TN Board Class 10 Science 2016

PART-III

Time: 2.5hrs **Total Score: 75**

Note: This paper has three sections.

Section-I

Note: **15x1=15**

(i) Answer all the 15 questions.

(ii) Choose the correct answer from the alternatives given in the brackets.

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. _____is a bacterial disease.

(Meningitis, Rabies, Tetanus, Smallpox)

Solution:

Meningitis

Q3. The part of the brain which controls emotional reactions in our body is

(Cerebellum, Cerebrum, Thalamus, Hypothalamus)

Solution:

Hypothalamus

Q4. Post - fertilisation, the ovule changes into a/an _____.

(seed, fruit, endosperm, pericarp)

Solution:

Seed

Q5. Normal body temperature of a man is _____.

(98.4° − 98.6°F, 96.6° − 96.8°F, 94.4° − 98.6°F, 98.4° − 99.6°F)

Solution:

98.4° − 98.6°F

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

(Mitochondria, Chloroplasts, Endoplasmic-reticulum, Nucleus)

Solution:

Chloroplasts

Q7. _____ is used in seeding clouds.

(Potassium iodide, Calcium carbonate, Sulphur dioxide, Ammonium phosphate)

Solution:

Potassium iodide

Q8. _____ is the chief component of natural gas.

(Ethane, Methane, Propane, Butane)

Solution:

Methane

Q9. In an endothermic process, solubility increases with _____ in temperature.

(increase/decrease)

Solution:

Increase

Q10. Chemical volcano is an example of _____ .

(combination reaction/ decomposition reaction)

Solution:

Decomposition reaction

Q11. _____ is used in making automobile parts.

(Nickel steel, Stainless steel, Bronze, Magnalium)

Solution:

Magnalium

Q12. Buckminster fullerene is the allotropic form of _____.

(Nitrogen, Carbon, Sulphur)

Solution:

Carbon

Q13. The momentum of a massive object at rest is _____.

(very large, very small, zero, infinity)

Solution:

Zero

Q14. _____ surface absorbs more heat than any other surface under identical conditions. (White, Rough, Black, Yellow)

Solution:

Black

Q15. The phenomenon of producing an emf in a circuit whenever the magnetic flux linked with a coil changes is _____.

(electromagnetic induction, inducing current, inducing voltage, change in current)

Solution:

Electromagnetic induction

Section-II

Note: Answer any twenty questions. **20x2=40**

Q16. Here are certain important hereditary jargons. Fill in the blanks by choosing a suitable one from the list given. (allele, variation, speciation, gene, allelomorphs)

(i) _____ are the factors which form the physical basis of inheritance.

(ii) _____ is the alternate form of the same gene.

Solution:

(i) Gene

(ii) Allele

Q17. What are the variations? Mention their types.

Solution:

Variations are the differences in traits among individuals of the same species, arising due to genetic and environmental factors. They play a crucial role in evolution and adaptation. Variations can be classified into somatic variations, which occur in body cells and are not inherited, and germinal variations, which occur in reproductive cells and are passed to the next generation. Based on their nature, variations are also categorized as continuous variations, which show gradual differences influenced by multiple genes and the environment, such as height and skin color, and discontinuous variations, which exhibit distinct differences with no intermediates, such as blood groups and the ability to roll the tongue.

Q18. Match the following by identifying the pairs

(medicines, fuel, microbes, metabolism, organic acids)

(i) Vaccine

(ii) Natural gas

(iii) Citric acid

(iv) Vitamins

Solution:

(i) Vaccine : Microbes

(ii) Natural gas : Fuel

(iii) Citric acid : Organic acid

(iv) Vitamins : Metabolism

Q19. What are the symptoms of a common cold?

(i) _____ (ii) _____

Solution:

(i) Runny nose and flow of mucous

(ii) Sneezing and chest congestion

Q20. Pick out the item, which has a sequential arrangement.

