Grade 10 Science Tamil Nadu 2014

Time Allowed: 2$^{1/2}$ Hours   **Maximum Marks: 75**

Section – I

15 x 1 = 15

Q1. The theory of natural selection was proposed by:

(Charles Darwin; Hugo de Vries; Gregor Johann Mendel; Jean Baptise Lamark)

Solution:

Charles Darwin

Q2. One of the following is transmitted through air. Find out.

(Tuberculosis, Meningitis, Typhoid, Cholera)

Solution:

Tuberculosis

Q3. The product of triple fusion which acts as nutritive tissue for the development of embryo is:

(zygote, placenta, scutellum, endosperm)

Solution:

Endosperm

Q4. The product obtained in the Anaerobic respiration of yeast is :

(lactic acid, pyruvic acid, ethanol, acetic acid)

Solution:

Ethanol

Q5. Example for fossil fuel is:

(Copper, Iron, Magnesium, Coal)

Solution:

Coal

Q6. When sunlight passes through window of classrooms its path is visible. This is due to _____ of light.

(reflection, scattering)

Solution:

Scattering

Q7. Chemical Volcano is an example of _____.

(combination reaction/ decomposition reaction)

Solution:

Decomposition reaction

Q8. A process employed for the concentration of sulphide ore is _____.

(froth floatation/ gravity separation)

Solution:

Froth flotation

Q9. The ore of Aluminium is _____.

(haemetite, magnetite, bauxite, siderite)

Solution:

Bauxite

Q10. Buckminster Fullerene is the allotropic form of .

(nitrogen/carbon/sulphur)

Solution:

Carbon

Q11. The weight of 50 kg person at the surface of earth is:

(50 N, 35 N, 380 N, 490 N)

Solution:

490 N (Weight = mass × acceleration due to gravity = 50 × 9.8)

Q12. The energy produced when 1 kg of a substance is fully converted into energy is

(9×10^{16} J, 9×10^{8} J, 18×10^{8} J, 18×10^{16} J)

Solution:

9×10^{16} J (Using Einstein's equation, $E = mc^2$)

Q13. The main source of bio-mass energy is _____.

(coal, heat energy, thermal energy, cow-dung)

Solution:

Cow-dung

Q14. The magnification produced by a mirror is $\frac{1}{3}$ then the type of mirror is :

(concave, convex, plane)

Solution:

Concave

Q15. An electric current through a metallic conductor produces _____ around it.

(heat, light, magnetic field,' mechanical force)

Solution:

Magnetic field

Section - II

Note : Answer any twenty questions.   20 x 2 = 40

Q16. The heritable characters are varying in different species and within the same

species. Name the variation in the following cases.

The eye colour among the human beings are varied as blue, black, brown, green

etc.

(a) This is called as _____variation.

The dentition in rabbit and elephant are not the same.

(b) This is called as _____ variation.

Solution:

a) Intra-Specific variation: In this, the variation is seen within the species.

b) Inter-Specific variation: In this, the variation is seen between two different organisms belonging to different genus.

Q17. Marasmus and Kwashiorkar are both protein deficiency defects. Marasmus differs from Kwashiorkar in enlarged belly and swelling in the face. Are these symptoms for the above diseases correct? If not correct it.

Solution:

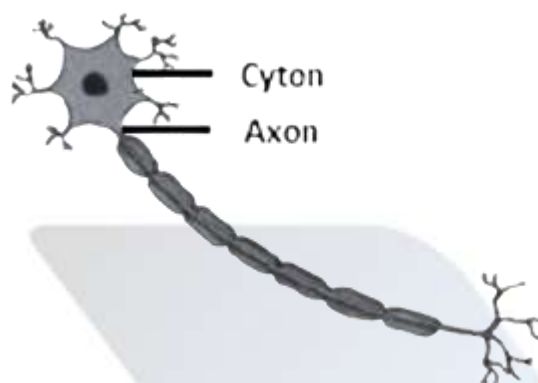The symptoms mentioned are incorrect.

