of Ebola.
2. WBC and blood plasma are transferred to the patient from the donor.
3. Convalescent plasma has the antigen of the infection causing virus.

**Select the correct option -**

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

**Q.7) Solution (d)**

**Usage of convalescent plasma in the past**

The plasma therapy was most famously used during the 1918 Spanish flu pandemic. It was also used during the Ebola epidemic, which started in 2013 and in 2003 against SARS. Even now, there is no vaccine or cure for SARS. The plasma therapy is also used against measles, bacterial pneumonia and numerous other infections before modern medicine came along.

**What is convalescent plasma?**

Those people who have recovered from COVID-19 have **antibodies** to the disease in their blood. Doctors call this convalescent plasma.

Researchers hope that convalescent plasma can be given to people with severe COVID-19 to boost their ability to fight the virus.

The neutralizing antibodies that when extracted via plasma and transfused on to others with the infection can help their immune system fight it off.

In a plasma-only donation, the liquid portion of the donor's blood is separated from the cells. Blood is drawn from one arm and sent through a high-tech machine that collects the plasma. **The donor's red blood cells and platelets are then returned to the donor along with some saline.** The process is safe and only takes a few minutes longer than donating whole blood.

**Q.8) Which of the following are the functions of the blood plasma?**

1. Maintaining blood pressure
2. Delivering important protein for blood clotting
3. Maintenance of pH in the body
4. Carrying oxygen to the body from the lungs.

**Select the correct option -**

- a) 1 and 2 only
- b) 1, 2 and 3 only
- c) 1, 2 and 4 only
- d) All of the above

**Q.8) Solution (b)**

Blood plasma is a yellowish liquid component of blood that holds the blood cells in whole blood in suspension. It is the liquid part of the blood that carries cells and proteins throughout the body. It makes up about 55% of the body's total blood volume.

Plasma is about 92% water. It also contains 7% vital proteins such as albumin, gamma globulin and anti-hemophilic factor, and 1% mineral salts, sugars, fats, hormones and vitamins.

Plasma serves four important functions in our bodies:

- Helps maintain blood pressure and volume.
- Supply critical proteins for blood clotting and immunity.
- Carries electrolytes such as sodium and potassium to our muscles.
- Helps to maintain a proper pH balance in the body, which supports cell function.

Note - **Oxygen is transported by RBC.**

**Q.9) Consider the following statements –**

1. The RT-PCR test detects the presence of antibodies in a patient to identify the infection
2. RT-PCR tests are effective only in the later stages of the infection after the immune system has responded by synthesizing antibodies.

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

- a) 1 only
- b) 2 only



- c) Both 1 and 2
- d) Neither 1 nor 2

### Q.9) Solution (d)

#### RT-PCR Test: Basics

Real time RT-PCR (Reverse transcription–polymerase chain reaction) is a nuclear-derived method for detecting the presence of specific genetic material from any pathogen, including a virus

- Normally DNA holds information about ingredients that make up a living being. The information coded in the DNA is converted into functional proteins in a living being which is called as gene expression.
- The process of gene expression happens in 2 processes namely transcription and translation. In the 1<sup>st</sup> step the information coded in the DNA is transcribed on to RNA in the nucleus. The job of copying this information onto RNA is done by an enzyme in the nucleus called RNA polymerase.
- Now in order to detect the presence of a viral infection the PCR test (Polymerase Chain Reaction) is used which detects the genetic material (DNA) from the samples collected from the patients. Usually the DNA from the patient's sample is collected and multiplied manifold using PCR which is then detected by a probe.
- In case of SAR-COV 2 the virus is an RNA virus which cannot be replicated using PCR. Thus the RNA is reverse-transcribed into DNA which can then be multiplied and then be used for detection using molecular testing.

#### Advantage of PCR Test over Rapid-Antibody Testing

In case of PCR tests it is the presence of an antigen in the infected patient that is tested for instead of the presence of antibodies which is done in case of Rapid Antibody testing. Detecting the presence of antigen can detect the infection early. Body will take some time to produce antibody. So detecting antibody may not confirm infection in early phase.

### Q.10) Which of the following correctly describe the term 'herd immunity' in context of infectious diseases?

- a) Immunity towards those diseases which have been already eradicated.
- b) Immunity towards that disease which occur every year.
- c) Resistance to the spread of a contagious disease as sufficiently high proportion of population has become immune to the disease.
- d) Resistance to the spread of a contagious disease as sufficiently high proportion of population has been vaccinated.

### Q.10) Solution (c)

Herd immunity refers to the resistance to the spread of a contagious disease within a population that results if a sufficiently high proportion of individuals have become immune to the disease.

As herd immunity increases in the community, many infected persons will not find another person to infect during the entire infective period. Consequently, there will be few new cases arising and existing cases will recover or die. Spread of the disease will slow down and the pandemic will end.

Herd immunity can be achieved with or without vaccines.

**Q.11) Consider the following statements regarding vaccine –**

1. A vaccine is a biological preparation that provides active acquired immunity to a particular infectious disease.
2. A vaccine always contains disease-causing microorganism.

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

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

**Q.11) Solution (b)**

A vaccine is a biological preparation that improves immunity to a particular disease.

A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters.

Vaccines are made using several different processes. Some of them are discussed below:

Type of vaccine	How it is processed?	Diseases covered
<b>Live attenuated vaccines</b>	Live, attenuated vaccines contain a version of the living microbe that has been weakened in the lab so it can't cause disease.	Measles, mumps, rubella (MMR combined vaccine) Varicella (chickenpox) Influenza (nasal spray) Rotavirus
<b>Inactivated vaccines</b>	It is produce inactivated vaccines by killing the disease-causing microbe with chemicals, heat, or radiation. Inactivated vaccines usually don't require refrigeration, and they can be easily stored and transported in a freeze-dried form, which makes them accessible to people in	Hepatitis A, Influenza, Pneumococcal polysaccharide

