Grade 10 Science Tamil Nadu 2024

Time Allowed: 3.00 Hours **Maximum Marks: 75**

Instructions:

(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

Note: This question paper contains four parts.

PART – I 12x1=12

Note:

(i) Answer all the questions.

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

Q1. The endarch condition is the characteristic feature of :

(a) Root (b) Stem

(c) Leaves (d) Flowers

Correct answer: (c)

Solution:

The endarch condition refers to the arrangement of xylem in which protoxylem is located towards the center (pith) and metaxylem is positioned towards the periphery. This type of xylem development occurs in stems

Q2. TFM in soaps represents _____ in soap.

(a) Mineral (b) Vitamin

(c) Fatty matter (d) Carbohydrate

Correct answer: (c)

Solution:

TFM (Total Fatty Matter) represents the amount of fatty substances in soap, determining its quality. A higher TFM indicates better cleansing and moisturizing properties.

Q3. The value of Universal Gas Constant:

(a) 3.81 J mol^{-1} K^{-1} (b) 8.03 J mol^{-1} K^{-1}

(c) 1.38 J mol^{-1} K^{-1} (d) 8.31 J mol^{-1} K^{-1}

Correct answer: (d)

Solution:

The Universal Gas Constant (R) has a standard value of 8.31 J mol^{-1} K^{-1} in SI units. It appears in the ideal gas equation PV = nRT and is crucial in thermodynamics and kinetic theory of gases.

Q4. Kilowatt hour is the unit of:

(a) resistivity (b) conductivity

(c) electrical energy (d) electrical power

Correct answer: (c)

Solution:

Kilowatt-hour (kWh) is the unit of electrical energy, where 1 kWh = 3.6×10^6 joules.

Q5. An enzyme which cuts DNA is:

(a) Protease (b) Restriction endonuclease

(c) DNA Ligase (d) RNAase

Correct answer: (b)

Solution:

Restriction endonucleases cut DNA at specific sequences, playing a key role in genetic engineering.

Q6. One mole of any substance contains _____ molecules.

(a) 6.023 x 10^{23} (b) 6.023 x 10^{-23}

(c) 3.0115×10^{23} (d) 12.046×10^{23}

Correct answer: (a)

Solution:

One mole of any substance contains Avogadro's number of molecules, which is 6.023×10^{23}.

Q7. Which one is referred as "Master gland"?

(a) Pineal gland (b) Pituitary gland

(c) Thyroid gland (d) Adrenal gland

Correct answer: (b)

Solution:

The pituitary gland is called the "Master gland" because it controls other endocrine glands.

Q8. Which among the following is not the characteristic of anemophilous plants?

(a) the flowers produce enormous amount of pollen grains.

(b) the stigmas are large and protruding.

(c) the flowers are brightly coloured, have smell and nectar.

(d) pollen grains are small and dry.

Correct answer: (b)

Solution:

Anemophilous plants are wind-pollinated, so their flowers are not brightly colored and do not produce nectar.

Q9. Inertia of a body depends on:

(a) Weight of the object

(b) Acceleration due to gravity of planet

(c) Mass of the object

(d) Both (a) and (b)

Correct answer: (c)

Solution:

Inertia depends on the mass of an object, as it resists changes in motion.

Q10. Which is the correct sequence of blood flow?

(a) Ventricle → Atrium → Vein → Arteries

(b) Atrium → Ventricle → Vein → Arteries

(c) Atrium → Ventricle → Arteries → Vein

(d) Ventricle → Vein → Atrium → Arteries

Correct answer: (c)

Solution:

Atrium → Ventricle → Arteries → Vein

Blood flows from the atrium to ventricle, then to arteries, and returns via veins.

Q11. Which of the following is not an "element + element compound" type reaction?

(a) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

(a) $2K_{(s)} + Br_{2(l)} \rightarrow 2KBr_{(s)}$

(a) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$

(a) $4Fe_{(s)} + 3O_{2(g)} \rightarrow 2Fe_2O_{3(s)}$

Correct answer: (c)

Solution:

$2CO(g) + O_2(g) \rightarrow 2CO_2(g)$

This is not an element + element reaction but a compound + element reaction.

Q12. Cancer of the epithelial cell is called as _____ .

(a) Leukaemia

(b) Sarcoma

(c) Carcinoma

(d) Lipoma

Correct answer: (c)

Solution:

Carcinoma is a type of cancer that originates in epithelial tissues like skin and organs.

PART – II 7x2=14

Note: Answer any seven questions. Question No. 22 is compulsory.

Q13. What is coefficient of apparent expansion?

Solution:

The coefficient of apparent expansion is the expansion observed in a liquid when heated in a container. It differs from true expansion due to the expansion of the container itself.