(i) Zygotene → Leptotene → Pachytene → Diplotene → Diakinesis

(ii) Diakinesis → Zygotene → Leptotene → Pachytene → Diplotene

(iii) Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis

Solution:

(iii) Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis

In Meiosis I, Prophase I is longer than the mitotic prophase and is further subdivided into five sub-stages: Leptotene, Zygotene, Pachytene, Diplotene and Diakinesis

Q21. (a) Identify figure A and B.

(b) Which part of *A* is modified into *B*.

A B

Solution:

(a) A – Carpel/Pistil, B – Fruit

(b) The ovary of a pistil develops into a fruit.

Q22. Assertion (A): Mammalian heart is called myogenic heart.

Reason (R): Heart-beat is regulated by a specialised muscle bundle (pacemaker) in mammals.

(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)

The heart is entirely composed of cardiac muscles, including a specialized group of cardiac muscle fibers known as nodal tissue, which is distributed within the heart. This nodal tissue includes the sinoatrial node (SAN)—a small patch of tissue located in the upper right corner of the right atrium—and the atrioventricular node (AVN)—a mass of tissue found in the lower left corner of the right atrium, near the atrioventricular septum.

The nodal musculature has the unique ability to generate action potentials independently, without requiring external stimuli, making it auto-excitable. Due to this property, the mammalian heart is classified as a myogenic heart, meaning its heartbeat is controlled by an internal pacemaker rather than external nerve signals.

Q23. Name the three important blood proteins seen in Plasma. Add a note on their functions.

Solution:

The three key blood proteins present in plasma are Albumin, Globulin, and Fibrinogen.

Function:

1. Albumin plays a crucial role in maintaining the osmotic pressure of blood, ensuring proper fluid balance.
2. Globulins are classified into three types: alpha, beta, and gamma. Alpha and beta globulins act as transport proteins, carrying lipids and fat-soluble

vitamins, while gamma globulins function as antibodies, aiding in immune defense.

3. Fibrinogen, produced in the liver, is one of the 13 coagulation factors essential for normal blood clotting. During the clotting process, fibrinogen is transformed into fibrin, which helps form a stable clot at the site of injury to prevent excessive bleeding.

Q24. The master chemists of our body are the kidneys. Justify.

(a) Kidneys filter all chemicals in the body

(b) Kidneys maintain the chemical composition of blood

(c) Kidneys eliminate all chemicals absorbed by the body

(d) Kidneys store the chemicals accumulated in the body

Solution:

(b) Kidneys maintain the chemical composition of blood

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

Autotrophs	Mycorrhiza	Cuscutta
Parasites	Chlorophyll	Monotropa
Saprophytes	Haustoria	Hibiscus

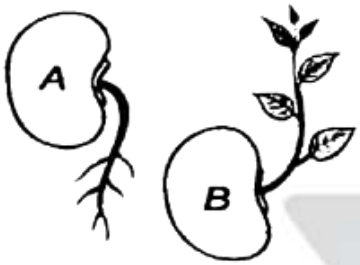
Solution:

Autotrophs	Chlorophyll	Hibiscus
Parasites	Haustoria	Cuscutta
Saprophytes	Mycorrhiza	Monotropa

Q26. Observe the diagram:

(a) Mention the type of movements shown in figure A and B.

(b) How does this movement differ from the movement of mimosa?



Solution:

(a) The types of movements shown in the figure are:

A – Geotropism (movement of plant parts in response to gravity – Roots).

B – Phototropism (movement of plants in response to light – Shoot).

(b) The movements observed in both geotropism and phototropism rely on growth (tropic movement). Whereas the movement seen in the Mimosa plant is independent of growth (nastic movement). It is in response to touch stimuli.

Q27. What is respiration? Give a balanced equation for aerobic respiration.

Solution:

Respiration is a biochemical process in which food molecules, such as glucose, are broken down to release energy in the form of ATP (Adenosine Triphosphate). This process occurs in all living organisms and is essential for carrying out various life processes. Respiration is further classified into two types:

1. Aerobic Respiration – Occurs in the presence of oxygen.
2. Anaerobic Respiration – Occurs in the absence of oxygen.

Balanced Equation for Aerobic Respiration:

$$\mathbf{C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38ATP}$$

- Glucose ($C_6H_{12}O_6$) is broken down in the presence of oxygen (O_2).
- It produces carbon dioxide (CO_2), water (H_2O), and energy (ATP).
- Aerobic respiration provides 38 molecules of ATP per molecule of glucose.
- This process takes place mainly in the mitochondria of the cell.