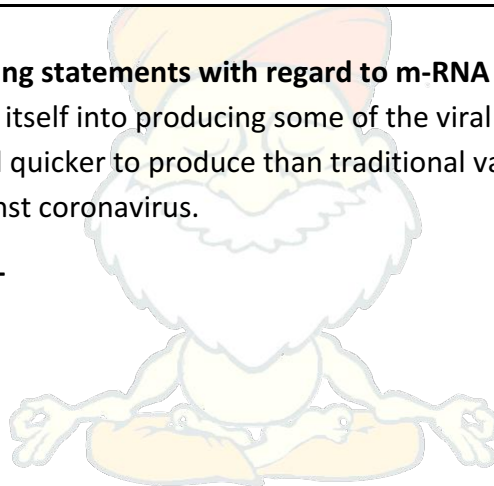
	developing countries.	
Sub-unit vaccine	Instead of the entire microbe, subunit vaccines include only the antigens that best stimulate the immune system.	Hepatitis B
Toxoid vaccines	<b>Toxoid vaccines</b> contain a toxin or chemical made by the bacteria or virus. They make a person immune to the harmful effects of the infection, instead of to the infection itself.	Diphtheria and tetanus
Polysaccharide Vaccines	Polysaccharide vaccines are a unique type of inactivated subunit vaccine composed of long chains of sugar molecules that make up the surface capsule of certain bacteria.	pneumococcal disease, meningococcal disease, and Salmonella Typhi
<b>Biosynthetic vaccines</b>	<b>Biosynthetic vaccines</b> contain manmade substances that are very similar to pieces of the virus or bacteria.	HIV

**Q.12) Consider the following statements with regard to m-RNA Vaccine –**

1. It triggers the body itself into producing some of the viral proteins.
2. It will be easier and quicker to produce than traditional vaccines.
3. It can be used against coronavirus.

**Select the correct option –**

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



**Q.12) Solution (d)**

**Note** – a number of RNA vaccines are under development to combat the 2019–20 coronavirus pandemic. This is a very important topic for coming prelims examination.

**What is m-RNA?**

- Every cell in an organism contains all of the information needed to manufacture every protein in its body.
- The DNA is the storehouse of information, an instruction book to build these proteins.
- The message to build these proteins from DNA to the cytoplasm of the cell is carried by a middle man called m-RNA.

**m-RNA based Vaccines**

A vaccine basically trains the immune system to recognize parts of a virus (antigen) and fight it before it enters the cell.

An RNA vaccine is a novel type of vaccine which is composed of the nucleic acid RNA, packaged within a vector such as lipid nanoparticles.

Traditional vaccines are made up of small or inactivated doses of the whole disease-causing organism, or the proteins that it produces, which are introduced into the body to provoke the immune system into mounting a response.

mRNA vaccines, in contrast, trick the body into producing some of the viral proteins itself. They work by using mRNA, or messenger RNA, which is the molecule that essentially puts DNA instructions into action. Inside a cell, mRNA is used as a template to build a protein. 'An mRNA is basically like a pre-form of a protein and its (sequence encodes) what the protein is basically made of later on.

To produce an mRNA vaccine, scientists produce a synthetic version of the mRNA that a virus uses to build its infectious proteins. This mRNA is delivered into the human body, whose cells read it as instructions to build that viral protein, and therefore create some of the virus's molecules themselves. These proteins are solitary, so they do not assemble to form a virus. The immune system then detects these viral proteins and starts to produce a defensive response to them.

There are two parts to our immune system: **innate** (the defenses we're born with) and **acquired** (which we develop as we come into contact with pathogens). Classical vaccine molecules usually only work with the acquired immune system and the innate immune system is activated by another ingredient, called an adjuvant. Interestingly, **mRNA in vaccines could also trigger the innate immune system**, providing an extra layer of defence without the need to add adjuvants.

All kinds of innate immune cells are being activated by the mRNA. This primes the immune system to get prepared for an endangering pathogen and thus the type of immune response that is triggered is very strong.

And **by getting the human body to produce the viral proteins itself, mRNA vaccines cut out some of the manufacturing process** and should be easier and quicker to produce than traditional vaccines.

**So far, no such vaccine has been licensed for infectious disease.**

**Q.13) Which organelle in the cell other than nucleus contains DNA?**

1. Mitochondria
2. Chloroplasts
3. Ribosome
4. Lysosome

**Select the correct option?**

- a) 1 only

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

**Q.13) Solution (b)**

Although the vast majority of DNA in most eukaryotes is found in the nucleus, some DNA is present within the mitochondria of animals, plants, and fungi and within the chloroplasts of plants.

**Q.14) Assertion (A) – In three parent baby, embryo would get a small amount of healthy mitochondrial DNA from a woman donor, apart from receiving the usual nuclear DNA from its mother and father**

**Reason (R) - Mitochondria from sperm are destroyed shortly after fertilisation.**

**Select the correct option –**

- a) A is true, R is True and A is the correct explanation of R
- b) A is true, R is True but A is not the correct explanation of R
- c) A is true, R is false
- d) A is false, R is true.

**Q.14) Solution (a)****THREE PARENT BABY**

Apart from receiving the usual “nuclear” DNA from its mother and father, the embryo would also include a small amount of healthy mitochondrial DNA from a woman donor.

This is resorted to when the actual mother is suffering from an incurable mitochondrial disease.

This technique involves removing the faulty mitochondrial DNA from the actual mother and nucleus from the mother’s egg and the resultant egg fertilizes with the sperm cell of the father outside the body (in-vitro).

Although both sperm and egg cells contain mitochondria, the mitochondria from the sperm are broken down shortly after fertilisation, which means that all the mitochondria, and all the copies of the mitochondrial DNA in the fertilised egg are from the mother.

**Q.15) What is the fundamental need of oxygen in animals?**

- a) Maintenance of blood pressure.
- b) Production of new cells.
- c) Conversion of food into useful energy.
- d) Prevention of cancer

**Q.15) Solution (c)**



Oxygen, with the formula  $O_2$ , makes up about one fifth of Earth's atmosphere. Oxygen is essential for animal life: it is used by the mitochondria present in virtually all animal **cells in order to convert food into useful energy**. Otto Warburg, the recipient of the 1931 Nobel Prize in Physiology or Medicine, revealed that this conversion is an enzymatic process.

