Grade 10 Science Tamil Nadu 2019

Instructions :

- Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
- Use Blue or Black ink to write and underline and pencil to draw diagrams.

Section I

(Marks : 15)

Note :

- Answer all the 15 questions. 15 x 1 = 15
- Choose the correct answer from the alternatives given in the bracket

Q1. Which of the following is inheritable?

(an altered gene in sperm,

(an altered gene in liver cells,

(an altered gene in skin cells,

(an altered gene in udder cells)

Solution:

An altered gene in sperm.

Q2. Which one of the following is not a hereditary disease?

(Thalassemia, Down's syndrome, Alzheimer's disease, Haemophilia)

Solution:

Alzheimer's disease

Q3. Spinal nerves are

(Sensory nerves, motor nerves, mixed nerves, innervating the brain)

Solution:

Mixed nerves

Q4. During post fertilization, the ovule changes into a/an

(seed, fruit, endosperm, peicarp)

Solution:

Seed

Q5. Carnivorous animals use teeth to tear flesh.

(incisors, canines, premolars, molars)

Solution:

Canines

Q6. _____ of green plants are called 'factories of food production'.

(Mitochondria, Chloroplasts, Endoplasmic Reticulum, Nucleus)

Solution:

Chloroplasts

Q7. Find the odd one out.

(bio-alcohol, green diesel, bio-ethers, petroleum)

Solution:

Petroleum

Q8. Dispersed medium+ Dispersion medium

(True Solution, Colloidal Solution, Suspension, All)

Solution:

Colloidal Solution

Q9. When aqueous solution of Silver Nitrate and Sodium chloride are mixed, _____ precipitate is immediately formed.

(white, yellow, red, blue)

Solution:

White

Q10. _____ is used in making electromagnets.

(Pig iron, Steel, Wrought iron, Nickel steel)

Solution:

Nickel Steel

Q11. _____ is the functional group of ketones.

$(-OH, -CHO, > C = O, -COOH)$

Solution:

$> C = O$

Q12. One light year is equal to

$(365.25 \times 24 \times 60 \times 60 \times 3 \times 10^8$ m, $60 \times 60 \times 3 \times 10^8$ m, $1 \times 24 \times 60 \times 60 \times 3 \times 10^8$ m, $360 \times 24 \times 60 \times 60 \times 3 \times 10^8$ m)

Solution:

$365.25 \times 24 \times 60 \times 60 \times 3 \times 10^8$ m

Q13. The value of ' G ' is

$(6.673$ X $10^{11} Nm^2 kg^{-2}, 6.673 \times 10^{-11} Nm^2 kg^{-2}, 6.673 \times 10^{11} Nm^{-2} kg^{-2}, 6.673 \times 10^{-11} Nm^2 kg^2$)

Solution:

$6.67 \times 10^{-11} Nm^2/kg^2$

Q14. How much work is done in moving a charge of 2 C across two points having a potential difference 10 V ?

(5 J, 20 J, 0.2 J, 2 J)

Solution:

20 J

Q15. A device that reverses the direction of flow of current through a circuit is called

(Voltmeter, Ammeter, Commutator, Transformer)

Solution:

Commutator

Section II

(Marks : 40)

Note :

- Answer any 15 questions. 20 x 2 = 40

Q16. Name the sources of somatic stem cells.

Solution:

The sources of somatic stem cells are cord blood and bone marrow.

Q17. Find out who am I.

(i) I was born when the diploid nucleus of the udder cells injected into the cytoplasm of the enucleated ovum and implanted into the uterus of the surrogate mother.

(ii) I coined the term vaccine and vaccination for protective inoculation.

Solution:

(i) Dolly, first mammal cloned sheep.

(ii) Edward Jenner.

Q18. Fill in the blanks:

(i) The first vaccine which is produced by Biotechnology was used against _____.

(ii) Biotechnologically synthesized _____ is used to cure pernicious anemia.

Solution:

(i) Hepatitis B

(ii) Vitamin b-12 shots/injections

Q19. What are the symptoms of Malaria?

Solution:

Malaria symptoms are exhibited within 7 to 18 days of being infected by the same. Common symptoms of malaria include:

- Fatigue, fever, vomiting, chills, and headaches
- Diarrhoea, anaemia, and muscle pain
- Profuse sweating and convulsions
- Bloody stools.
- In severe cases, malaria can be devastating as in severe cases it can lead to seizures, coma and eventually, death.

Q20. What is Corpora quadrigemina? Name the functions associated with it.

