Grade 10 Science Tamil Nadu 2022

Part - I

Note: (i) Answer all the questions 12 x 1 = 12

(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

Q1. Where should an object be placed so that a real and inverted image of same size is obtained by a convex lens?

(a) f

(b) infinity

(c) 2 f

(d) between f and 2 f

Solution:

(c) 2 f

Q2. If a molecule is made of similar kind of atoms, then it is called molecule.

(a) mono atomic

(b) hetero atomic

(c) homo atomic

(d) poly atomic

Solution:

(c) homo atomic

Q3. The number of components in a binary solution is .

(a) 2

(b) 3

(c) 4

(d) 5

Solution:

(a) 2

Q4. A charge of 12 coulomb flows through a bulb in 5 second. What is the current through the bulb?

(a) 60 A

(b) 17 A

(c) 2.4 A

(d) 24 A

Solution:

(c) 2.4 A

Q5. Rectified spirit is an aqueous solution which contains about of ethanol.

(a) 95.5%

(b) 75.5%

(c) 55.5%

(d) 45.5%

Solution:

(a) 95.5%

Q6. The endarch condition is the characteristic feature of .

(a) root

(b) stem

(c) leaves

(d) flowers

Solution:

(b) stem

Q7. The heart of fishes possess _____ chambers.

(a) 3

(b) 4

(c) 2

(d) 5

Solution:

(b) 2

Q8. Male gametes in angiosperms are formed by the division of .

(a) Generative cell

(b) Vegetative cell

(c) Pollen grain mother cell

(d) Microspore

Solution:

(a) Generative cell

Q9. Which one is referred as "Master Gland"?

(a) Pineal gland

(b) Pituitary gland

(c) Thyroid gland

(d) Adrenal gland

Solution:

(b) Pituitary gland

Q10. Himgiri developed by hybridization and selection for disease resistance against rust pathogens is a variety of .

(a) chilli

(b) maize

(c) sugarcane

(d) wheat

Solution:

(d) wheat

Q11. Match the following:

(1) Solar Energy	(i) Flowing water
(2) Petroleum	(ii) Mobile phone
(3) Hydropower	(iii) Inexhaustible energy
(4) Electronic device	(iv) Exhaustible energy resource

(a) (1) - (iv), (2) - (iii), (3) - (ii), (4) - (i)

(b) (1) - (iii), (2) - (iv), (3) - (i), (4) - (ii)

(c) (1) - (iii), (2) - (i), (3) - (iv), (4) - (ii)

(d) (1) - (i), (2) - (iv), (3) - (ii), (4) - (iii)

Solution:

(d) (1) - (iii), (2) - (iv), (3) - (i), (4) - (ii)

Q12. Find the correct pair

(a) Gregor Johann Mendel - Theory of Natural Selection

(b) Waldeyer - Chromosomes

(c) Watson and Crick - Theory of Evolution

(D) Jean Baptoste Lamarch - Law of Heredity

Solution:

(b) Waldeyer – Chromosomes

Part-II

Note: Answer any seven questions. Question No. 22 is compulsory. 7 x 2=14

Q13. State Newton's second law.

Solution:

Newton's second law:
"The force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force".
$F = m \times a$
Force mass × acceleration

Q14. Write any two applications of echo.

Solution:

Applications of Echo: (any two)

- Echoes are utilized in obstetric ultrasonography to produce real-time images of the developing fetus in the mother's womb. This technique is safe as it does not involve harmful radiation.
- Certain animals rely on echoes for communication over long distances and to detect objects by sending sound signals and analyzing the reflected sound waves.
- Echoes help in measuring the speed of sound in different mediums.

Q15. State Boyle's Law.

Solution:

Boyle's law:
When the temperature of a gas is kept constant, the volume of a fixed mass of gas is inversely proportional to its pressure.
P $\alpha 1/V$

Q16. Write the functional group and the suffix used for the following class of compounds.