**Q.16) The fundamental property of our immune system is the ability to discriminate “self” from “non-self” so that invading bacteria, viruses and other pathogens can be attacked and eliminated. T-cells, a type of white blood cell, are key players in this defense. T-cells have receptors that bind to structures recognized as non-self and such interactions trigger the immune system to engage in defense. Other proteins functions as brakes on the T-cells, inhibiting immune activation. This intricate balance between accelerators and brakes is essential for tight control. It ensures that the immune system is sufficiently engaged in attack against foreign microorganisms while avoiding the excessive activation that can lead to autoimmune destruction of healthy cells and tissues.**

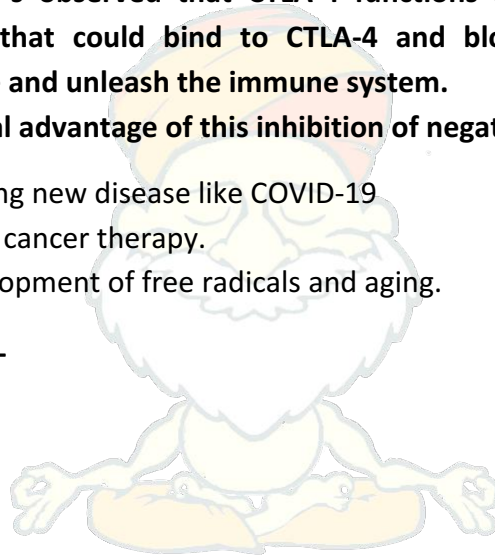
**James P. Allison in 1990's observed that CTLA-4 functions as a brake on T cells. He developed an antibody that could bind to CTLA-4 and block its function. This will disengage the T-cell brake and unleash the immune system.**

**What could be the medical advantage of this inhibition of negative immune regulation?**

1. It can help in fighting new disease like COVID-19
2. It can be utilised in cancer therapy.
3. It can reduce development of free radicals and aging.

**Select the correct option –**

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



**Q.16) Solution (c)**

Antibodies against CTLA-4 block the function of the brake leading to activation of T cells and attack on cancer cells. Mice with cancer had been cured by treatment with the antibodies that inhibit the brake and unlock antitumor T-cell activity. In 2010 an important clinical study showed striking effects in patients with advanced melanoma, a type of skin cancer. In several patients signs of remaining cancer disappeared.

The 2018 Nobel Prize in Physiology or Medicine was jointly given to James P. Allison and Tasuku Honjo for their discovery of **cancer therapy by inhibition of negative immune regulation**.

**Statement 1 is incorrect** as new diseases can be fought only when these is acquired immunity against the disease and not just by increasing the immune response.

**Statement 3 is incorrect** – Nothing like that! Antioxidants — such as vitamins C and E and carotenoids, which include beta-carotene, lycopene and lutein — help protect healthy cells from damage caused by free radicals.

**Q.17) Which of the following are parts of innate immunity?**

1. Skin
2. Acid in the stomach
3. B-lymphocytes and T-lymphocytes.
4. Cytokine Barriers
5. Antibodies

**Select the correct option?**

- a) 1, 2 and 3 only
- b) 1, 2 and 4 only
- c) 1, 2, 4 and 5 only
- d) All of the above

**Q.17) Solution (b)**

**Innate immunity**

- **Physical Barriers:** Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.
- **Physiological Barriers:** Acid in the stomach, saliva in the mouth, tears from eyes-all prevent microbial growth.
- **Cellular Barriers:** Certain types of **leukocytes** (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and **monocytes** and natural killer (type of lymphocytes) in the blood as well as **macrophages** in tissues can **phagocytose** and destroy microbes.
- **Cytokine Barriers:** Virus-infected cells secrete proteins called **interferons** which protect non-infected cells from further viral infection.

**Acquired Immunity**

- Acquired immunity is pathogen specific. It is characterized by memory. This means that our body when it encounters a pathogen for the first time produces a response called primary response which is of low intensity.
- Subsequent encounter with the same pathogen elicits a highly intensified secondary or anamnestic response. This is ascribed to the fact that our body appears to have memory of the first encounter.

- The primary and secondary immune responses are carried out with the help of two special types of lymphocytes present in our blood, i.e., B-lymphocytes and T-lymphocytes.
- The B-lymphocytes produce an army of proteins in response to pathogens into our blood to fight with them. These proteins are called Antibodies [a blood protein produced by the body in response to and counteracting an antigen].
- The T-cells themselves do not secrete antibodies but help B cells produce them.
- Each antibody molecule has four peptide chains, two small called light chains and two longer called heavy chains. Hence, an antibody is represented as H<sub>2</sub>L<sub>2</sub>.
- Different types of antibodies are produced in our body. IgA, IgM, IgE, IgG are some of them.
- Because these antibodies are found in the blood, the response is also called as humoral immune response. This is one of the two types of our acquired immune response – antibody mediated. The second type is called cell-mediated immune response or cell mediated immunity (CMI). The T-lymphocytes mediate CMI.
- Very often, when some human organs like heart, eye, liver, kidney fail to function satisfactorily, transplantation is the only remedy to enable the patient to live a normal life. Then a search begins – to find a suitable donor. Why is it that the organs cannot be taken from just anybody? What is it that the doctors check?
- Grafts from just any source – an animal, another primate, or any human beings cannot be made since the grafts would be rejected sooner or later. Tissue matching, blood group matching are essential before undertaking any graft/transplant and even after this the patient has to take immuno-suppressants all his/her life. The body is able to differentiate 'self' and 'nonself' and the cell-mediated immune response is responsible for the graft rejection.

**Q.18) Consider the following statements –**

1. It is possible to make numerous copies of a DNA molecule in laboratory.
2. Base excision repair is a cellular mechanism that repairs damaged DNA by in vivo gene editing.

**Select the correct option –**

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

**Q.18) Solution (a)**

In 1983, Kary Mullis discovered the polymerase chain reaction (PCR), a process that allows scientists to make numerous copies of DNA molecules that they can then study. Today, PCR is used for

- Making lots of DNA for sequencing
- Finding and analyzing DNA from very small samples for use in forensics
- Detecting the presence of disease-causing microbes in human samples
- Producing numerous copies of genes for genetic engineering

Base excision repair is a cellular mechanism, studied in the fields of biochemistry and genetics, that repairs damaged DNA throughout the cell cycle. It is responsible primarily for removing small, non-helix-distorting base lesions from the genome. (This is not gene editing)

CRISPR gene editing is a genetic engineering technique in molecular biology by which the genomes of living organisms may be modified. It is based on a simplified version of the bacterial CRISPR-Cas9 antiviral defense system. By delivering the Cas9 nuclease complexed with a synthetic guide RNA (gRNA) into a cell, the cell's genome can be cut at a desired location, allowing existing genes to be removed and/or new ones added in vivo.