Solution:

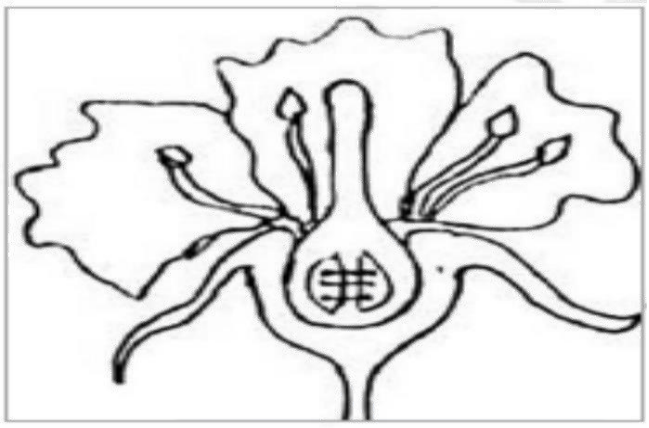
Corpora quadrigemina is a part of brain which is formed by the grey matter of nerve cells scattered in white matter. Corpora quadrigemina is a group of four colliculi that are found at the dorsal aspect of the mid brain just below the thalamus. The Corpora quadrigemina forms the connection among the mid brain and the hind brain.

The functions associated with Corpora quadrigemina are as follows:

- The corpora quadrigemina has four colliculi, two superior and two inferior.
- The superior colliculi of the corpora quadragemina possess the correlation centers for the optic reflexes while the inferior colliculi contain the correlation centers for auditory reflexes.

In simple terms, Corpora quadrigemina is associated with hearing and seeing.

Q21. Draw the given diagram and label the parts.



Solution:

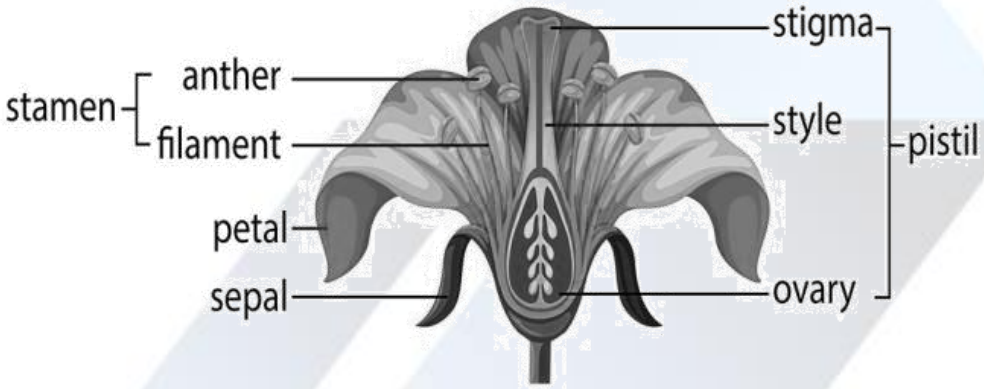


Fig. Different parts of a flower

Q22. **Assertion (A):** In summer, we sweat more.

Reason (**R**) : The kidneys expel less urine, since much of water is lost in the form of sweat.

(a) Both (A) and (R) are true and (R) explains (A).

(b) Both (A) and (R) are true but (R) doesn't explain (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Solution:

(a) Both (A) and (R) are true and (R) explains (A).

Assertion (A): In summer, we sweat more – This statement is true because sweating helps in cooling the body by releasing heat through evaporation.
Reason (R): The kidneys expel less urine since much of the water is lost in the form of sweat – This statement is also true as the body conserves water by reducing urine production when a significant amount is lost through sweating.
Since, the reduced urine output is a direct consequence of excessive sweating, Reason correctly explains Assertion.

Q23. Draw the LS of kidney and label the parts.

Solution:

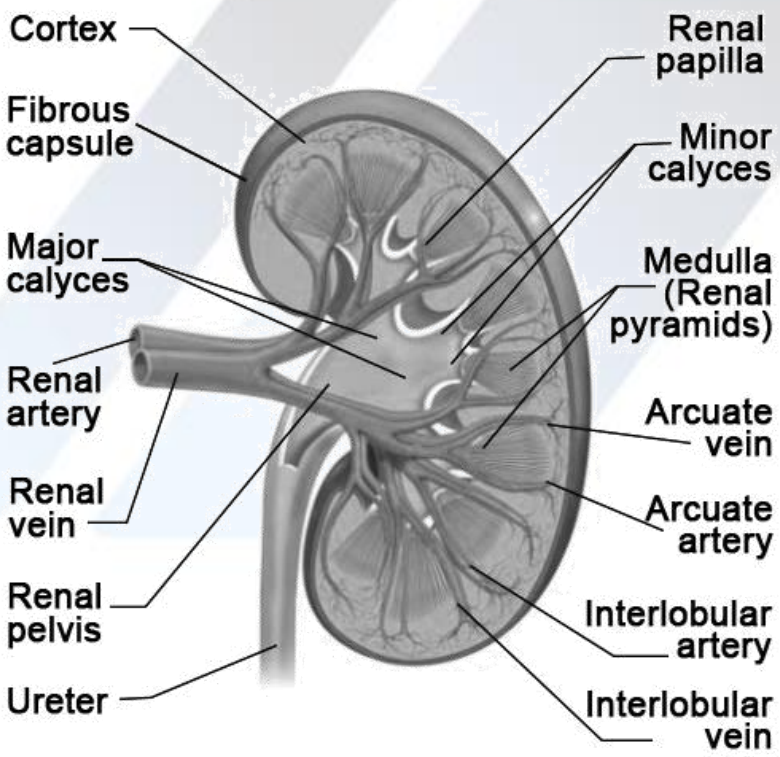


Fig. Kidney

Q24. Mention any four adaptations seen in the Camel so that it can live successfully in deserts.