Q28. Depict a food chain by placing the following organisms in the correct trophic levels. (snake, grass, eagle, frog, grasshopper)

Solution:

The food chain for this will be as given below:

Grass → Grasshopper → Frog → Snake → Eagle

Grass acts as the producer, while the grasshopper, being an herbivore, serves as the primary consumer. The frog, which preys on the grasshopper, functions as the secondary consumer or primary carnivore. The snake, feeding on the frog, is the tertiary consumer or secondary carnivore. Finally, the eagle, at the top of the food chain, is the apex predator or top consumer.

Q29. Find the odd one out:

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

(b) cholera, typhoid, scabies, dysentery

Solution:

(a) Odd man out is petroleum as it is a non-renewable resource, while the other three are renewable resources.

(b) Scabies is the odd man out, as the other three are all water-borne disease, and scabies is not.

Q30. Substituting energy efficient Compact Fluorescent Light bulbs (CFL) for standard incandescent bulbs will save on an average up to 6,000 megawatts of electricity each year.

Raise questions:

(a) _____? (b) _____?

Solution:

(a) How does using Compact Fluorescent Light bulbs (CFLs) instead of incandescent bulbs contribute to energy conservation?

(b) What is the impact of saving 6,000 megawatts of electricity annually on the environment and economy?

Q31. Write any four liquid biofuels for transportation.

Solution:

Biofuels are liquid or gaseous fuels utilized for transportation. Four types of liquid biofuels include:

- Ethanol (bio-alcohol)
- Green diesel
- Biodiesel
- Vegetable oil

Q32. (a) Which gas is dissolved in soft drinks?

(b) What will you do to increase the solubility of this gas?

Solution:

(a) Soft drinks contain dissolved carbon dioxide.

(b) According to Henry's law, the solubility of a gas in a liquid increase with the pressure of the gas above the liquid's surface. Therefore, increasing the pressure enhances the amount of gas that dissolves in the liquid.

Q33. What is the Tyndall Effect?

Solution:

The Tyndall effect is the phenomenon in which the particles in a colloid scatter the beams of light that are directed at them.

Q34. Calculate the number of molecules in 11 g of CO_2

Solution:

If the Gram molecular weight of $CO_2 = 12 + 2 \times 16 = 44$ g.

Then, 44 g of CO_2 contains 6.023×10^{23} molecules.

Hence, number of molecules in 11 g of $CO_2 = (11 \times 6.023 \times 10^{23})/44 = 1.51 \times 10^{23}$ molecules.

Q35. Identify the wrong statements and correct them.

(a) Sodium benzoate is used in food preservative.

(b) Nitric acid is not used as fertiliser in agriculture.

(c) Sulphuric acid is called the king of chemicals.

(d) The pH of acid is greater than 7.

Solution:

(a) Correct. Sodium benzoate is used in food preservation as food preservative.

(b) Correct. Nitric acid is not directly used as fertiliser, rather it is used in the production of nitrogen based fertiliser in agriculture.

(c) Correct. Sulphuric acid is called the king of chemicals.

(d) Incorrect. pH value of acid is less than 7. Bases have pH value greater than 7.

Q36. The hydrogen ion concentration of a solution is 0.001 M. What is the pH of the solution?

Solution:

$$\text{pH} = -\log_{10}[\text{H}^+] = -\log_{10}(0.001) = -\log_{10}(10^{-3})$$

$$\text{pH} = -(-3)\log_{10} 10$$

Hence, pH of the solution is 3.

Q37. Correct the mistakes, if any, in the following statement.

In a period, the metallic character of the element increases while their non-metallic character decreases.

Solution:

As you move from left to right across a period, the metallic character decreases, while the nonmetallic character increases.

Q38. Assertion (A): Electroplating method not only protects but also enhances the metallic appearance.

Reason (R): Electroplating is a method of coating one metal with another by passing electric current.