- Marasmus: Severe weight loss, thin limbs, and muscle wasting, but no swelling.
- Kwashiorkor: Enlarged belly, swelling in the face and limbs due to fluid retention.

Q18. Copy the diagram and label any two parts in the group given:

(a) axon

(b) dendron

(c) cyton

(d) endplate

Solution:

Cyton
Axon

Q19. The important event of meiosis is the crossing over. It occurs during:
(Leptotene, Pachytene, Diplotene, Zygotene)
Solution:
Crossing over occurs during the Pachytene phase of Prophase I in meiosis. During this stage, homologous chromosomes pair up and exchange genetic material at specific points called chiasmata. This process increases genetic variation in offspring by creating new combinations of alleles.

Q20. Pick out the item which has sequential arrangements.
(a) Zygotene → Leptotene → Pachytene → Diplotene → Diakinesis
(b) Diakinesis → Zygotene → Leptotene → Pachytene → Diplotene
(c) Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis
Solution:
The correct sequential arrangement of meiotic prophase I stages is Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis. This sequence represents the progressive pairing, crossing over, and separation of homologous chromosomes during meiosis.

Q21. In balsam plant the seeds fall off far away from the mother plant.
(a) Is this statement correct or incorrect?
(b) Give reason.
Solution:

(a) Yes, the statement is correct

(b) Reason: Balsam seeds are dispersed by explosive mechanism (ballistic seed dispersal), where the fruit bursts open and scatters the seeds.

Q22. The epidermis of mammals contains:

(a) Hair, bristle, quills

(b) Hair, nail, claw

(c) Hair, bristle, horn

(d) Hair, nail, scale

Solution:

The epidermis of mammals contains **hair, nails, and claws**, which are all keratinized structures derived from the skin. Hair provides insulation, nails offer protection and support, and claws help in gripping, defense, and locomotion.

Q23. Which organ is known as "Master Chemist"? Why?

Solution:

The liver is called the "Master Chemist" because it performs various biochemical functions like detoxification, metabolism, protein synthesis, and bile production.

Q24. Fill in the blanks:

Plasma : Fibrinogen : RBC : _____.

WBC : _____ .

Solution:

Plasma : Fibrinogen : RBC : Haemoglobin

WBC : Antibodies (or Immunity)

Q25. Match the methods of nutrition of special organs with suitable examples.

Autotrophs	Mycorrhiza	Cuscuta
Parasites	Chlorophyll	Monotropa

Saprophytes	Haustoria	Hibiscus

Solution:

Method of Nutrition	Special Organ	Example
Autotrophs	Chlorophyll	Hibiscus
Parasites	Haustoria	Cuscuta
Saprophytes	Mycorrhiza	Monotropa

Q26. (a) Name the processes noted as no. 1 and 3.

(b) Define the process 1
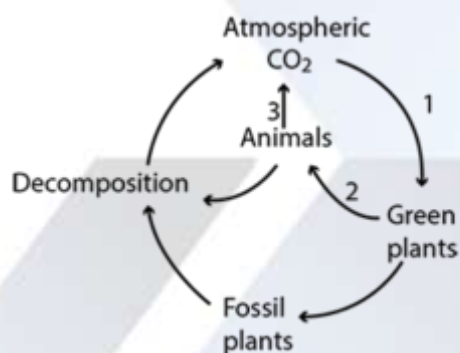
Solution:

(a) Process 1 - Photosynthesis

Process 2 - Respiration

(b) Photosynthesis is a process that converts CO2 into organic compounds especially carbohydrates using sunlight as the source of energy.

Q27. The pie diagram represents a survey result of infectious diseases of a village during 2008-2009. Analyse it and answer the following chart:

(a) Which diseases affected the majority of the population?

(b) How are the diseases transmitted?

Solution:

(a) Dengue fever and Chikungunya have affected 50% of the population.

(b) These diseases are transmitted through insect vectors, mosquitoes which breed in water.

Q28. Match the suitable renewable and non-renewable sources.