**Q.19) Recombinant DNA is the general name for taking a piece of one DNA, and combining it with another strand of DNA. Recombinant DNA technology allows genes to be transferred:**

1. From species of plant to another.
2. From microorganisms to higher organisms
3. From animals to plants

**Select the correct answer using the codes given below.**

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

**Q.19) Solution (d)**

Recombinant DNA is the general name for taking a piece of one DNA, and combining it with another strand of DNA. Examples of these methods are:-

- The gene 'Chitinase' has source organism 'Rice' and characteristic conferred on transformed plants is fungal resistance.
- The gene '2'-5' oligoadenylate synthetase' has source organism 'Rat' and characteristic conferred on transformed plants is Virus resistance .
- Human Proteins 'Somatostatin' have been synthesized from genes in bacteria and used in the treatment of Growth disorders.

**Q.20) There has been widespread resistance in malarial parasite to drugs like chloroquine. This has encouraged attempts to develop a malarial vaccine. However it is difficult to develop an effective malaria vaccine. Which of the following is the most appropriate explanation?**

- Malaria is caused by several species of Plasmodium, mutating at rapid rate.
- We lack naturally acquired protective immunity against the plasmodium
- Vaccines can be developed only against virus.
- Plasmodium does not release any nuclear material for antigen development in the body.

**Q.20) Solution (b)**

For most infectious diseases for which effective vaccines are available, a single infection confers long standing protective immunity. A person who had measles does not develop measles again. This type of sterile protective immunity does not exist for malaria. We lack naturally acquired protective immunity against the plasmodium or other malarial parasites. Plasmodium has its own ingenious way of avoiding hosts' immune response and that is why it has been very difficult.

**Q.21) Consider the following statement(s) with regard Indian Data Relay Satellite System (IDRSS) –**

- It enabling satellite to satellite communication and transfer of data.
- IDRSS satellites will be placed in geostationary orbit.
- India will be the third country to have Data Relay Satellite System.

**Select the correct option –**

- 1 only
- 1 and 2 only
- 1 and 3 only
- All of the above

**Q.21) Solution (b)**

India plans for its own space-to-space tracking and communication of its space assets this year by putting up a new satellite series called Indian Data Relay Satellite System (IDRSS).

About IDRSS

- A set of 2 IDRSS satellites will be placed in **geostationary orbit**, enabling **satellite to satellite communication** and transfer of data.
- It will track, send and receive real-time information from other Indian satellites, in particular those in low-earth orbits (LEO) which have limited coverage of earth.
- It will also be useful in monitoring launches and benefitting crew members of the Gaganyaan mission ensuring mission control throughout their travel.



- It is also significant for space docking, space station, as well as distant expeditions to moon, Mars and Venus.
- It will also reduce the dependence on the ground stations in tracking satellites.
- First satellite will be launched by 2020 end and second one by 2021.
- **India will join US, China, Japan and Europe who already have such DRS systems.**

**Q.22) “This type of computing means taking real-time decisions close to the source of data. By locating computational intelligence close to the individual and different sources of the data, it reduces latency in the implementation of a requested service. Instead of sending data through the entire core network to the cloud for processing, it uses a distributed network architecture to ensure near-real-time processing with reduced delays, which would otherwise simply not be acceptable for the specific service.”**

**Which technology has been depicted in the above paragraph?**

- Cloud Computing
- Quantum Computing
- Edge Computing
- Nano computing

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**Q.22) Solution (c)**

The word edge in this context means literal geographic distribution. Edge computing is computing that’s done at or near the source of the data, instead of relying on the cloud at one of a dozen data centers to do all the work. It doesn’t mean the cloud will disappear. It means the cloud is coming to you.

Edge computing enables data to be analyzed, processed and transferred at the edge of a network. The basic difference between edge computing and cloud computing lies in where the data processing takes place. In Edge computing, The idea is to analyze data locally, closer to where it is stored, in real-time without latency, rather than send it far away to a centralized data centre.

So whether you are streaming a video on Netflix or accessing a library of video games in the cloud, edge computing allows for quicker data processing and content delivery. Hence statement 1 is correct.

At the moment, the existing Internet of Things (IoT) systems performs all of their computations in the cloud using data centers. Edge computing, on the other hand, essentially manages the massive amounts of data generated by IoT devices by storing and processing data locally. That data doesn't need to be sent over a network as soon as it processed; only important data is sent — therefore, an edge computing network reduces the amount of data that travels over the network.

**Q.23) Consider the following pairs –**

Satellite	Function
1. RISAT	Can take pictures of the earth during day and night and also under cloudy conditions.
2. GISAT-1	Continuous observation of Indian subcontinent from Geostationary orbit.
3. XPoSat	dedicated mission to study polarisation

**Which of the above has been correctly matched?**

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

**Q.23) Solution (d)**

The RISAT satellites are equipped with a Synthetic Aperture Radar (SAR) that can take pictures of the earth during day and night and also under cloudy conditions.

RISAT-2BR1 is the second radar imaging satellite in the RISAT-2B series and along with the CARTOSAT-3 is part of a group of satellites that will boost India's earth imaging capabilities from space.

The satellite will help in agriculture, mining, forestry and coastal management, soil monitoring, disaster management support and round the clock border surveillance.

In the past decade, ISRO has launched two satellites in the RISAT series, beginning in 2009 with the Israeli-built RISAT 2, and the second one, RISAT 1, in 2012. The RISAT 1 is no longer operational.

Risat-2 is a military satellite which was fast tracked after the Mumbai terrorist incident to boost surveillance capabilities of security forces.

**Geo Imaging Satellite (GISAT-1)**

- It is planned Indian earth observing satellite to facilitate continuous observation of Indian subcontinent, quick monitoring of natural hazards and disaster.
- It will be the first of two planned Indian Earth Observatory spacecraft to be placed in a geostationary orbit of around 36,000 km.