Class of Compounds	Functional Group	Suffix used
Alcohol		
Aldehyde		

Ketone		
Carboxylic Acid		

Solution:

Class of Compounds	Functional Group	Suffix used
Alcohol	-OH	-ol
Aldehyde	-CHO	-al
Ketone	$O\| \| - C -$	-one
Carboxylic Acid	-COOH	-oic acid

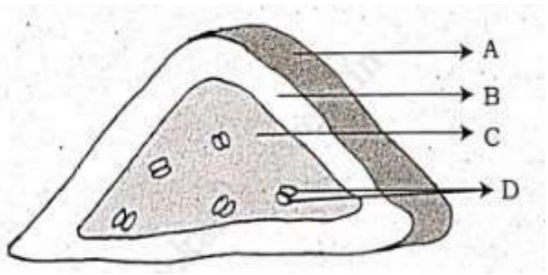
Q17. What is the importance of rainwater harvesting?

Solution:

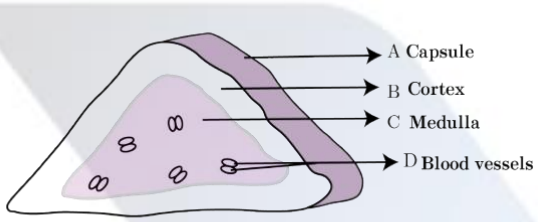
Importance of Rainwater Harvesting:

- It aids in addressing the rapid decline of groundwater levels.
- Helps meet the growing demand for water.
- Minimizes the risk of floods and soil erosion.
- Ensures clean water storage underground, free from contamination by human and animal waste, making it suitable for drinking.

Q18. Identify the parts A, B, C, D in the given figure.



Solution:



Q19. What is evolution? Who proposed the theories of evolution?

Solution:

- Evolution refers to the gradual transformation that takes place in living organisms over an extended period.
- The development of new species occurs due to modifications in certain traits over successive generations, driven by natural selection.
- Theories of evolution were proposed by scientists such as Lamarck and Darwin.

Q20. Name the two maize hybrids rich in amino acid lysine.

Solution:

Two maize hybrids rich in amino acid lysine are:

- Shakti
- Rathna
- Protina (any two)

Q21. What is the importance of valves in the heart?

Solution:

Importance of valves in the heart:

Valves are muscular structures that ensure blood flows in only one direction within the heart. They play a crucial role in preventing the backflow of blood, maintaining efficient circulation.

Q22. A person with myopia can see objects placed at a distance of 4 m. If he wants to see objects at a distance of 20 m, what should be the focal length and power of the concave lens he must wear?

Solution:

Given that x = 4 m and y = 20 m

Focal length of the correction lens is

$$f = \frac{xy}{x - y}$$

$$f = \frac{4 \times 20}{4 - 20} = \frac{80}{-16} = -5 \text{ m}$$

Power of the correction lens

$$= \frac{1}{f} = -\frac{1}{5} = -0.2D$$

Part - III

Note: Answer any seven questions. Question No. 32 is compulsory. 7 x 4=28

Q23. Differentiate mass and weight.

Solution:

Sl. No.	Mass	Weight
1	It is the quantity of matter contained in the body	It is the gravitational force exerted on a body due to the earth's gravity alone

2	Mass is a scalar quantity	Weight is a vector quantity
3	It's unit is kg (kilogram)	It's unit is N (newton)

Q24. List any four properties of light,

Solution:

Properties of light: (any 4 points)

1. Light is a form of energy.
2. Light always travels along a straight line.
3. Light does not need any medium for its propagation. It can even travel through vacuum,
4. The speed of light in vacuum or air is, $c = 3 \times 10^8$ ms^{-1}.
5. Since, light is in the form of waves, it is characterized by a wavelength (λ) and a frequency (v), which are related by the following equation $c = V\lambda$ (c -velocity of light).
6. Light of different colors varies in wavelength and frequency.
7. When light is incident on the interface between two media, it is partly reflected and partly refracted.

Q25. Explain why the ceilings of concert halls are curved?