(a) (A) is right, (R) is wrong.

(b) (A) is right, (R) is not relevant.

(c) (A) is right, (R) is relevant.

Solution:

(c) (A) is right, (R) is relevant.

Q39. Diamond is the hardest allotrope of carbon. Give a reason for its hardness.

Solution:

Diamond is the hardest form of carbon. Its exceptional hardness is due to the need to break multiple strong covalent bonds within its crystal structure. Since covalent bonds are difficult to break, this characteristic makes diamond the hardest naturally occurring substance on Earth.

Q40. Assertion (A): Liquefied cryogenic gases are sprayed on underground electric cables in big cities.

Reason (R): Liquefied cryogenic gases prevent wastage of power.

(a) (A) is incorrect and (R) is correct.

(b) (A) is correct and (R) is incorrect.

(c) Both (A) and (R) are incorrect.

(d) (A) is correct and (R) supports (A).

Solution: (d) (A) is correct and (R) supports (A).

Q41. As a matter of convention, an anticlockwise moment is taken as _____ and a clockwise moment is taken as _____.

Solution:

As a matter of convention, an anticlockwise moment is taken as positive and a clockwise moment is taken as negative.

Q42. Match the following:

(1) Potential Difference	(a) Coulomb
(2) Current	(b) Volt
(3) Electric Charge	(c) Ohm
(4) Resistor	(d) Newton
	(e) Ampere

Solution:

(1) Potential Difference	(b) Volt
(2) Current	(e) Ampere
(3) Electric Charge	(a) Coulomb
(4) Resistor	(c) Ohm

Q43. Fuse wire is made up of an alloy of _____ which has high resistance and _____ melting point.

Solution:

A fuse wire is composed of a tin and lead alloy and is characterized by its high resistance and low melting point.

Q44. In the list of sources of energy given below, find the odd one out.

(Solar energy, Thermal energy, Hydropower, Biomass)

Solution:

Biomass is the odd man out because it is an example of renewable energy, from living species.

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

Solution:

Use the formula for power of the lens $(P) = 1/f$

Focal length of the concave lens (f) $= -2$m

Hence, $P = 1/-2$

So, the power of the lens P would be 0.5 Dioptre

Q46. Define Fleming's left-hand rule.

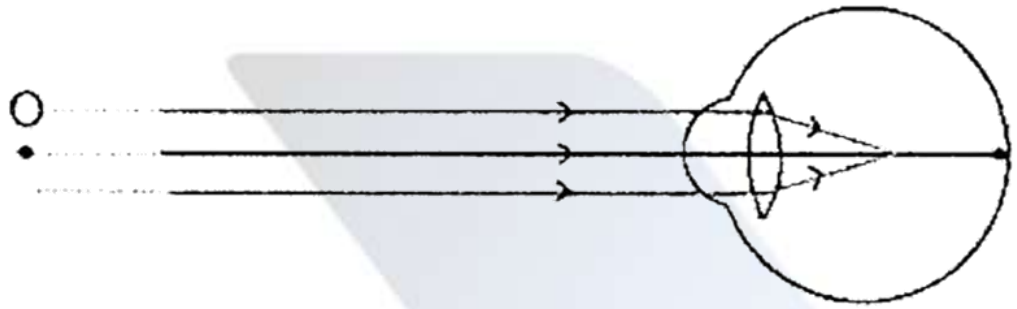
Solution:

Fleming's left-hand rule states that "When a current-carrying conductor is placed in an external magnetic field, the conductor experiences a force perpendicular to both the fields and to the direction of the current flow."

Q47. Observe the diagram and fill up the following:

(a) _____ defect of eye.

(b) _____ lens is used to correct the defect.



Solution:

(a) Myopia (short-sightedness)

(b) Concave

Section-III

4x5=20

Note: (i) Answer any four questions by choosing one question from each part.

(ii) Each question carries five marks.

(iii) Draw diagrams wherever necessary.

Part-1

Q48. Kala has delivered a baby.

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

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

Solution:

(a A newborn baby should follow the recommended immunization schedule to protect against various infectious diseases.