## XPoSat

- X-ray Polarimeter Satellite, is a planned dedicated mission to study polarisation.
- The spacecraft will carry Polarimeter Instrument in X-rays (POLIX) payload which will study the degree and angle of polarisation of bright X-ray sources in the energy range 5-30 keV.
- The satellite has a mission life of five years and will be placed in circular 500-700km orbit
- It will study neutron stars, supernova remnants, pulsars and regions around black holes.

**Q.24) Which of the following can be the application of gravitational lensing?**

1. Study of very far-away galaxies
2. Study of dark matter
3. Understanding the star formation

**Select the correct option –**

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

## Q.24) Solution (d)

**Gravitational lensing**

- It is a phenomenon, which occurs when a huge amount of matter, such as a massive galaxy or cluster of galaxies, creates a gravitational field that distorts and magnifies the light from objects behind it, but in the same line of sight.
- These large celestial objects will magnify the light from distant galaxies that are at or near the peak of star formation. So, in a way these objects act as natural, cosmic telescopes and are called gravitational lenses.
- As a result, the galaxies appear much, much brighter than they actually are, because they've been highly magnified up to 50 times.

**Applications of Gravitational Lensing**

- Study the galaxies, which are very far away and can't be seen otherwise with even the most powerful space telescopes.
- Observe invisible things in the Universe- since dark matter doesn't emit or absorb light on its own, so it can't be observed directly. Using this effect, it can be worked out how much dark matter exists in the universe.

- Understand the star formation - by studying how those galaxies are forming their stars, and how that star formation is distributed across the galaxies.
- Understand the past- e.g. The Milky Way today forms the equivalent of one Sun every year, but in the past, that rate was up to 100 times greater. Using this effect, the scientists can look billions of years into the past in order to understand how our Sun formed.

**Q.25) Which of the following correctly describes Ploonets recently in news?**

- Moons that are in gaseous state.
- Ancient heavenly bodies which are theories to have signs of life.
- Moons that have escaped the bonds of their parent planet and started orbiting their stars instead.
- Moons that have escaped the bonds of their parent planet and started to exist as a separate planet.

Q.25) Solution (c)

**Ploonets**

- Recently a team of astronomers from Royal Astronomical Society have defined a new class of celestial objects called 'Ploonets'.
- Ploonets are the orphaned moons that have escaped the bonds of their parent planet and start orbiting their stars instead.
- Ploonets could help explain some bizarre exoplanetary features and can also provide details on planet formation processes.
- Astronomers concede, however, that Ploonets still remain hypothetical.

**Q.26) Consider the following statements with regard to Global Innovation & Technology Alliance –**

- It is operated as a Public Private Partnership.
- It is headed by Finance secretary.

**Select the correct option –**

- 1 only
- 2 only
- Both 1 and 2
- None of the above

Q.26) Solution (a)

A Public Private Partnership (PPP) between Technology Development Board (TDB), Department of Science & Technology (DST), Government of India (GoI) and India's apex industry association Confederation of Indian Industry (CII).

GITA is now working with 8 countries and adding further energy, momentum and scale. The projects were from a range of areas including smart transport management to biomedical technologies and smart water quality monitoring solutions.

It has provided an enabling platform for frontline techno-economic alliances.

Enterprises from India are tying up with their counterparts from partner countries including Canada, Finland, Italy, Sweden, Spain, and the UK.

This industry-led collaboration, with the government as an equal partner, is aimed at supporting the last phase of technology-based high-end, affordable product development which can connect to both global and domestic markets.

Technology Acquisition and Development Fund (TADF) to facilitate Micro, Small & Medium Enterprises (MSME) to acquire clean, green and energy efficient technologies is implemented through GITA. India improved its rank on the Global Innovation Index for the fourth year consecutively. From being ranked at the 81st position in 2015, India improved its ranking steadily to reach 52nd position in 2019. GITA, has been able to successfully engage in implementation of bilateral industrial R&D collaboration with some of the most innovative nations of the world including Canada, Finland, Israel, Italy, Korea, Spain, Sweden and the UK.



**Q.27) Which of the above is incorrect about OSIRIS-Rex mission?**

- It is NASA's first mission to study an asteroid.
- It is part of NASA's New Frontiers program.
- It has orbiter, lander and rover as mission components.
- None of the above

Q.27) Solution (a)

**OSIRIS-REx**

- NASA's OSIRIS-REx will be the **first mission to bring an asteroid sample to Earth.**
- OSIRIS-REx is the third mission in NASA's New Frontiers program, which previously sent the **New Horizons** spacecraft zooming by Pluto and the **Juno spacecraft** into orbit around Jupiter.



- The spacecraft is currently orbiting near-Earth asteroid, Bennu, and will spend two years mapping it before collecting a sample and returning to Earth.
- Bennu is a potentially hazardous asteroid that could one day threaten Earth.
- **Nightingale**, OSIRIS-REx's primary sample collection site, is located within a crater in Bennu's northern hemisphere.

**Q.28) Indigenously built Typbar TCV is the world's first clinically proven conjugate Typhoid vaccine. Consider the following statement regarding this –**

1. It is basically a Polysaccharide linked to a carrier protein to create more powerful combined immune response.
2. Its single dose gives life-long immunity.

**Select the correct option –**

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

**Q.28) Solution (a)**

Hyderabad-based Bharat Biotech has developed a typhoid vaccine (Typbar TCV) which has better efficacy (82% protection) than the previously used vaccinations in preventing typhoid fever.

**Typbar TCV**

- Typbar TCV is the world's first clinically proven conjugate Typhoid vaccine. **Conjugate vaccines** are made using a combination of two different components. In Typbar TCV, an antigen is chemically linked to a carrier protein to create more powerful combined immune response.
- Currently, two typhoid vaccines viz. Polysaccharide Typhoid Vaccine and Live, Weakened Typhoid Vaccine are used in India
- The conjugate vaccine can be given to babies as young as six months, while the other two typhoid vaccines — polysaccharide typhoid vaccine and live, weakened typhoid vaccine cannot be given to children below two years of age.
- Its single dose is effective in preventing typhoid in children aged 9 months to 16 years.

**Typhoid**

- Typhoid fever is caused by food and water contaminated by Salmonella Typhi (S. Typhi) bacteria.
- It occurs predominantly in association with poor sanitation and lack of clean drinking water.
- The symptoms of the disease include fever, headache, nausea, loss of appetite, constipation and sometimes diarrhoea.
- According to the WHO, a large proportion of severe typhoid fever cases occur in children aged below two years.