Solution:

- The ceilings of concert halls are curved to ensure that sound waves, after reflection, reach every corner of the hall.
- This design allows the audience to hear the sound clearly throughout the space.
- The curved surfaces alter the intensity of the reflected sound waves.

- It helps in better distribution of sound across the hall.
- Multiple reflections of sound waves from the curved walls ensure an even and clear auditory experience for everyone.

Q26. (a) What is an alloy?

(b) Give the reasons for alloying.

Solution:

(a) Alloy: An alloy is a homogeneous mixture of two or more metals or of one or more metals with certain non-metallic elements.

(b) Reason for alloying:

- To modify appearance and colour
- To modify chemical activity
- To lower the melting point.
- To increase hardness and tensile strength.
- To increase resistance to electricity.

Q27. Classify the following compounds based on the pattern of carbon chain and give their structural formula:

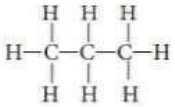
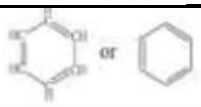
(i) Propane

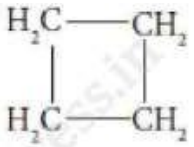
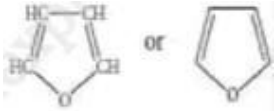
(ii) Benzene

(iii) Cyclobutane

(iv) Furan

Solution:

(i) Propane	-	Acyclic compound	-	$CH_3CH_2CH_3$ **(or)** 
(ii) Benzene	-	Cyclic Aromatic Compound	-	

(iii) Cyclobutane	-	Alicyclic Compound	-	
(iv) Furan	-	Heterocyclic Compound	-	

Q28. (a) What is respiratory quotient?
(b) Write the overall reaction for photosynthesis.

Solution:

(a) Respiratory Quotient:

Respiratory quotient is the ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration. It is expressed as

$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

(b) Overall reaction for photosynthesis:

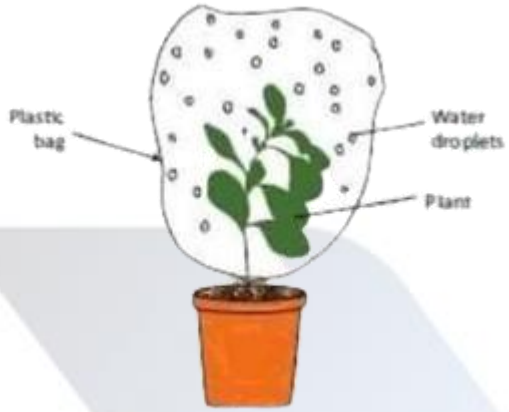
$$6CO_2 + 12H_2O \xrightarrow[\text{chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2 \uparrow$$

$$\text{Carbon dioxide} + \text{Water} \xrightarrow[\text{chlorophyll}]{\text{Light}} \text{Glucose} + \text{Water} + \text{Oxygen} \uparrow$$

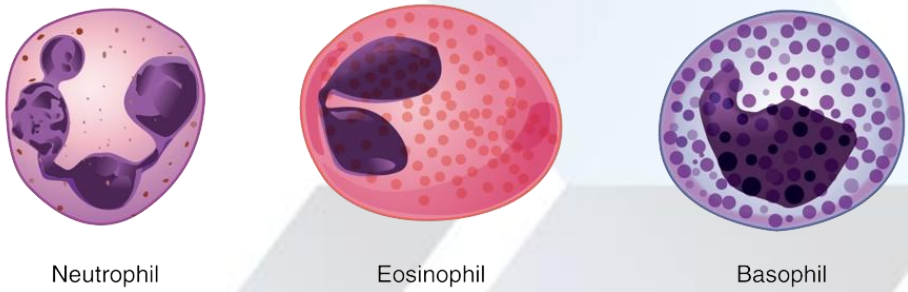
Q29. (a) Draw and label the parts of process of transpiration.
(b) Draw the pictures of Granulocytes.

Solution:

(a) Process of Transpiration:



(b) Granulocytes



Q30. (a) List of theories postulated to explain the origin of life

(b) Who coined the term Ethnobotany?