The immunization schedule for the first six months includes:

Age	Vaccine	Protection Against
At Birth	BCG	Tuberculosis
At Birth	Hepatitis B (1st Dose)	Hepatitis B
At Birth	OPV (Oral Polio Vaccine - 0 dose)	Polio
6 Weeks	DPT (1st Dose)	Diphtheria, Pertussis (Whooping Cough), Tetanus
6 Weeks	Hib (Haemophilus Influenzae Type B - 1st Dose)	Meningitis, Pneumonia
6 Weeks	Hepatitis B (2nd Dose)	Hepatitis B
6 Weeks	OPV (1st Dose)	Polio
6 Weeks	Rotavirus Vaccine (1st Dose)	Rotavirus Infection (Diarrhea)
10 Weeks	DPT (2nd Dose)	Diphtheria, Pertussis, Tetanus
10 Weeks	Hib (2nd Dose)	Meningitis, Pneumonia
10 Weeks	Hepatitis B (3rd Dose)	Hepatitis B
10 Weeks	OPV (2nd Dose)	Polio
10 Weeks	Rotavirus Vaccine (2nd Dose)	Rotavirus Infection
14 Weeks	DPT (3rd Dose)	Diphtheria, Pertussis, Tetanus
14 Weeks	Hib (3rd Dose)	Meningitis, Pneumonia
14 Weeks	OPV (3rd Dose)	Polio
14 Weeks	Rotavirus Vaccine (3rd Dose)	Rotavirus Infection

(b) By following this schedule, the baby is protected from the following diseases:

- Tuberculosis (TB) – Prevented by BCG vaccine.
- Polio – Prevented by OPV.
- Hepatitis B – Prevented by the Hepatitis B vaccine.
- Diphtheria – Prevented by the DPT vaccine.

- Pertussis (Whooping Cough) – Prevented by the DPT vaccine.
- Tetanus – Prevented by the DPT vaccine.
- Haemophilus Influenzae Type B Infections (like Meningitis and Pneumonia) – Prevented by Hib vaccine.
- Rotavirus Infection (which causes severe diarrhea in infants) – Prevented by the Rotavirus vaccine.

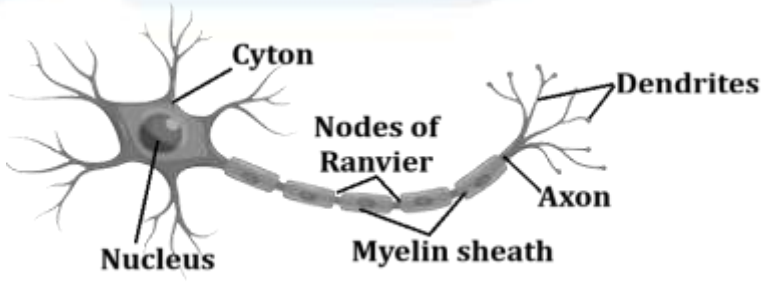
Q49. Describe the structure of a neuron with the help of a neat, labelled diagram.

Solution:

A neuron is the structural and functional unit of the nervous system. It is a specialized cell designed to transmit electrical and chemical signals throughout the body.

The structure of a neuron consists of three main parts:

- Cell Body (Soma) – It contains the nucleus and other organelles. It is responsible for maintaining the neuron's metabolic activities.
- Dendrites – These are short, branched structures that receive signals from other neurons or sensory receptors and transmit them to the cell body.
- Axon – It is a long, single extension that carries nerve impulses away from the cell body toward other neurons, muscles, or glands. The axon is often covered with a myelin sheath, which insulates and speeds up signal transmission.
- Nodes of Ranvier – These are small gaps in the myelin sheath that occur at regular intervals along the axon of a neuron.