Type of vaccine	How it is processed?	Diseases covered
<b>Live attenuated vaccines</b>	Live, attenuated vaccines contain a version of the living microbe that has been weakened in the lab so it can't cause disease.	Measles, mumps, rubella (MM combined vaccine) Varicella (chickenpox) Influenza (nasal spray) Rotavirus
<b>Inactivated vaccines</b>	It is produce inactivated vaccines by killing the disease-causing microbe with chemicals, heat, or radiation.	Hepatitis A, Influenza Pneumococcal polysaccharide
<b>Sub-unit vaccine</b>	Instead of the entire microbe, subunit vaccines include only the antigens that best stimulate the immune system.	Hepatitis B
<b>Toxoid vaccines</b>	Toxoid vaccines contain a toxin or chemical made by the bacteria or virus. They make a person immune to the harmful effects of the infection, instead of to the infection itself.	Diphtheria and tetanus
<b>Polysaccharide Vaccines</b>	Polysaccharide vaccines are a unique type of inactivated subunit vaccine composed of long chains of sugar molecules that make up the surface capsule of certain bacteria.	pneumococcal disease meningococcal disease, a Salmonella Typhi
<b>Biosynthetic vaccines</b>	Biosynthetic vaccines contain manmade substances that are very similar to pieces of the virus or bacteria.	HIV

**Q.29) Which of the following statements correctly describes the Elastocaloric effect?**

- Reversible thermal response to changes, induced by an applied electric field.
- Cooling effect produced by twisting and untwisting of rubber bands.
- Heating or cooling of materials under external pressure variation.
- Energy released in a fuel or food by the complete combustion of a specified quantity of it.

**Q.29) Solution (b)**

In the elastocaloric effect, the transfer of heat works much the same way as when fluid refrigerants are compressed and expanded. When a rubber band is stretched, it absorbs heat from its environment, and when it is released, it gradually cools down. When rubber bands are twisted and untwisted, it produces a cooling effect. This is called the “elastocaloric” effect.

**Background**

- Refrigeration plays an important role in a wide range of human activity and keeping people and things cool consumes huge amounts of energy.
- They use fluids such as Hydrofluorocarbons which are susceptible to leakages, and can contribute to global warming.
- An alternative approach involves using “caloric” materials, which release heat when subjected to an external stimulus such as an applied magnetic or electric field or a compressive force. When the stimulus is removed, the material will absorb heat, thus cooling its surroundings.
- Recently, owing to the strong demand for efficient and environmentally friendly refrigeration technologies, materials with giant caloric effects, including elastocaloric, have been widely investigated.

**Q.30) Consider the following statements regarding the National Supercomputing Mission:**

1. It is joint Mission of Niti Aayog, Department of Science and Technology and Department of Electronics and Information Technology.
2. Under this Mission, supercomputers will also be networked on the National Supercomputing Grid over the National Knowledge Network (NKN).

**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.30) Solution (b)****National Supercomputing Mission (NSM)**

It is being implemented and steered jointly by the Department of Science and Technology (DST) and Department of Electronics and Information Technology (DeitY).

Implemented by the Centre for Development of Advanced Computing (C-DAC), Pune and the Indian Institute of Science (IISc), Bengaluru.

Focus of the mission:

- The Mission envisages empowering national academic and R&D institutions spread over the country by installing a vast supercomputing grid comprising of more than 70 high-performance computing facilities.

- These supercomputers will also be networked on the National Supercomputing grid over the National Knowledge Network (NKN). The NKN is another programme of the government which connects academic institutions and R&D labs over a high speed network.
- The Mission includes development of highly professional High Performance Computing (HPC) aware human resource for meeting challenges of development of these applications.

The first supercomputer assembled indigenously, called Param Shivay, was installed in IIT (BHU) and was inaugurated by the Prime Minister. Similar systems Param Shakti and Param Brahma were installed at IIT-Kharagpur and IISER, Pune. They are equipped with applications from domains like Weather and Climate, Computational Fluid Dynamics, Bioinformatics, and Material science.

**Q.31) The Lunar Reconnaissance Orbiter (LRO), a multipurpose spacecraft to make a comprehensive atlas of the Moon's features and resources, was launched by which of the following organizations/ institutions?**

- a) ISRO
- b) European Space Agency
- c) NASA
- d) SpaceX

Q.31) Solution (c)

**Lunar Reconnaissance Orbiter (LRO):**

- It is a NASA mission to the moon within the Lunar Precursor and Robotic Program (LPRP) in preparation for future manned missions to the moon and beyond (Mars).
- LRO is the first mission of NASA's 'New Vision for Space Exploration'.
- The objectives of LRO are to:
  - Identify potential lunar resources.
  - Gather detailed maps of the lunar surface.
  - Collect data on the moon's radiation levels.
  - Study the moons polar regions for resources that could be used in future manned missions or robotic sample return missions.
  - Provide measurements to characterize future robotic explorers, human lunar landing sites and to derive measurements that can be used directly in support of future Lunar Human Exploration Systems

**Q.32) With reference to recently announced National Guidelines for Gene Therapy, consider the following statements:**

1. It seeks to regulate the gene therapy procedures in India.
2. It mandates registration of all clinical trials with Clinical Trials Registry-India (CTRI).

3. All entities producing gene therapy products must establish an Institutional Bio-safety Committee (IBSC).

**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.32) Solution (d)

National Guidelines for Gene Therapy Product Development and Clinical Trials

- The apex health research body ICMR has released national guidelines regarding the procedures to be followed for developing and performing gene therapies to tackle inherited genetic or rare diseases in India.
- The aim of the document is to ensure that gene therapies can be introduced in India and clinical trials for gene therapies can be performed in an ethical, scientific and safe manner.
- Cumulatively, approximately 70 million Indians suffer from some form of rare disease. These include hemophilia, thalassemia, sickle-cell anemia certain forms of muscular dystrophies, retinal dystrophies such as retinitis pigmentosa, corneal dystrophies, primary immunodeficiency (PID) in children, lysosomal storage disorders such as Pompe disease, Gaucher's disease, haemangioma, cystic fibrosis etc.
- These national guidelines provide the general principles for developing Gene Therapy Products (GTPs) any human ailment and provides the framework for human clinical trials which must follow the established general principles of biomedical research for any human applications
- The guidelines cover all areas of GTP production, pre-clinical testing and clinical administration, as well as long term, follow up.
- Mechanism for Review and Oversight:
  - Proposed establishment of Gene Therapy Advisory and Evaluation Committee (GTAEC)- an independent body with experts from diverse areas of biomedical research, government agencies and other stakeholders.
  - It is mandatory for all institutions and entities engaged in development of GTPs to establish an Institutional Bio-safety Committee (IBSC). Research involving development of new Gene Therapy Product (GTPs) needs to obtain approvals from IBSC and Ethics Committee (EC). Biological material from humans can be procured only from clinics/hospitals that have an Ethics Committee.