Sources	A	B	C
Renewable	Coal	Wind	Petroleum
Non-Renewable	Hydrogen	Natural gas	Solar energy

Solution:

Sources	A	B	C
Renewable	Wind	Solar energy	Hydrogen
Non-Renewable	Coal	Natural gas	Petroleum

Q29. Write any four liquid bio - fuels used for transportation.

Solution:

Biofuel is the fuel produced by the living organic matters. The various liquid biofuels are used for transportation such as:

- Ethanol

- Biodiesel
- Methanol
- Biobutanol

Q30. Distinguish between the saturated and unsaturated solution using the data given below.

(a) 16 g NaCl in 100 g water.

(b) 36 g NaCl in 100 g water

(Note - Solubility of NaCl is 36 g)

Solution:

Solution	Type	Explanation
(a) 16 g NaCl in 100 g water	Unsaturated	Since 16 g is less than the solubility limit (36 g), more salt can dissolve.
(b) 36 g NaCl in 100 g water	Saturated	It has reached the maximum solubility, so no more salt can dissolve.

Q31. When sunlight passes through the window of the classroom, the path of the light is visible. What is this effect called? Give reason.

Solution:

Effect: Tyndall effect

Reason: When light passes through a medium containing dust particles, it scatters, making the path of light visible.

Q32. Molecular mass of nitrogen is 28. It's atomic mass is 14. Find the atomicity of nitrogen.

Solution:

Atomicity = Molecular Mass / Atomic Mass
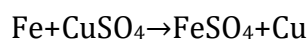
Atomicity of Nitrogen (N_2) = 28 / 14 = 2

Thus, nitrogen is a diatomic molecule.

Q33. Why does the colour of copper sulphate change when an iron nail is kept in it ? Justify your answer.

Solution:

Iron is more reactive than copper. When an iron nail is placed in copper sulphate ($CuSO_4$) solution, a displacement reaction occurs:

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

This forms iron sulphate ($FeSO_4$), which is green in colour, and copper is deposited as a reddish-brown layer.

Q34. The hydroxyl ion concentration of a solution is 1.0×10^{-8} M. What is the pH of the solution?

Solution:

pH + pOH = 14

$pOH = -\log[OH^-]$

$= -\log(10^{-8}) = 8$

pH = 14 − 8 = 6

Thus, the pH of the solution is 6, making it slightly acidic.

Q35. Mention any two uses of iron.

Solution:

Two uses of iron:

- Used in construction for making steel structures and tools.
- Used in manufacturing vehicles, machines, and appliances.

Q36. Why cannot aluminium metal be obtained by the reduction of aluminium oxide with coke?

Solution:

Aluminium metal cannot be obtained by the reduction of aluminium oxide (Al_2O_3) with coke (carbon) because aluminium has a very high affinity for oxygen and forms a highly stable aluminium oxide.

In the reactivity series, aluminium is more reactive than carbon, meaning carbon is not strong enough to reduce aluminium oxide. Instead, aluminium is extracted using electrolysis of molten aluminium oxide mixed with cryolite in the Hall-Héroult process.

Q37. Fill in the blanks:

S.No.	Molecular formula	Common name	IUPAC name
(1)	CH_3COOH	-	Ethanoic acid
(2)	HCHO	Formaldehyde	

Solution:

S. No.	Molecular Formula	Common Name	IUPAC Name
(1)	CH_3COOH	Acetic acid	Ethanoic acid
(2)	HCHO	Formaldehyde	Methanal

Q38. From the following statements write down that which is not applicable to mass of an object:

(a) It is a fundamental quantity.

(b) It is measured using physical balance.

(c) It is measured using spring balance.

(d) It is the amount of matter.

Solution:

Incorrect statement:

(c) It is measured using a spring balance.

Correction:

Mass is measured using a physical balance, while a spring balance measures weight.

Q39. Correct the mistakes if any in the following statements:

(a) One newton is the force that produces an acceleration of $1\ ms^{-2}$ in an object of 1 gram mass.

(b) Action and reaction is always acting on the same body.

Solution:

(a) Incorrect: One newton is the force that produces an acceleration of $1\ m/s^2$ in an object of 1 gram mass.