Solution:

(a) Numerous theories have been proposed to explain how life originated. These include:

1. Special Creation

This theory suggests that life on Earth was created by a divine power at a specific point in time. It emphasizes that life has remained unchanged since its origin and attributes its existence to a supernatural event.

2. Spontaneous Generation (Abiogenesis)

According to this concept, life arose spontaneously from non-living matter. For

example, it was once believed that fishes came from mud, frogs from moist soil, and insects from decaying material.

3. Biogenesis

Proposed by Louis Pasteur in 1862, this theory argues that life arises only from pre-existing life forms. Pasteur demonstrated that in sealed, sterilized flasks containing dead yeast, no new life emerged. However, when a flask was exposed to air, microorganisms developed.

4. Extraterrestrial or Cosmic Origin

Some scientists hypothesize that life came from outer space. This idea, known as Panspermia, suggests that microscopic life forms or spores were transported to Earth and possibly other planets.

5. Chemical Evolution

Oparin (1922) and Haldane (1929) proposed that life originated through chemical evolution. Under early Earth conditions, non-living inorganic molecules transformed into diverse organic compounds. These compounds eventually formed colloidal systems, which further developed into the first life forms. This concept is widely accepted today.

(b) The term Ethnobotany was introduced by J.W. Harshberger.

Q31. Discuss the importance of biotechnology in the field of medicine.

Solution:

Biotechnology has revolutionized medicine in numerous ways, including:

- Production of Insulin: Used for managing diabetes effectively.
- Human Growth Hormone: Helps treat growth deficiencies in children.
- Blood Clotting Factors: Developed to treat conditions like haemophilia.
- Tissue Plasminogen Activator: Aids in dissolving blood clots and preventing heart attacks.

- Vaccine Development: Facilitates the creation of vaccines for diseases such as Hepatitis B and rabies.

These advancements demonstrate the critical role of biotechnology in improving healthcare and saving lives.

Q32. ' A ' is a blue coloured crystalline salt. On heating it loses blue colour and gives ' B '. When water is added, ' B ' gives back ' A '. Identify ' A ' and ' B '. Write the equation.

Solution:

'A': Blue-colored crystalline salt → Copper(II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$)

'B': White anhydrous salt → Anhydrous Copper(II) sulfate ($CuSO_4$).

- When 'A' (Copper sulfate pentahydrate) is heated, it loses water molecules and becomes 'B' (Anhydrous Copper sulfate), losing its blue color.
- Adding water to 'B' restores the crystalline structure of 'A', bringing back its blue color.

The equation is:

$CuSO_4.5H_2O \quad Heating \rightleftharpoons Cooling \quad CuSO_4 + 5H_2O$

(Copper sulphate pentahydrate) (Anhydrous copper sulphate)

Part-IV

Note: Answer all the questions. Draw diagrams wherever necessary. 3 x 7=21

Q33. (a) (i) What is meant by electric current?

(ii) Name and define its unit.

(iii)Which instrument is used to measure the electric current? How should it be connected in a circuit?

OR

(b) (i) Who discovered natural radioactivity?

(ii) Write any three features of natural and artificial radioactivity.

(iii) Give any three uses of radio isotopes in the field of agriculture.

Solution:

(a) (i) Electric current:

- Electric current, often called simply "current" and represented by the symbol I, is the rate at which electric charge flows through a conductor.
- $I = Q/t$

(ii) Name and define its unit.

- SI unit of electric current is ampere.
- The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross-section of a conductor, in one second. Hence,

$$1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$$

iii) An ammeter is used to measure electric current. It must be connected in series with the circuit to measure the current flowing through it.

OR

(b) (i) Henri Becquerel.

(ii) Features of natural and artificial radioactivity: (any 3 points)

Sl. No.	Natural Radioactivity	Artificial Radioactivity
1	Emission of radiation due to self-disintegration of a nucleus.	Radiation occurs due to induced nuclear reactions.
2	Alpha, beta and gamma radiations are emitted.	Emits elementary particles like neutrons, positrons, etc.