- All clinical trials are mandated to be registered with Clinical Trials Registry-India (CTRI). It is an online public record system for registration of clinical trials being conducted in India.

**Q.33) Global Consortium for Digital Currency Governance is an initiative of –**

- a) European Union
- b) G-20
- c) World Bank
- d) World Economic Forum

**Q.33) Solution (d)**

The World Economic Forum recently announced the first global consortium focused on designing a framework for the governance of digital currencies, including stable coins. The Global Consortium for Digital Currency Governance will aim to increase access to the financial system through innovative policy solutions that are inclusive and interoperable.

This is the first initiative to bring together leading companies, financial institutions, government representatives, technical experts, academics, international organizations, NGOs and members of the Forum's communities on a global level.

This consortium will focus on solutions for a fragmented regulatory system. Efficiency, speed, interoperability, inclusivity, and transparency will be at the heart of this initiative. It will call for innovative regulatory approaches to achieve these goals and build trust. A set of guiding principles will be codesigned to support public and private actors exploring the opportunities that digital currencies present.

This initiative builds on work done by the World Economic Forum over the past year, convening a global community of central banks to co-design a policy framework for the adoption of digital currencies called the Central Bank Digital Currency Toolkit.

**Q.34) Consider the following statements with reference to NEST (New and Emerging Strategic technologies):**

1. NEST will negotiate technology governance rules, standards and architecture, suited to India's conditions, in multilateral and plurilateral frameworks.
2. It is formed under the aegis of NITI Aayog

**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.34) Solution (a)**

The external affairs ministry recently announced the setting up of new, emerging and strategic technologies (NEST) division.

NEST will negotiate technology governance rules, standards, and architecture, suited to India's conditions, in multilateral and plurilateral frameworks. Hence statement 1 is correct.

The development comes close on the heels of the government allowing all network equipment makers, including Huawei, to participate in 5G trials.

NEST will act as the nodal division within the ministry for issues pertaining to new and emerging technologies.

NEST will negotiate technology governance rules, standards and architecture, suited to India's conditions, in multilateral and plurilateral frameworks.

It will help in collaboration with foreign partners in the field of 5G and artificial intelligence.

Its mandate shall include, but not be limited to, evolving India's external technology policy in coordination with domestic stakeholders and in line with India's developmental priorities and national security goals.

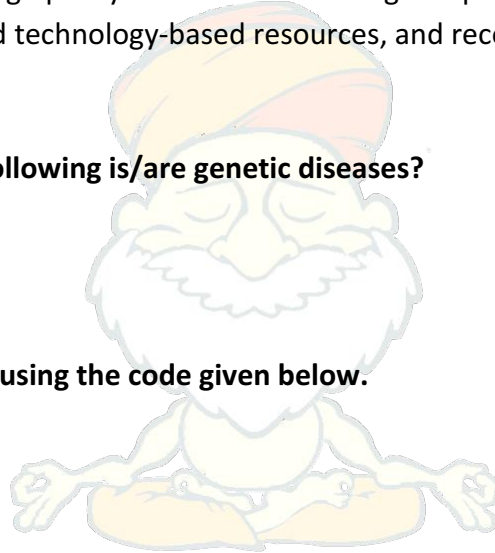
It will also help assess foreign policy and international legal implications of new and emerging technologies and technology-based resources, and recommend appropriate foreign policy choice.

**Q.35) Which among the following is/are genetic diseases?**

1. Haemophilia
2. Down's syndrome
3. Sickle-cell anemia

**Select the correct answer using the code given below.**

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



**Q.35) Solution (d)**

All of the given diseases are genetic diseases.

- Hemophilia: In this disease, a single protein that is a part of the cascade of proteins involved in the clotting of blood, is affected. Due to this, in an affected individual, a simple cut will result in non-stop bleeding. The heterozygous female (carrier) for hemophilia may transmit the disease to sons. The possibility of a female becoming hemophilic is extremely rare because the mother of such a female has to be at least carrier and the father should be hemophilic.
- Sickle-cell anemia: This is an autosome linked recessive trait that can be transmitted from parents to the offspring when both the partners are a carrier for the gene (or heterozygous). It results in an abnormality in the oxygen-carrying protein

hemoglobin (hemoglobin S) found in red blood cells. This leads to a rigid, sickle-like shape under certain circumstances.

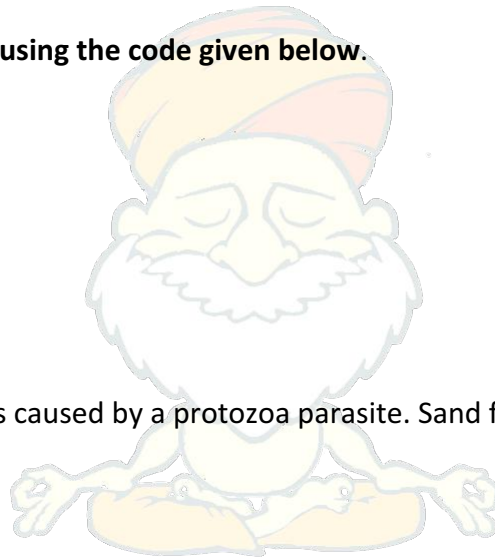
- Down's Syndrome: The cause of this genetic disorder is the presence of an additional copy of chromosome number 21 (trisomy of 21). The affected individual is short-statured with a small round head, furrowed tongue, and partially open mouth. Palm is broad with characteristic palm crease.
- Other examples of genetic disorders are: Klinefelter's Syndrome, Turner's syndrome, Cystic fibrosis, Colour blindness, Phenylketonuria, Thalesemia.