Correction: One newton is the force that produces an acceleration of $1\ m/s^2$ in an object of 1 kg mass.

(b) Incorrect: Action and reaction forces always act on the same body.

Correction: Action and reaction forces always act on different bodies but with equal magnitude and opposite direction.

Q40. Three resistances having the values $5\Omega, 10\Omega, 30\Omega$ are connected parallel with each other. Calculate the total circuit resistance.

Solution:

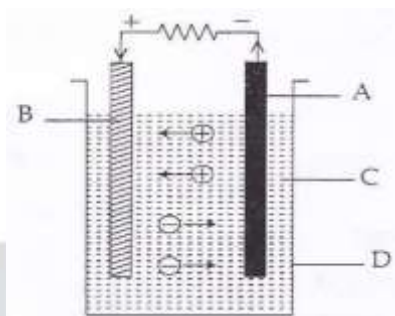Formula for parallel resistance:

$1/R=1/R_1+1/R_2+1/R_3$

$1/R=1/5+1/10+1/30$

$1/R=6/30+3/30+1/30=10/30=1/3$

$R=3\Omega$

Thus, the total circuit resistance is 3Ω.

Q41. Volta cell diagram is given below. Label the parts A, B, C and D.

Solution:

A: Zinc Electrode (Anode)

B: Copper Electrode (Cathode)

C: Electrolyte (Dilute Sulfuric Acid)

D: Glass vessel

Q42. Match the following:

Components	Symbols
(a) Plug key or Switch (Closed)	
(b) A wire joint	
(c) Electric bulb	
(d) Electric cell	

Solution:

Components	Symbols
(a) Plug key or Switch (Closed)	
(b) A wire joint	
(c) Electric bulb	

(d) Electric cell	$\pm\dashv\vdash\!-$

Q43. Fill in the blanks.

(a) For motor : a permanent magnet, then commercial motor : _____.

(b) Focal length of a lens : metre, then for power of a lens _____.

Solution:

(a) For a motor: a permanent magnet, then for a **commercial motor**: **an electromagnet**.

(b) Focal length of a lens: metre, then for **power of a lens: dioptre**.

Q44. Considering these write down the names of the parts in human eye.

(a) Dark muscular diaphragm that controls the pupil -.

(b) The screen where the image is formed by eye lens

Solution:

(a) Dark muscular diaphragm that controls the pupil – Iris

(b) The screen where the image is formed by the eye lens – Retina

Q45. The focal length of a concave lens is 2 m, calculate the power of the lens.

Solution:

Given: Focal length (f) =-2 m (concave lens has a negative focal length)

Formula: Power (P) = 1/f (in meters)

P=1/-2

P=−0.5 D

So, the power of the concave lens is -0.5 dioptres (D).

Section - III

Each question carries five marks. Answer any 4 of them   4 x 5 = 20

Part - I

Q46. (a) Define genetic engineering.

(b) What are the benefits of genetic engineering?

Solution:

(a) Genetic engineering is a technique of modifying the DNA of an organism to introduce desirable traits or remove unwanted ones.

(b) Benefits of Genetic Engineering:

Disease Resistance – Crops can be made resistant to pests and diseases.

Medical Advancements – Production of insulin and other medicines using genetically modified bacteria.

Increased Crop Yield – Genetically modified crops can have better growth and nutritional value.

Gene Therapy – Used in treating genetic disorders like cystic fibrosis.

Improved Livestock – Animals can be bred with desirable traits for better milk and meat production.

Q47. Kala has delivered a baby :

(a) Suggest the immunization schedule for the baby in the first six months.

(b) What are all the diseases that can be cured as per the schedule?

Solution:

(a) Immunization Schedule (First Six Months)

Age	Vaccine
At birth	BCG, Hepatitis B, OPV-0
6 weeks	DPT-1, OPV-1, Hepatitis B-2, Hib-1
10 weeks	DPT-2, OPV-2, Hepatitis B-3, Hib-2
14 weeks	DPT-3, OPV-3, Hib-3

(b) Diseases Prevented:

BCG – Tuberculosis

Hepatitis B – Liver infection

OPV (Oral Polio Vaccine) – Polio

DPT – Diphtheria, Pertussis (Whooping Cough), and Tetanus

Hib – Haemophilus Influenzae Type B infections

Part - II

Q48. Describe the structure of dicot seed.