Solution:

The four adaptations seen in the Camel so that it can live successfully in deserts are:

- Two rows of long eye-lashes
- Fat stored in humps
- Thick leathery patches on knees.
- Thick fur and underwool

Q25. Why diffusion process is not suitable for transportation in multicellular organisms?

Solution:

Unicellular organisms have specialized cells and tissues that perform various necessary functions of the body such as intake of food and oxygen. Unlike unicellular organisms, multicellular organisms are not in direct contact with the outside environment which is why diffusion cannot meet their oxygen requirements.

Q26. What are Saprophytes? Give two examples.

Solution:

Saprophytes are the living organisms that live and feed on dead and decaying organisms that are considered extremely important in soil biology. They break down the complex organic matter into simpler substances which is taken up by the plants for various metabolic activities. Thus, saprophytes play a significant role in the ecosystem. Ex: Yeast and Cheese mold.

Q27. Match the methods of nutrition of special organs with suitable examples.

Autotrophs	Mycorrhiza	Cuscuta
Parasites	Chlorophyll	Monotropa
Saprophytes	Haustoria	Hibiscus

Solution:

Autotrophs	Chlorophyll	Hibiscus
Parasites	Haustoria	Cascuta
Saprophytes	Mycorrhiza	Monotropa

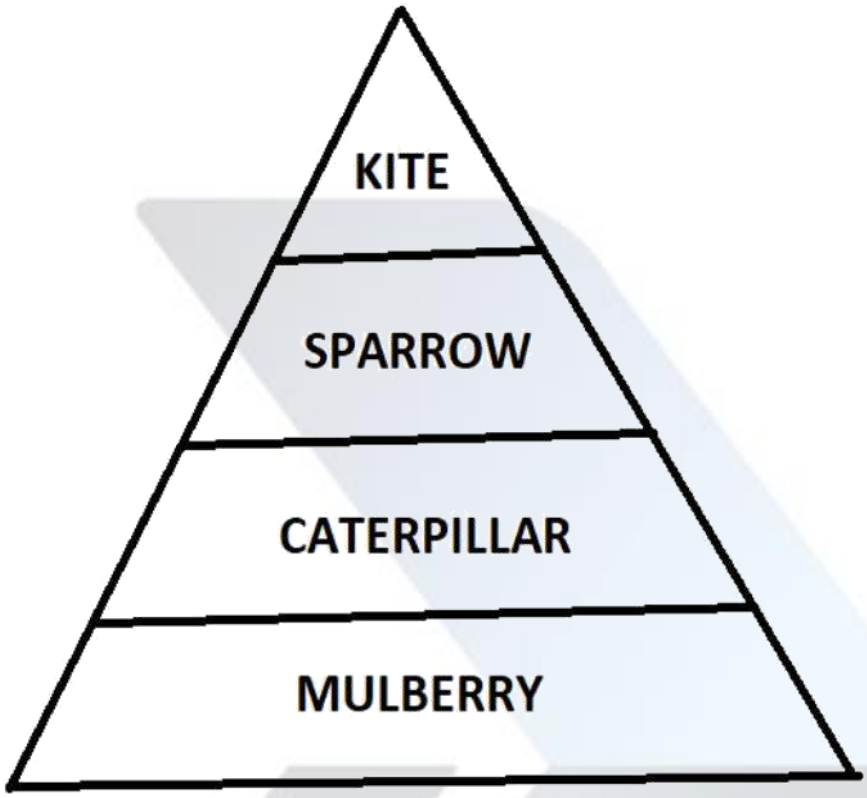
Q28. Study the food chain below, correct it and convert it into a pyramid of energy.

Mulberry → Sparrow → Caterpillar → Kite.

Solution:

Mulberry → Caterpillar → Sparrow → Kite

- First - Mulberry as it is a plant which is autotrophic.
- Second - Caterpillar that feeds on mulberry, which is a primary consumer.
- Third - Sparrow which is a bird feeds on the caterpillar and it is a secondary consumer.
- Fourth - The kite which eats the sparrow and acts as the tertiary consumer.



Q29. Why is hydrogen considered to be the best choice among all the alternative fuel options?

Solution:

Hydrogen is the best choice among all the alternative fuel options because it is non-toxic, and reasonably safe to handle and distribute. It has the highest mass energy content.