Part-II

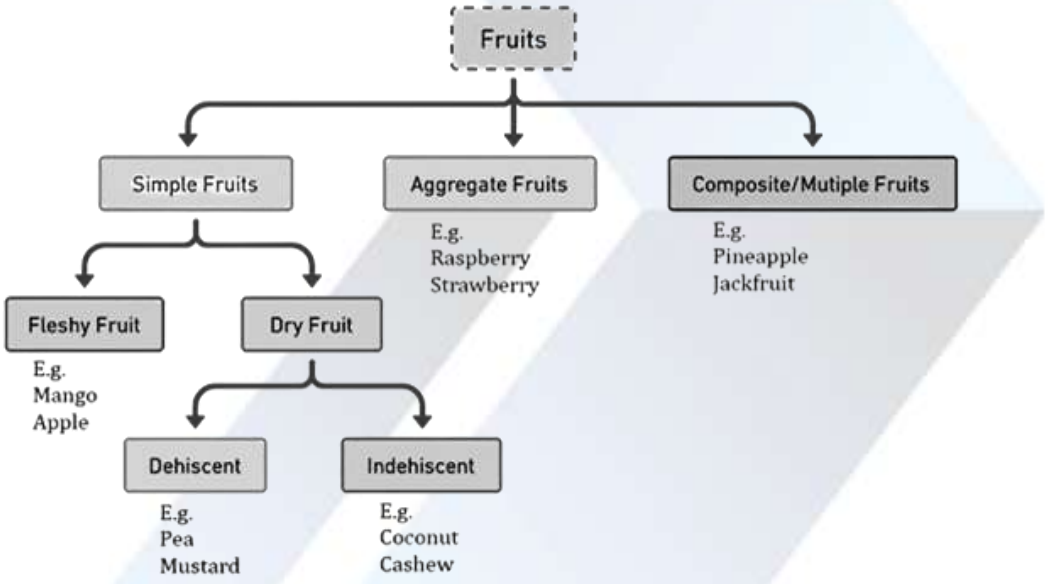
Q50. (a) Fruit is a product of fertilization. Are there any fruits which are formed without the act of fertilization?

(b) Represent the classification of fruits in a diagrammatic sketch.

Solution:

(a) Yes, some fruits develop without fertilization. These are called Parthenocarpic fruits as they do not contain seeds. Examples: banana, pineapple, seedless grapes, seedless oranges, etc.

(b) Fruits can be classified into three main types based on their development:



Q51. List out the harmful effects of burning coal.

Solution:

Burning coal has several harmful effects on the environment and human health. Some of the major harmful effects are:

- **Air Pollution** – Coal combustion releases harmful gases such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and carbon monoxide (CO), which contribute to air pollution.

- **Global Warming** – Burning coal releases large amounts of carbon dioxide (CO_2), a greenhouse gas that traps heat in the atmosphere, leading to climate change and global warming.
- **Acid Rain** – Sulfur dioxide (SO_2) and nitrogen oxides (NO_x) released from coal burning react with water vapor in the atmosphere to form acid rain, which damages soil, plants, water bodies, and buildings.
- **Respiratory Problems** – Fine particulate matter (PM2.5 and PM10) released during coal combustion can cause serious respiratory diseases such as asthma, bronchitis, and lung infections.
- **Toxic Heavy Metals** – Coal contains toxic metals like mercury, lead, and arsenic, which are released into the environment and can contaminate water bodies, affecting both human and aquatic life.
- **Water Pollution** – Waste products from coal-burning power plants, such as fly ash and sludge, can contaminate nearby rivers and groundwater, making water unsafe for drinking and harming aquatic ecosystems.
- **Soil Degradation** – Deposition of coal ash on land reduces soil fertility, making it unfit for agriculture. Acid rain further depletes soil nutrients.
- **Thermal Pollution** – Power plants using coal release hot water into nearby lakes and rivers, raising water temperatures and disrupting aquatic life.
- **Deforestation** – Large-scale coal mining leads to deforestation, destroying habitats and reducing biodiversity.
- **Health Hazards to Workers** – Miners exposed to coal dust can develop diseases like pneumoconiosis (black lung disease), which severely affects lung function.

Part- III

Q52. (a) What are Isotopes?

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

Solution:

(a) Isotopes are atoms of the same element that have the same number of protons but different numbers of neutrons in their nuclei. This means they have the same atomic number but different mass numbers.