Solution:

A dicot seed, such as a bean seed, has several distinct parts that play important roles in its growth and development. The **seed coat** is the tough outer covering that protects the inner structures of the seed. Near the seed coat, there is a small scar called the **hilum**, which marks the spot where the seed was attached to the fruit. Close to the hilum is a tiny pore known as the micropyle, which allows water to enter the seed during germination. Inside the seed, there are two cotyledons, which act as food storage organs, providing nutrients to the developing embryo. The embryo consists of two main parts: the **plumule**, which eventually grows into the shoot, and the **radicle**, which develops into the root system. These structures work together to ensure the seed successfully germinates and grows into a healthy plant.
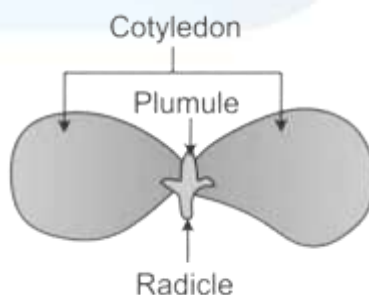
Q49. Smoke, smoke, everywhere smoke. Do you agree this situation is good for health ?
List out the harmful effects of coal burning.

Solution:

No, the situation of excessive smoke everywhere is not good for health. Smoke from burning coal contains harmful pollutants that can severely impact both human health and the environment.

Harmful Effects of Coal Burning:

i. Air Pollution: Burning coal releases large amounts of carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter, leading to air pollution and respiratory problems.

ii. Respiratory Diseases: Inhalation of coal smoke can cause lung diseases like bronchitis, asthma, and even lung cancer due to the presence of fine particulate matter.

iii. Acid Rain: Sulfur dioxide (SO_2) released during coal combustion reacts with water vapor in the atmosphere, forming acid rain, which harms soil, water bodies, and plant life.

iv. Global Warming: Coal burning is a major contributor to greenhouse gas emissions, especially CO_2, which traps heat in the atmosphere and leads to global warming and climate change.

v. Environmental Damage: The pollutants from coal burning settle on plants, water bodies, and soil, affecting biodiversity and reducing agricultural productivity.

Part - III

Q50. (a) State any three findings of modern atomic theory.

(b) Write down any two applications of Avogadro's law.

Solution:

(a) Three Findings of Modern Atomic Theory:

1. Atoms are Divisible: Unlike Dalton's atomic theory, modern atomic theory states that atoms are not indivisible; they consist of subatomic particles like protons, neutrons, and electrons.

2. Atoms of the Same Element Can Differ: Isotopes exist, meaning atoms of the same element can have different masses due to varying numbers of neutrons.

3. Atoms Combine in Whole Numbers: Atoms combine in whole number ratios to form compounds, but in complex organic compounds, they may also combine in fractional ratios.

(b) Two Applications of Avogadro's Law:

1. Determination of Molar Volume: Avogadro's Law states that equal volumes of gases at the same temperature and pressure contain the same number of molecules. This helps determine the molar volume of gases (22.4 L at STP).

2. Calculation of Molecular Mass: Using Avogadro's constant (6.022×10^{23} molecules/mol), scientists can determine the molecular masses of gases by comparing their densities with a known gas.

Q51. (a) Define "Esterification".

(b) Write any three uses of ethanol.

Solution:

Esterification is a chemical reaction in which an alcohol reacts with a carboxylic acid in the presence of an acid catalyst (like concentrated sulfuric acid) to form an ester and water. This reaction is responsible for the pleasant fragrances of esters.

Example:

$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$
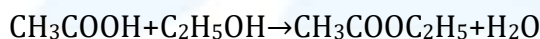
(Acetic acid + Ethanol → Ethyl acetate + Water)

(b) Three Uses of Ethanol:

As a Fuel: Ethanol is used as a biofuel or mixed with petrol to produce gasohol, reducing pollution.