Q30. A non-renewable resource is a natural resource. It can be replaced by natural process at a rate equal to or faster than its rate of consumption by humans. Read this statement and say whether it is correct or incorrect. If it is incorrect, give the correct statement.

Solution:

This statement is incorrect because a renewable resource is a natural resource that can be replaced by natural process at a rate equal to or faster than its rate of consumption by humans.

Q31. How will you reuse the waste water in your houses?

Solution:

We can reuse the waste water in our houses by following ways:

- By watering yards and gardens
- Filtering septic systems.
- By irrigating fields.

Q32. What is called Brownian movement?

Solution:

The erratic, zig-zag motion of particles observed under a high-power ultramicroscope is referred to as Brownian Motion. This movement mirrors the motion of pollen grains in water, as first described by Robert Brown, which is why it is named Brownian Motion.

Q33. Fill in the blanks

Solute	Solvent	Example
Solid	_____	Smoke
_____	Solid	Cork

Solution:

Solute	Solvent	Example
Solid	Gas	Smoke

Gas	Solid	Cork

Q34. Identify and correct the mistake if any:

(i) $2 \times \text{R.M.M} = \text{V.D}$

(ii) The molar volume of gas at STP is $22.4\ \text{cm}^3$

Solution:

There are some errors in the statements. The corrected statements are –

(i) $\text{R.M.M} = 2 \times \text{V.D}$

(ii) The molar volume of gas at STP is $\mathbf{22.4}$ litres.

Q35. The hydroxide ion concentration of a solution is 1.0×10^{-8}M. What is the pH of the solution?

Solution:

$$\text{pOH} = -\log^{10}[\text{OH}^-]$$

$$\text{pOH} = -\log^{10}(1.0 \times 10^{8})$$

$$\text{pOH} = 8$$

$$\text{pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 8$$

$$\text{pH} = 8$$

So, the pH value of the solution is 8 .

Q36. Which of the following reactions does not take place? State the reason

(i) $FeSO_4 + Mg \rightarrow MgSO_4 + Fe$

(ii) $ZnSO_4 + Cu \rightarrow CuSO_4 + Zn$

Solution:

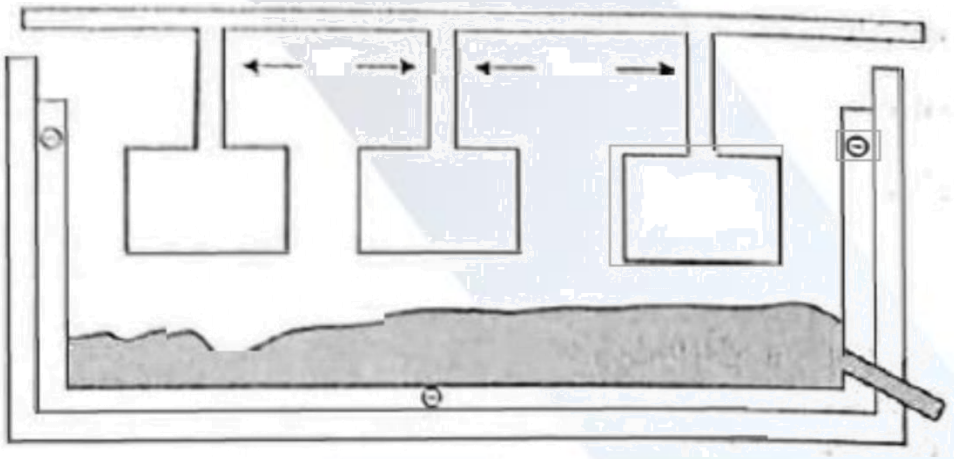
Among the two given reactions above the second reaction does not take place as zinc is more reactive than copper.

Q37. To design the body of an aircraft, aluminum alloys are used. Give reasons.

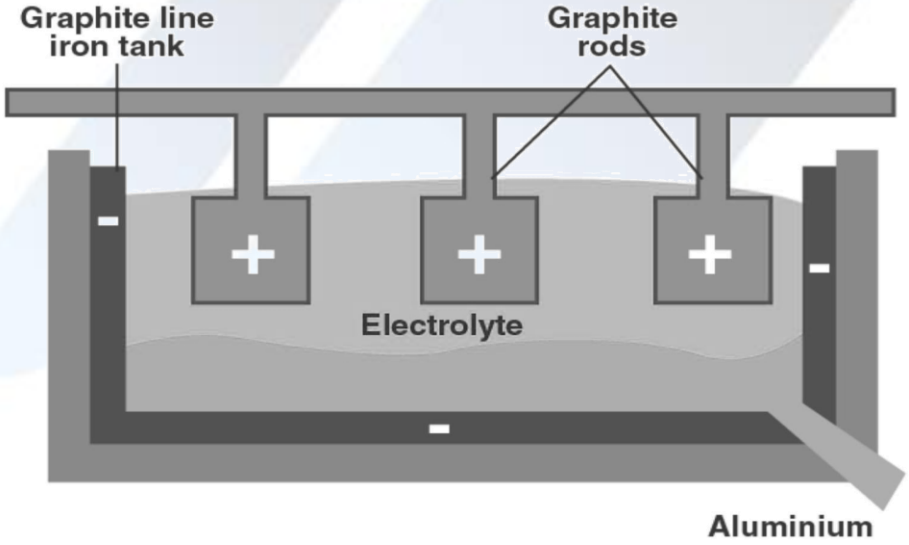
Solution:

When designing the body of an aircraft, aluminum alloys are utilized due to their lightweight nature, high tensile strength, and resistance to corrosion.