Q14. Why is tungsten metal used in bulbs but not used as fuse wires?

Solution:

Tungsten's high melting point makes it ideal for bulb filaments that must operate at high temperatures. However, fuse wires need a low melting point to melt quickly and interrupt the circuit, so tungsten is unsuitable.

Q15. What is rust? Give the equation for the formation of rust.

Solution:

Rust is hydrated iron oxide ($Fe_2O_3 \cdot xH_2O$) formed when iron reacts with oxygen and water.

Equation: $4Fe + 3O_2 + 6H_2O \rightarrow 4F(OH)_3$ (which later forms rust).

Q16. What is stage?

Solution:

A stage refers to a specific period or step in a process, such as stages of cell division, growth, or a mechanical process.

Q17. Why is sinoatrial node called as pacemaker of heart?

Solution:

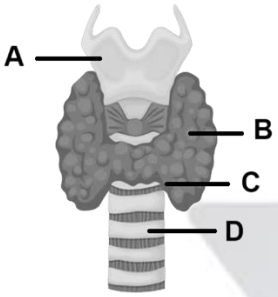
The sinoatrial (SA) node is called the pacemaker of the heart because it generates electrical impulses that regulate heartbeats, ensuring rhythmic contraction.

Q18. What are the parts of the hind brain?

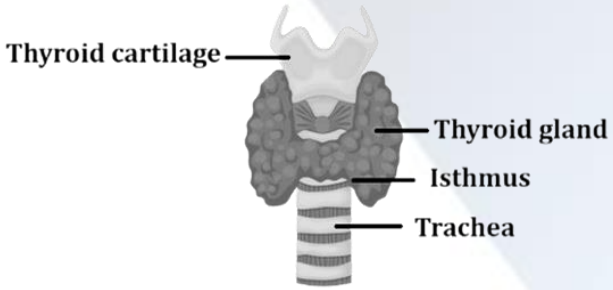
Solution:

The hindbrain consists of the cerebellum, pons, and medulla oblongata, which control balance, coordination, and involuntary actions.

Q19. Identify the parts A, B, C and D in the given figure.



Solution:



Q20. What is colostrum? How is milk production hormonally regulated?

Solution:

Colostrum is the first milk produced after childbirth, rich in antibodies and nutrients. Milk production is regulated by prolactin (for synthesis) and oxytocin (for ejection).

Q21. What is metastasis?

Solution:

Metastasis is the spread of cancer cells from the original site to other parts of the body through blood or lymph, forming secondary tumors.

Q22. If the pH of a solution is 4.5, find the value of its pOH.

Solution:

pH + pOH = 14, so for pH = 4.5,

pOH = 14 - 4.5 = 9.5

PART – III 7x4=28

Note: Answer any seven questions. Question No. 32 is compulsory.

Q23. Explain the various types of inertia with examples.

Solution:

Types of Inertia:

- Inertia of rest – A body remains at rest unless acted upon (e.g., a passenger jerks backward when a bus starts suddenly).
- Inertia of motion – A moving body continues its motion unless stopped (e.g., a runner continues forward after stopping).
- Inertia of direction – A body maintains its direction unless changed (e.g., passengers feel pushed outward in a turning vehicle).

Q24. (a) Write any three features of natural and artificial radioactivity.

(b) Name any two devices, which are working on the heating effect of current.

Solution:

(a) Features of natural and artificial radioactivity:

Feature	**Natural Radioactivity**	**Artificial Radioactivity**
Definition	Spontaneous emission of radiation from naturally occurring elements like uranium and radium.	Induced radioactivity in stable elements by bombarding them with particles.
Source	Found in nature (e.g., uranium-238, thorium-232).	Produced in laboratories or nuclear reactors (e.g., carbon-14, cobalt-60).
Types of Radiation	Emits alpha (α), beta (β), and gamma (γ) rays.	Can produce additional radioactive isotopes emitting similar radiation.

(b) Devices using the heating effect of current:

- Electric iron
- Electric heater

Q25. (a) What happens when $MgSO_4$ $7H_2O$ is heated? Write the appropriate equation.

(b) Define: solubility.

Solution:

(a) Heating of $MgSO_4 \cdot 7H_2O$:

When heated, magnesium sulfate heptahydrate loses its water molecules and forms anhydrous magnesium sulfate.

Equation: $MgSO_4 \cdot 7H_2O \xrightarrow{heat} MgSO_4 + 7H_2O$

(b) Solubility:

It is the maximum amount of solute that can dissolve in a given solvent at a specific temperature to form a saturated solution.

Q26. (a) What is respiratory quotient?

(b) Why should the light dependent reaction occur before light independent reaction during photosynthesis?

Solution:

(a) Respiratory Quotient (RQ):

RQ is the ratio of CO_2 released to O_2 consumed during respiration.