In Medicine: It is used as an antiseptic and disinfectant in medical applications.

In Perfume and Cosmetics: Ethanol is a solvent in perfumes and cosmetics due to its quick evaporation and pleasant odor.

Part - IV

Q52. (a) Space stations are used to study the effects of longspace flight on the human body. Justify.

(b) $F = Gm_1 m_2/d^2$ is the mathematical form of Newton's Law of gravitation. $G =$ gravitational constant, m_1, m_2 are the masses of two bodies separated by a distance ' d '. Then give the statement of Newton's Law of gravitation.

Solution:

(a) Space Stations and Long-Term Human Flight Studies:

Space stations like the International Space Station (ISS) help scientists study the long-term effects of space travel on the human body. In microgravity, astronauts experience:

1. Bone and Muscle Loss: Lack of gravity leads to muscle weakening and bone density reduction.
2. Fluid Redistribution: Body fluids move upwards, causing facial swelling and changes in vision.
3. Psychological Effects: Prolonged isolation in space can affect mental health.
4. Immune System Changes: Studies show that immunity may weaken in space.
5. Radiation Exposure: Space stations allow research on shielding astronauts from harmful cosmic radiation.

These studies help in planning future long-duration missions, like those to Mars.

(b) Newton's Law of Universal Gravitation states that:

"Every object in the universe attracts every other object with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them."
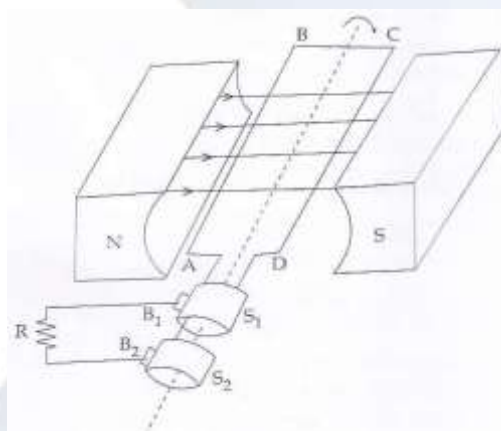
Mathematically,

$F = Gm_1m_2/d^2$

Where:

- F = Gravitational force

- G = Universal gravitational constant

- m_1 and m_2 = Masses of the two objects

- d = Distance between their centers

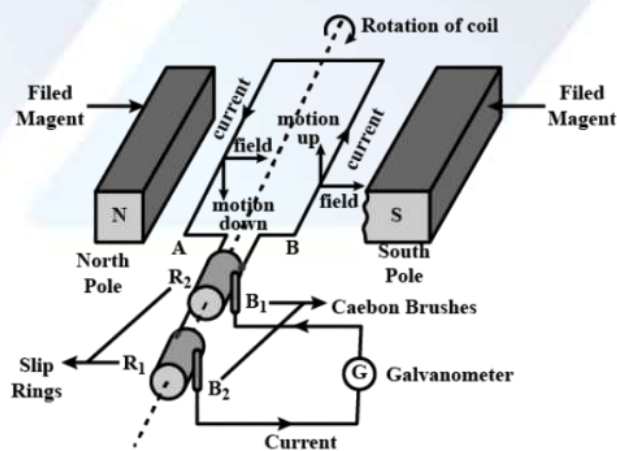Q53. (a) Redraw the given diagram.

(b) This diagram represents _____.

(c) Label the parts of the diagram.

(d) Mention the working principle of the device denoted by this diagram.

Solution:

(a) & (c)

(b) The given diagram illustrates an **AC Electric Generator**, a device that transforms mechanical energy into electrical energy to generate an alternating current.

(d) The working of an electric generator is based on the principle of **electromagnetic induction.** When a coil is rotated within a uniform magnetic field while its axis remains perpendicular to the field, the number of magnetic field lines passing through the coil changes. This variation induces an electromotive force (EMF) and generates an electric current in the circuit.