Q38. Draw the given diagram and label the parts.



Solution:



Q39. **Assertion**: Chemical bonds in organic compounds are covalent in nature.

Reason: Covalent bond is formed by the sharing of electrons in the bonding atoms

Does the reason satisfy the assertion?

Solution:

Yes, the reason satisfies the assertion.

Organic compounds, including hydrocarbons, alcohols, and acids, primarily consist of carbon (C), hydrogen (H), oxygen (O), and nitrogen (N), which form covalent bonds through the sharing of electrons. Since covalent bonding is characterized by the sharing of electron pairs between atoms, this reasoning accurately explains why organic compounds display covalent bonding.

Q40. List out the names of the organisations which are not associated with Chandrayaan -I mission from the following:

(ISRO, BARC, NASA, ESA, WHO, ONGC)

Solution:

The organisations which are not associated with Chandrayaan - I are BARC, WHO, and ONGC among the given organisations.

Q41. Two similar trucks are moving with the same velocity on a road. One of them is loaded while the other is empty. Which of the two will require a large force to stop it.

Solution:

Between the two trucks, the loaded truck will need a greater force to stop because it possesses more inertia and greater momentum compared to the empty truck.

Q42. An electric bulb is connected to a 240 V generator. The current is 0.65 A . What is the power of the bulb?

Solution:

$V = 240\ V, I = 0.65\ A$

The power of the bulb, $P = VI$

$= 240 \times 0.65$

$= 156\ W$

The power of the bulb is 156 W .

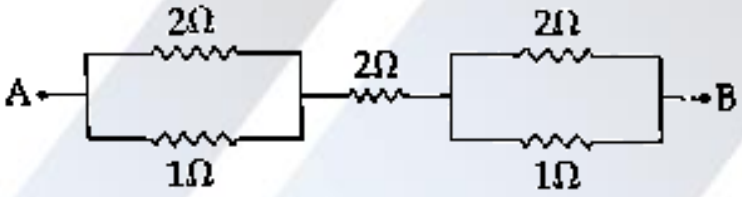
Q43. What are the limitations in harnessing wind energy?

Solution:

Limitations in obtaining energy from wind.

- There will not be continuous and consistent production.
- Area required to install wind power mill is large.
- Minimum speed of the wind should be 15 km/ hour.

Q44. Find the effective resistance between A and B in the given circuit.



Solution:

$R_1 + R_2$ are parallel.

$$\frac{1}{R_{12}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{12}} = \frac{1}{2} + \frac{1}{1}$$

$$\frac{1}{R_{12}} = \frac{3}{2}$$

$$R_{12} = \frac{2}{3}\ \Omega$$

R_3, R_4 are parallel

$$\frac{1}{R_{34}} = \frac{1}{R_3} + \frac{1}{R_4}$$

$$\frac{1}{R_{34}} = \frac{1}{2} + \frac{1}{1}$$

$$\frac{1}{R_{34}} = \frac{3}{2}$$

$$R_{34} = \frac{2}{3}\ \Omega$$

R_{12}, R_5, R_{34} series

Hence, total resistance, $R_S = R_{12} + R_5 + R_{34}$

$$R_S = \frac{2}{3} + 2 + \frac{2}{3}$$

$$R_S = \frac{10}{3}$$

The effective resistance between A and B in the given circuit $R_S = 3.33\Omega$

Q45. Define Power of Lens. Give its units.

Solution:

The power of a lens is defined as the reciprocal of its focal length, where the focal length is measured in metres. It is represented by the letter 'p'.

$p = 1/f$

The SI unit of power of lens is 'dioptre' by the letter ' D '.

Q46. How can an AC generator be converted into a DC generator?

Solution:

An AC generator can be transformed into a DC generator by replacing the slip rings with a split-ring commutator. A commutator is a device connected to the armature of a motor or dynamo that facilitates electrical connections and ensures the current flows as direct current.

Q47. **Assertion (A):** When white light is allowed to pass through a prism, it splits into seven colours.

Reason (R): This is due to reflection of light.

(a) Both (A) and (R) are correct and (R) explains (A).

(b) Both (A) and (R) are correct but (R) does not explain (A).

(c) (A) is wrong (R) is correct.

(d) Both (A) and (R) is wrong.

Solution:

(c) (A) is wrong (R) is correct.