Formula: $RQ = \frac{CO_2\ produced}{O_2\ consumed}$.

It varies for carbohydrates (RQ = 1), fats (<1), and proteins (~0.8).

(b) Importance of Light-Dependent Reactions in Photosynthesis:

The light-dependent reaction produces ATP and NADPH, which are essential for the light-independent reaction (Calvin cycle). Without these energy molecules, the synthesis of glucose cannot occur.

Q27. Write the dental formula of rabbit.

Solution:

A rabbit has 28 teeth in total.

Dental formula of rabbit: $\frac{2(2/1,0/0,3/2,3/3)}{1}$

Q28. (a) Why is Euploidy considered to be advantageous to both plants and animals?

(b) Classify Neurons based on its structure.

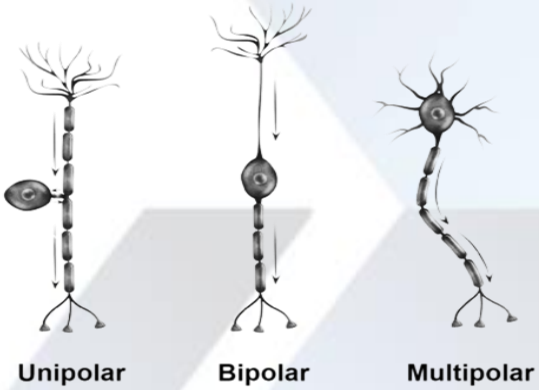
Solution:

(a) Advantages of Euploidy:

Euploidy improves plant size, vigor, and yield (e.g., polyploidy in wheat). In animals, it can lead to increased robustness, though often lethal.

(b) Classification of Neurons (Based on Structure):

- Unipolar neurons – Single process (common in invertebrates).
- Bipolar neurons – Two processes (found in the retina).
- Multipolar neurons – Multiple dendrites (most common in the brain and spinal cord).

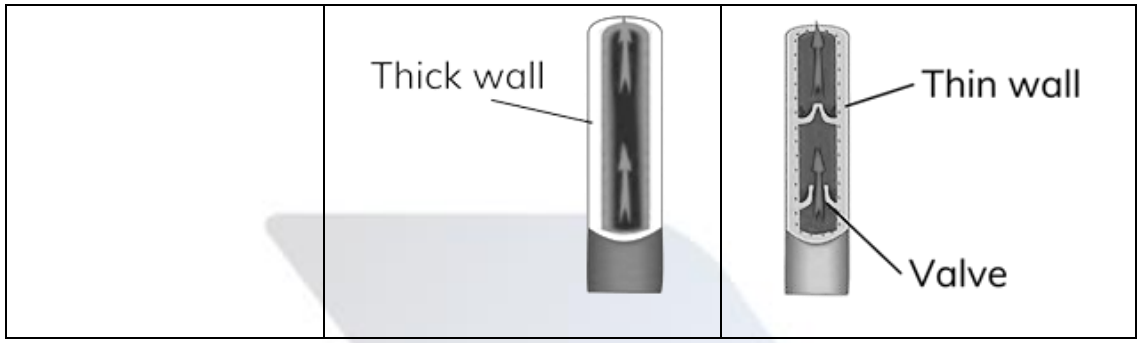


Q29. How are Arteries and Veins structurally different from one another?

Solution:

Structural differences between Arteries and Veins:

Feature	**Arteries**	**Veins**
Type of Wall	Thick walls	Thin walls
Thickness of Wall	Elastic walls (to withstand high pressure)	Less elastic walls
Presence of Valves	Valves absent	Have valves to prevent backflow of blood



Q30. Define Ethnobotany and write its importance.

Solution:

Ethnobotany studies the relationship between plants and human culture, focusing on medicinal uses, traditional knowledge, and conservation. It aids in drug discovery and sustainable agriculture.

Q31. (a) What are the consequences of deforestation?

(b) State the applications of DNA fingerprinting technique.

Solution:

(a) Consequences of deforestation:

- Loss of biodiversity
- Increased carbon dioxide levels (global warming)
- Soil erosion and desertification

(b) Applications of DNA Fingerprinting:

- Forensic science (criminal identification)
- Paternity testing
- Genetic disorder detection

Q32. (a) Name the acid that renders Aluminium passive. Why?

(b) Calculate the number of moles in 1.51×10^{23} molecules of NH_4Cl.

Solution:

(a) Conc. Nitric acid (HNO_3) makes aluminum passive by forming an oxide layer (Al_2O_3) that prevents further reaction.

(b) Moles in 1.51×10^{23} molecules of NH_4Cl:

Formula: Moles = $\frac{\text{Given molecules}}{\text{Avogadro's number}}$

$= \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} = 0.25$ moles

PART – IV

3x7=21

Note: Answer all the questions. Draw diagrams wherever necessary.