3	It is a spontaneous process.	It is an induced process.
4	Occurs in elements with atomic numbers greater than 83.	Can occur in elements with atomic numbers less than 83.
5	This cannot be controlled	This can be controlled

(iii) Uses of radio isotopes: (any 3 points)

- Pest control: To kill the insects and parasites and prevent the wastage of agricultural products.
- Preservation: Certain perishable cereals exposed to radiations remain fresh beyond their normal life, enhancing the storage time.
- Preventing spoilage: Very small doses of radiation prevent sprouting and spoilage of onions, potatoes and gram.

Q34. (a) (i) Define Atomicity. Give an example.

(ii) Consolidate the major differences between atoms and molecules.

OR

(b) (i) Define combination reaction.

(ii) Give an example for combination reaction.

(iii) Differentiate reversible and irreversible reaction.

Solution:

(a) (i) Atomicity: The number of atoms present in the molecule is called its 'atomicity.

(ii) The major Differences between atoms and molecules:

Atom	Molecule

An atom is the smallest particle of an element	A molecule is the smallest particle of an element or compound.
Atom does not exist in free state except in noble gas	Molecule exists in a free a state
Except some of noble gas, other atoms are highly reactive	Molecules are less reactive
Atom does not have a chemical bond	Atoms in a molecule are held by chemical bonds

OR

(i) Combination reaction:

A combination reaction is a reaction in which two or more reactants combine to form a compound. It is otherwise called 'synthesis reaction' or 'composition reaction'.

(ii) Example:

Hydrogen gas combines with chlorine gas to form hydrogen chloride gas.

$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{\,g}$

(iii) Reversible and irreversible reaction:

REVERSIBLE REACTION	IRREVERSIBLE REACTION
It can be reversed under suitable condition	It cannot be reversed.
Both forward and backward reactions take place simultaneously	It is unidirectional. It proceeds only in forward direction.
It attains equilibrium	Equilibrium is not attained.

The reactants cannot be converted completely into products	The reactants can be completely converted into products
It is relatively slow.	It is fast

Q35. (a) (i) What are synthetic auxins? Give examples.

(ii) Define triple fusion.

(iii) Name the secondary sex organs in male.

OR

(b) (i) Why did Mendel select pea plant for his experiment?

(ii) Suggest measures to overcome the problems of an alcoholic.

Solution:

(a) (i) Synthetic auxins:

Artificially synthesized auxins that have properties like auxins are called as synthetic auxins.

Example: 2, 4 D (2,4 Dichlorophenoxy Acetic Acid).

(ii) Triple fusion:

One sperm cell fuses with the egg cell in a process called syngamy, resulting in the formation of a diploid zygote. The other sperm cell fuses with the secondary nucleus in a process known as triple fusion, giving rise to the triploid primary endosperm nucleus.

(iii) Secondary sex organs in male:

Vas deferens, epididymis, seminal vesicle, prostate gland and penis.

OR

(b) (i) Mendel select pea plant for his experiment:

- It is naturally self- pollinating and is very easy to raise pure breeding individuals.

- It has a short life span as it is an annual and so it was possible to follow several generations.
- It is easy cross pollinate.
- It has deeply defined contrasting characters.
- The flowers are bisexual.

(ii) Challenges Faced by an Alcoholic:

- Education and Counseling: Providing proper education and counseling can assist alcoholics in overcoming stress, addressing their issues, and accepting life's challenges constructively.
- Engagement in Physical Activities: Encouraging participation in healthy activities like reading, music, sports, yoga, and meditation can help individuals undergoing rehabilitation focus on positive habits.
- Support from Family and Friends: Alcoholics should seek guidance and support from parents and peers during challenging times. Sharing their feelings of anxiety and guilt can aid in breaking free from the habit.
- Professional Medical Help: Consulting psychologists and psychiatrists is essential for managing the condition and fostering a relaxed, healthy lifestyle.

Rehabilitation and alcohol de-addiction programs play a crucial role in helping individuals fully recover and lead a balanced and healthy life.