- Assertion (A): "When white light is allowed to pass through a prism, it splits into seven colours."
  This phenomenon is known as dispersion. White light consists of all the colors within the visible spectrum (VIBGYOR: Violet, Indigo, Blue, Green, Yellow, Orange, and Red). When it passes through a prism, the varying wavelengths of light are refracted at different angles, causing the light to separate into these seven distinct colors.
- Reason (R): The separation of light into its constituent colors when it passes through a prism is caused by refraction, not reflection.
  Refraction happens because light changes speed and bends as it moves between different mediums, such as air and glass, leading to dispersion. In contrast, reflection would cause light to bounce off a surface rather than splitting into colors.

Section III

(Marks : 20)

Note :

- Answer any four questions by choosing one question from each part.
- Draw diagrams wherever necessary. 4 x 5 =20

Part I

Q48. Explain elaborately about Typhoid fever.

Solution:

Typhoid is a contagious bacterial infection primarily transmitted through contaminated food or water, as well as poor hygiene practices. The key symptoms of this illness include high fever, loss of appetite, and diarrhea. The bacterium Salmonella typhi is the causative agent, and humans serve as the sole carriers of this disease.

Causes of Typhoid

Salmonella enterica serotype Typhi is the microbe responsible for causing typhoid fever. It is a gram-negative bacterium, characterized by a thin cell wall and an outer membrane. When observed under a microscope, the cells appear reddish, with some displaying black stains at their centers.

The bacteria enter the human body through contaminated food and water, invading the intestinal cells. From there, they travel into the bloodstream, damaging the lymphatic system and spreading throughout the body. This bacterium primarily resides and multiplies within white blood cells in the liver and bone marrow. Eventually, it re-enters the bloodstream, leading to the onset of various symptoms in the later stages of the infection.

Symptoms of Typhoid

Patients affected with typhoid usually display the following symptoms:

- Malaise or weakness.
- Loss of Appetite
- Abdominal Pain.
- Ulcers
- Constipation
- Hallucinations
- High Fever
- Dehydration
- Skin rashes

Treatment for Typhoid

Maintaining proper sanitation is one of the most effective ways to prevent infections like typhoid. Another crucial measure is the use of antibiotics, which can eliminate disease-causing bacteria. Additionally, adopting good and hygienic food practices can significantly reduce the risk of such illnesses.

Q49. Explain the Peripheral Nervous System.

Solution:

Peripheral nervous system involves the parts of the nervous system outside the brain and the spinal cord.

Following are the major parts of the peripheral nervous system:

Somatic Nervous System

The main function of the somatic nervous system is to transfer impulses from CNS to skeletal muscles. It consists of

- Cranial Nerves
- Spinal Nerves

Cranial nerves emerge from the brain and there are twelve pairs of cranial nerves. Some of the examples may be the sensory nerves like optic, olfactory, etc.

Spinal nerves have their point of emergence as the spinal cords. There are thirty-one pairs of spinal nerves. They emerge from the spinal cords into dorsal and ventral roots. At the junction of these two roots, the sensory fibers continue into the dorsal root and the motor fibers into the ventral root.

Autonomic Nervous System

The autonomic nervous system relays impulses from the central nervous system to the involuntary organs and smooth muscles of the body.

It is further divided into two parts -

- Sympathetic Nervous System
- Parasympathetic Nervous System

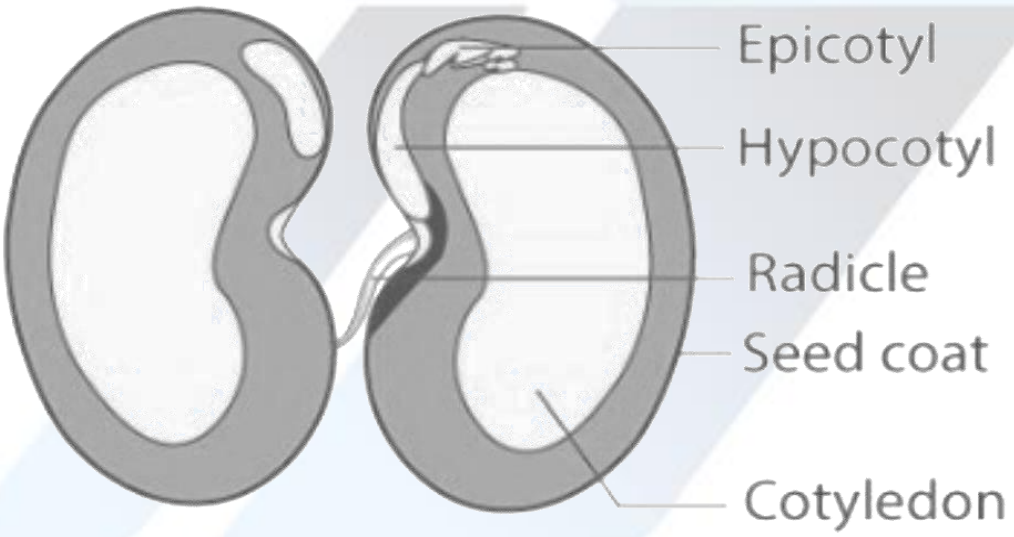
The sympathetic nervous system consists of nerves arising from spinal cord between the neck and waist region. It prepares the body for violent actions against abnormal conditions and is generally stimulated by adrenaline.