**Q.36) Which of the following diseases are caused by viruses?**

1. Kala-azar
2. Dengue
3. Tuberculosis
4. Influenza

Select the correct answer using the code given below.

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



Q.36) Solution (d)

Kala-azar (Leishmaniasis) is caused by a protozoa parasite. Sand fly is the vector.

**Common viral disease**

- Cold cough
- Chicken pox
- Crimean-Congo hemorrhagic fever
- Dengue - mosquito-borne viral infection transmitted by the Aedes mosquitoes. It mainly **affects liver**.
- Japanese encephalitis - mosquito-borne viral disease mainly effecting **liver** of the body
- Jaundice - a viral disease caused by hepatitis C virus which leads to inflammation of **liver** increasing excretion of bilirubin
- AIDS
- Influenza

**Common bacterial diseases**

- Anthrax - Most forms of the disease are lethal, and it affects mostly animals
- Diphtheria - bacterial infection in the upper respiratory tract.

- Leprosy - Hansen's disease
- Leptospirosis - an infectious bacterial disease occurring in rodents, dogs, and other mammals, which can be transmitted to humans.
- Tuberculosis - bacterial infection which mainly affects lungs
- Cholera
- Typhoid

**Q.37) Which of the following statements are correct regarding the Intellectual Property Appellate Board (IPAB)?**


1. It is a statutory body established under the provisions of Trade Marks Act, 1999.
2. The Chairman of IPAB should be a retired judge of the Supreme Court.
3. Appeals against the decision of IPAB can only be filed before the Supreme Court.

Select the correct answer using the code given below.

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



Q.37) Solution (c)



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The intellectual property Appellate Board (IPAB) was established under section 83 of the Trade Marks Act. It was constituted in 2003 to hear appeals against the decisions of the

Registrar under the Trade Marks Act, 1999 and the Geographical Indications of Goods (Registration and Protection) Act, 1999. **Hence, statement 1 is correct.**

The IPAB comprises a chairman (a retired judge of high court) and vice-chairman. In addition, there are three technical members: one for patent and one for trademark; the third member hears the case based on the nature of the dispute. **Hence, statement 2 is not correct.**

The Intellectual Property Appellate Board has its headquarters at Chennai.

As per the sections of the Finance Act 2017, the Intellectual property Appellate Board shall exercise the jurisdiction, powers and authority conferred on it by or under this Copy Right Act, 1957. In view of the same, all the cases pending before the Copy Right Board were transferred to Intellectual Property Appellate Board.

The applicants of all Intellectual Property Rights (IPRs) can directly file a Special Leave Petition (SLP) before the Hon'ble Supreme Court against any order of Intellectual Property Appellate Board (IPAB). They can also prefer a writ petition before the High Court against orders of IPAB and IP offices by invoking Article 226 of the Constitution of India and then file SLP before the Supreme Court. **Hence, statement 3 is not correct.**

**Q.38) India is purchasing 'Integrated Air Defence Weapon System (IADWS)' from which of the following nation?**

- a) The United States of America
- b) Russia
- c) France
- d) Israel

**Q.38) Solution (a)**

- The US has approved the sale of an Integrated Air Defence Weapon System (IADWS) to India at an estimated cost of \$1.9 billion.
- The objective of the deal is to modernize India's armed forces and to expand its existing air defence architecture to counter threats posed by air attacks.
- IADWS will be used along with indigenous, Russian and Israeli systems to erect an ambitious multi-layered missile shield over the National Capital Territory (NCT) of Delhi against aerial threats.
- It comes amidst the massive military modernisation by China which is also flexing its military muscles in the strategic Indo-Pacific region.

**Q.39) Which of the following statements is/are correct with regard to Space Activities Bill, 2017?**

1. A non-transferable licence shall be provided by the Central Government to any person carrying out commercial space activity.

2. There are provisions for financial subsidy and technical support in terms of designing and launching of satellites to the private sector.
3. The bill sets the target of annual space revenue generation of \$10 billion.

**Select the correct answer using the code given below:**

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

Q.39) Solution (a)

**Features of Space activities bill 2017:**

- It is a proposed Bill to promote and regulate the space activities of India.
- The new Bill encourages the participation of non-governmental/private sector agencies in space activities in India under the guidance and authorisation of the government through the Department of Space.
- The provisions of this Act shall apply to every citizen of India and to all sectors engaged in any space activity in India or outside India.
- **A non-transferable licence shall be provided by the Central Government to any person carrying out commercial space activity.**
- The Central Government will formulate the appropriate mechanism for licensing, eligibility criteria, and fees for licence.
- The government will maintain a register of all space objects (any object launched or intended to be launched around the earth) and develop more space activity plans for the country.
- It will provide professional and technical support for commercial space activity and regulate the procedures for conduct and operation of space activity.
- It will ensure safety requirements and supervise the conduct of every space activity of India and investigate any incident or accident in connection with the operation of a space activity.
- It will share details about the pricing of products created by space activity and technology with any person or any agency in a prescribed manner.
- If any person undertakes any commercial space activity without authorisation they shall be punished with imprisonment up to 3 years or fined more than Rs 1 crore or both.

Statement 1 is correct as given above. Statement 2 and 3 are incorrect. There are no such provisions.



**Q.40) The India Knowledge Hub (IKH), a dynamic web portal, functioning as a repository to disseminate best practices in various sectors from across the country was launched by –**

- a) NITI Aayog
- b) Ministry of Human Resource Development
- c) Ministry of Science and Technology
- d) Ministry of Communications and Information Technology

Q.40) Solution (a)

NITI Aayog has created the India Knowledge Hub (IKH), a dynamic web portal, functioning as a repository to store and disseminate best practices from across the country.

Reflecting the spirit of cooperative federalism, the NITI Aayog launched the India Knowledge Hub so that districts, States, Central ministries and other government institutions can exchange knowledge on real-time basis and replicate practices that have worked in other areas.

The portal serves as a dynamic sharing platform in which the key functionaries can directly upload best practices for replication in other regions. While, mostly the best practices are directly uploaded by the district collectors from any State/UT, Departments of State governments and Central Ministry can also upload the best practices in the portal. In its first phase, the portal is also being extended to certain non-government institutions which have requested access to upload best practices.

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