Example: **Hydrogen Isotopes**

Protium (^{1}H) – 1 proton, 0 neutrons

Deuterium (^{2}H)

– 1 proton, 1 neutron

Tritium (^{3}H) – 1 proton, 2 neutrons

(b) Avogadro's law states that under identical conditions of temperature and pressure, equal volumes of different gases contain an equal number of molecules.

Q53. What are the evil effects of consuming alcohol?

Solution:

1. Health Effects:

Liver Damage – Causes fatty liver, hepatitis, cirrhosis, and liver failure.

Brain Impairment – Leads to memory loss, poor judgment, and lack of coordination.

Heart Problems – Increases risk of high blood pressure, stroke, and heart disease.

Digestive Disorders – Causes stomach ulcers, acid reflux, and pancreatitis.

Weakened Immunity – Makes the body more prone to infections.

Cancer Risk – Increases chances of liver, mouth, throat, and esophageal cancer.

2. Psychological and Behavioral Effects:

Depression and Anxiety – Worsens mental health issues.

Addiction (Alcoholism) – Leads to alcohol dependence and difficulty in quitting.

Aggressive Behavior – Causes loss of self-control and violent actions.

3. Social and Economic Effects:

Family Problems – Causes conflicts, domestic violence and social withdrawal.

Work and Academic Decline – Reduces concentration, leading to failures.

4. Effects on Society:

Road Accidents – Drunk driving causes fatal accidents.

Crime and Violence – Increases theft and public disturbances.

Part-IV

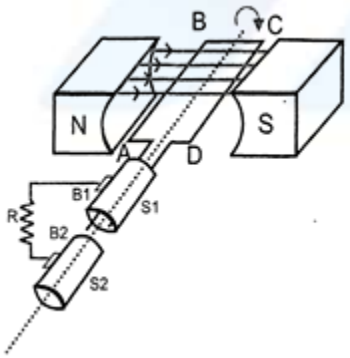
Q54. Write any five achievements of Chandrayaan-I.

Solution:

Given below are some achievements of Chandrayaan-I:

- Discovery of Water Molecules on the Moon – Chandrayaan-I's Moon Impact Probe (MIP) and NASA's M3 instrument confirmed the presence of water molecules on the lunar surface.
- Mapping of the Moon's Surface – The orbiter mapped the Moon's topography, minerals, and chemical composition, providing valuable data for future missions.
- Detection of Magnesium, Aluminum, and Silicon – The X-ray spectrometer onboard Chandrayaan-I helped identify key elements like magnesium, aluminum, and silicon on the Moon's surface.
- Study of the Moon's Atmosphere (Exosphere) – The mission provided insights into the Moon's thin exosphere and its interaction with solar radiation.
- Discovery of Subsurface Ice at the Lunar Poles – Data from Chandrayaan-I suggested the presence of ice in permanently shadowed regions near the Moon's poles, which could support future human missions.

Q55.



(a) Redraw the diagram.

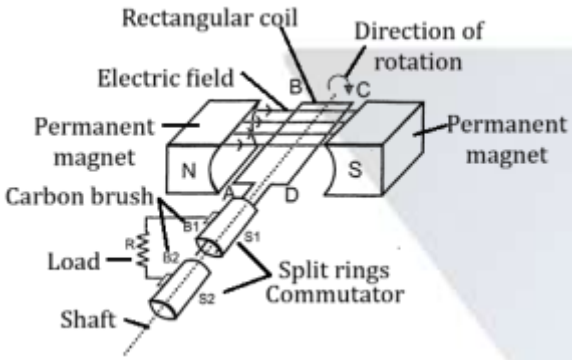
(b) This diagram represents

(c) Label the parts of the diagram.

(d) Mention the principle used in the device denoted by this diagram.

Solution:

(a)



(b) Dynamo

(c) Labels are as follows:

N & S – Poles of Permanent magnet

ABCD – Spinning rectangular coil

S1 & S2 – Split rings/Commutator

B1 & B2 – Carbon brushes

R – Load/Voltmeter

(d) A dynamo works on the principle of electromagnetic induction, which was discovered by Michael Faraday. It converts mechanical energy into electrical energy by rotating a coil within a magnetic field.