The parasympathetic nervous system is located anterior in the head and neck and posterior in the sacral region. It is mainly involved in re-establishment of normal conditions when violent action is over.

Part II

Q50. Describe the structure of a dicot seed.

Solution:



A mature embryo with its parts

- The seed is bulky, oval and slightly indented on one side. On this side, there is a short longitudinal, whitish ridge called the raphae.

- At one end of the raphae, there is a minute opening known as germ pore or micropyle.
- The embryo is enclosed by the seed coat. It consists of cotyledons attached to the primary axis.
- Rudimentary root portion called the radicle and a rudimentary stem portion known as plumule.
- The tip of the radicle projects outside, and is nearer to the micropyle.
- The plumule is placed between the two cotyledons and consists of a shoot axis and a small bud having two tiny folded leaves.

Q51. Explain the components of Pond eco-system.

Solution:

A pond ecosystem is an example of an aquatic ecosystem, consisting of both abiotic and biotic factors that interact with each other to sustain life within the pond.

Abiotic Factors:

These are the non-living components that influence the ecosystem. In a pond ecosystem, abiotic factors include:

- Inorganic substances : CO_2 (Carbon dioxide), O_2 (Oxygen), N (Nitrogen), PO_4 (Phosphates), CO_3 (Carbonates), and S (Sulfur).
- Organic substances : Carbohydrates, proteins, and lipids are essential for growth and energy in organisms.

Biotic Factors:

Biotic factors represent the living components of the pond ecosystem, which include producers, consumers, and decomposers.

1. **Producers (Autotrophs)**: These are organisms that produce their own food through photosynthesis and serve as the base of the food chain. In the pond ecosystem:

- Aquatic plants: Examples include Hydrilla, Vallisneria, and other submerged plants.

- Phytoplankton: Microscopic plants like Chlamydomonas, Volvox, and Spirogyra that float in the water and perform photosynthesis.

2. **Primary Consumers (Herbivores):** These are organisms that feed on producers (plants and plankton). Examples in the pond include:

- Zooplankton: Small, floating animals like copepods and water fleas.
- Larvae of insects and small animals like insect larvae, which feed on phytoplankton.

3. **Secondary Consumers:** These are organisms that feed on primary consumers. Examples include:

- Small fishes and frogs that consume zooplankton.
- Water beetles and other insects that prey on smaller herbivores.

4. **Tertiary Consumers**: These are the top predators in the pond ecosystem. They feed on secondary consumers. Examples include:

- Large fishes like catfish and pike.
- Birds like herons and kingfishers that feed on small fish and amphibians.

5. **Decomposers:** Decomposers break down dead organic matter, returning nutrients back into the ecosystem. In the pond, these include:

- Bacteria and fungi, which decompose dead plants, animals, and waste products, contributing to the nutrient cycle.

Part III

Q52. Nitroglycerine is used as an explosive. The equation for the explosive reaction is:

$$4\underset{(l)}{C_3H_5(NO_3)_3} \rightarrow 12\underset{(g)}{CO_2} + 10\underset{(l)}{H_2O} + 6\underset{(g)}{N_2} + \underset{(g)}{O_2}$$

(Atomic mass of $C = 12, H = 1, N = 14, O = 16$)

(a) How many moles does the equation show for?

(i) Nitroglycerine

(ii) Gas molecules produced?

(b) How many moles of gas molecules are obtained from 1 mole of nitroglycerine?

(c) What is the mass of 1 mole of nitroglycerine?

Solution:

(a) (i) 4 moles of nitroglycerine are produced.

(ii) 19 moles of gas molecule are produced.

(b) For 4 moles of nitroglycerine, 19 moles of gas molecules are produced.

So, for 1 mole of nitroglycerine:

$\frac{19 \text{ moles of gas molecules}}{4 \text{ moles of nitroglycerine}} = 4.75$ moles of gas molecules.

4.75 moles of gas molecules are produced from 1 mole of nitroglycerine.

(c): Nitroglycerine $C_3H_5(NO_3)_3 = (3 \times 12) + (5x1) + (3 \times 14) + (3 \times 16)$

$= 36 + 5 + 42 + 144 = 227$ g

Mass = No. of moles x molecular mass

$= 1 \times 227$

$= 227$ g

Q53. (a) What are alkynes? Give an example.

(b) If the molecular mass of an alkynes is 54 , then its molecular formula is _____

Solution:

(a) Alkynes are a type of unsaturated hydrocarbon that contain at least one triple bond between two carbon atoms. They are part of the alkyne family and follow the general formula C_nH_{2n-2}, where n is the number of carbon atoms in the molecule.