Q33. (a) (i) What are the uses of convex lens?

(ii) Define dispersion of light.

(iii) Why are traffic signals red in colour?

(iv) What is the least count of travelling microscope?

OR

(b) (i) What is an echo?

(ii) State two conditions necessary for hearing an echo.

(iii) What are the medical applications of echo?

(iv) How can you calculate the speed of sound using echo?

Solution:

(a) (i) Uses of convex lens: Used in magnifying glasses, microscopes, cameras, and spectacles for hypermetropia (long-sightedness).

(ii) Dispersion of light: The splitting of white light into its component colors when passing through a prism.

(iii) Red in traffic signals: Red has the longest wavelength, making it visible from a long distance, even in fog.

(iv) Least count of a traveling microscope: Typically 0.01 mm or 0.001 cm.

OR

(b) (i) Echo is the reflection of sound that returns after bouncing off a surface.

(ii) Conditions for hearing an echo are:

- The reflecting surface must be at least 17 meters away.
- The medium should allow the clear propagation of sound.

(iii) Medical applications of echo are: Used in ultrasonography (USG), Echocardiography, and detecting abnormalities in organs.

(iv) Speed of sound using echo: $v = \frac{2d}{t}$, where d is the distance of the obstacle, and t is the time for the echo to return.

Q34. (a) (i) Under same conditions of temperature and pressure, if you collect 3 litre of O_2, 5 litre of Cl_2 and 6 litre of H_2,

(A) Which has the highest number of molecules?

(B) Which has the lowest number of molecules?

(ii) Give the salient features of 'Modern Atomic theory'.

OR

(b) (i) How do detergents cause water pollution?

(ii) An organic compound 'A' is widely used as a preservative and has the molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B', then

(A) Identify the compound 'A'.

(B) Write the chemical equation for its reaction with ethanol to form compound 'B'.

(C) Name this process.

Solution:

(a)

(i) (A) H_2 has the highest number of molecules as it has the smallest molar mass.

(B) Cl_2 has the lowest number of molecules as it has the highest molar mass.

(ii) Modern Atomic Theory:

- Atoms are divisible (discovery of subatomic particles).
- Atoms of the same element may have different masses (isotopes).
- Atoms of different elements can have the same mass (isobars).
- Atoms combine in fixed whole-number ratios to form compounds.

OR

(b)

(i) Detergents being synthetic in nature are non-biodegradable. They cause foaming in water bodies. This harms the aquatic life.

(ii) (A) Compound 'A' is Acetic acid (CH_3COOH).

(B) Reaction: $\mathbf{CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O}$

(C) This process is called esterification.

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

(ii) With a neat labelled diagram, describe the parts of the typical angiospermic ovule.

OR

(b) (i) Who is called the "Father of Indian Green Revolution"?

(ii) Differentiate between out-breeding and in-breeding.

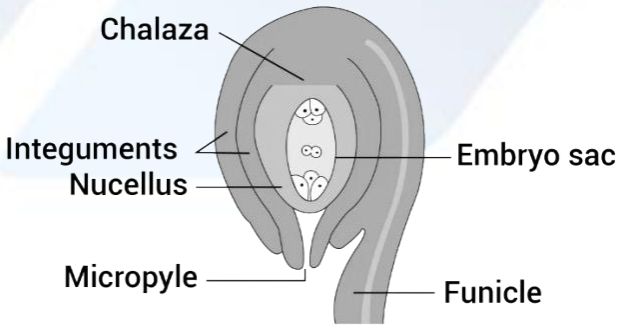
(iii) Differentiate between Type-I and Type-II Diabetes mellitus.

Solution:

(a)

(i) Synthetic auxins are artificial plant hormones that promote growth, rooting, and fruit development (e.g., 2,4-D, NAA).

(ii) Parts of a typical angiospermic ovule:



- Funicle – Attaches the ovule to the ovary.
- Nucellus – Provides nutrition.
- Integuments – Protective layers.

- Micropyle – Allows sperm entry.
- Embryo sac – Contains the female gamete.

OR

(b)

(i) Father of Indian Green Revolution: Dr. M.S. Swaminathan.

(ii) Out-breeding vs. In-breeding:

Feature	**Out-breeding**	**In-breeding**
Definition	Mating of unrelated individuals	Mating of closely related individuals
Advantage	Increases genetic diversity	Preserves desired traits

(iii) Type-I vs. Type-II Diabetes:

Feature	**Type-I Diabetes**	**Type-II Diabetes**
Cause	Lack of insulin production	Insulin resistance
Onset	Usually in childhood	Common in adults
Treatment	Insulin injections	Lifestyle changes & medication