Example of an alkyne: Ethylene (C_2H_2), which is the simplest alkyne with a triple bond between two carbon atoms.

(b) If the molecular mass of an alkynes is 54 , then its molecular formula is :

$H_3C - C \equiv C - CH_3$ (2-Butyne)

$H_3C - CH_2 - C \equiv CH$(1-Butyne)

Part IV

Q54. (a) A and B are two objects. What happens to the force between two objects, if:

(i) the mass of A is doubled.

(ii) the distance between A and B is doubled.

(iii) the mass of both A and B are doubled.

(b) What is the relation between ' g ' and ' G '?

Solution:

(a) The force between two objects due to gravity is given by Newton's Law of Universal Gravitation:

$$F = \frac{Gm_Am_B}{r^2}$$

Where:

- F is the gravitational force,
- G is the gravitational constant,
- m_A and m_A are the masses of objects A and B,
- r is the distance between the centers of the two objects.

(i) If the mass of A is doubled:

$$F' = \frac{G(2m_A)m_B}{r^2}$$

$$F' = \frac{2 \times Gm_Am_B}{r^2}$$

$$F' = 2 \times F$$

So, the force will **double**.

(ii) If the distance between A and B is doubled:

$$F' = \frac{Gm_Am_B}{(2r)^2}$$

$$F' = \frac{Gm_A m_B}{4r^2}$$

$$F' = \frac{F}{4}$$

So, the force will become **one-fourth** of the original force.

(iii) If the mass of both A and B are doubled:

$$F' = \frac{G(2m_A)(2m_B)}{r^2}$$

$$F' = \frac{4 \times Gm_A m_B}{r^2}$$

$$F' = 4 \times F$$

So, the force will **quadruple**.

(b) The relation between ' g ' and ' G '

$$g = \frac{GM}{R^2}$$

Where,

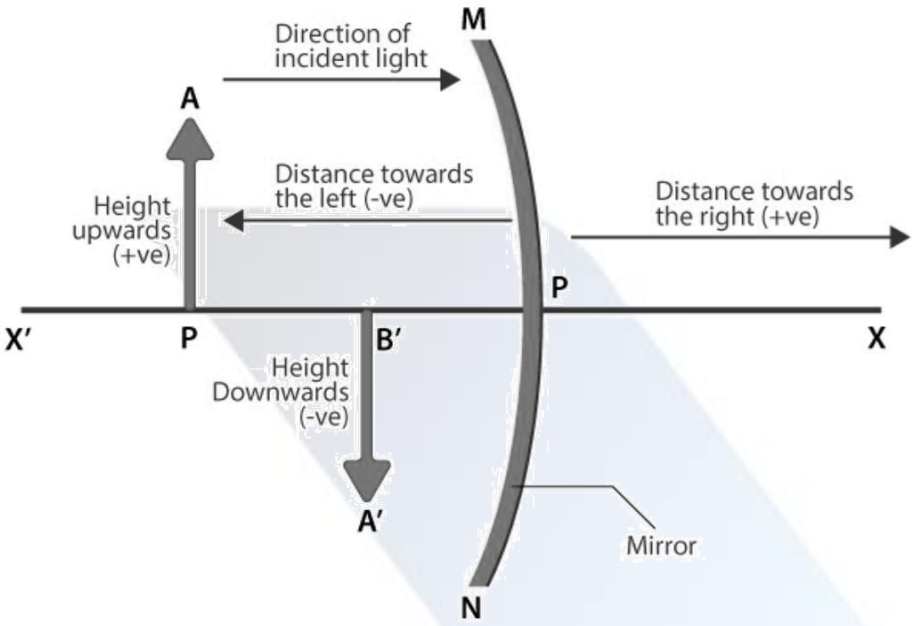
- M is the mass of the Earth,
- R is the radius of the Earth.

Thus, g depends on the gravitational constant G, the mass of the Earth M, and the radius of the Earth R.

Q55. (a) Write the sign convention for reflection by spherical mirrors.

(b) Why convex mirrors are used as rear-view mirrors in vehicles?

Solution:



(a) The sign convention for reflection by spherical mirrors is as follows:

1. The object is always positioned to the left of the mirror.
2. All distances parallel to the principal axis are measured from the pole of the mirror.
3. Distances measured to the right of the origin (along the +X axis) are considered positive, while those measured to the left of the origin (along the -X axis) are considered negative.
4. Distances measured perpendicular to and above the principal axis (along the +Y axis) are taken as positive.
5. Distances measured perpendicular to and below the principal axis (along the -Y axis) are taken as negative.

(b) We prefer a convex mirror as a rear-view mirror in vehicles because it gives a wider field of view, which allows the driver to see most of the traffic behind him. Convex mirrors always form a virtual, erect, and diminished image of the objects placed in front of it.