

# Grade 10 Science Karnataka 2016

## SECTION- A

- Q1. In Fleming's right hand rule middle finger indicates the direction of
- (A) magnetic field
  - (B) induced electric current
  - (C) mechanical energy
  - (D) motion of the conductor.

**Correct answer: (B)**

**Solution:**

Fleming's Right-Hand Rule helps determine the direction of induced current in a conductor moving through a magnetic field. According to the rule, if the thumb points in the direction of motion, the forefinger in the direction of the magnetic field, then the middle finger indicates the direction of the induced electric current.

- Q2. Identify one of the uses of solar heater in the following.
- (A) Conversion of solar energy into electrical energy
  - (B) Providing energy for artificial satellites
  - (C) Desalination of marine water
  - (D) Using in automatic street lights.

**Correct answer: (C)**

**Solution:**

A solar heater utilizes solar energy to heat water, which can be used for various applications, including desalination. In the desalination process, solar heaters provide the necessary heat to evaporate seawater, leaving behind salts and impurities, and then condense the vapor into fresh water.

- Q3. Significant reduction in the platelet count of human blood is the main symptom of this disease.
- (A) Chikungunya
  - (B) Dengue
  - (C) Bird flu
  - (D) Gonorrhoea

**Correct answer: (B)**

**Solution:**

Dengue fever is a viral infection transmitted by Aedes mosquitoes. One of its main symptoms is a significant reduction in platelet count (thrombocytopenia), which can lead to bleeding complications. The virus affects bone marrow function, reducing platelet production and increasing the risk of hemorrhage.

Q4.  $\text{Si} + \text{C} \rightarrow \text{SiC}$ . This chemical reaction is an example for:

- (A) Exothermic reaction
- (B) Endothermic reaction
- (C) Dissociation reaction
- (D) Displacement reaction

**Correct answer: (B)**

**Solution:**

The chemical reaction  $\text{Si} + \text{C} \rightarrow \text{SiC}$  is an example of a combination reaction, where silicon (Si) and carbon (C) combine to form silicon carbide (SiC). This reaction is endothermic, meaning it absorbs heat from its surroundings.

Q5. No image is formed on the blind spot of the human eye because,

- (A) Cones are absent
- (B) Rods are absent
- (C) Rods and cones are absent
- (D) Optic nerve is absent

**Correct answer: (B)**

**Solution**

The blind spot, or optic disc, is a small region in the retina of the human eye where the optic nerve exits the eye. This area lacks photoreceptor cells—both rods and cones—resulting in no image detection at this spot. Consequently, any light that falls on the blind spot cannot be perceived, leading to a gap in the visual field.

Q6. A domestic electrical appliance requires alternating current of 15 V. If 220 V of alternating current is supplied to the house, then the device that helps in the functioning of that electrical appliance is

- (A) induction coil
- (B) step-up transformer
- (C) AC dynamo

(D) step-down transformer.

**Correct answer: (D)**

**Solution:**

A step-down transformer reduces the high input voltage (220 V) to the required lower voltage (15 V) for the safe operation of domestic electrical appliances.

Q7. While doing the experiment of copper voltameter, in which of the following cases, more amount of copper gets deposited at cathode?

- (A) 2 amperes of electric current is passed for 30 minutes
- (B) 4 amperes of electric current is passed for 20 minutes
- (C) 0.5 amperes of electric current is passed for 80 minutes
- (D) 1.5 amperes of electric current is passed for 30 minutes.

**Correct answer: (B)**

**Solution:**

The amount of copper deposited at the cathode is directly proportional to the product of current (I) and time (t), given by Faraday's law of electrolysis:

The mass of copper deposited is directly proportional to the product of current and time.

Mass of Cu deposited  $\propto I \times t$

Mass of Cu deposited  $\propto I \times t$

Now, calculating  $I \times t$  for each option:

- (A)  $2 \times 30 = 60$
- (B)  $4 \times 20 = 80$
- (C)  $0.5 \times 80 = 40$
- (D)  $1.5 \times 30 = 45$

Since option (B) has the highest value (80), more copper gets deposited in this case.

Q8. Identify the correct complementary base pairing among the following.

- (A) Adenine - Thymine and Guanine - Cytosine
- (B) Adenine - Guanine and Thymine - Cytosine
- (C) Adenine - Cytosine and Thymine - Guanine
- (D) Guanine - Adenine and Cytosine - Adenine.

**Correct answer: (B)**

**Solution:**

The correct complementary base pairing in DNA follows Chargaff's rule, where Adenine pairs with Thymine and Guanine pairs with Cytosine through hydrogen bonds.

Q9. Find out the most efficient engine in the following.

- (A) an engine converts 80 KJ of heat energy into 20 KJ of work
- (B) an engine converts 50 KJ of heat energy into 15 KJ of work
- (C) an engine converts 30 KJ of heat energy into 6 KJ of work
- (D) an engine converts 60 KJ of heat energy into 24 KJ of work.

**Correct answer: (D)**

**Solution:**

A step-down transformer reduces the high input voltage (220 V) to the required lower voltage (15 V) for safe operation of domestic electrical appliances.

The most efficient engine is the one that converts 60 KJ of heat energy into 24 KJ of work, as it has the highest efficiency of 40%.

Q10. Haemoglobin levels in the blood samples of two persons *A* and *B* are found 9m/dL and 13 m/dL respectively. Which statement is true with respect to the amount of oxygen supply in their body?

- (A) More in person *B* than in person *A*
- (B) More in person *A* than in person *B*
- (C) Equal in person *A* and person *B*
- (D) No correlation between oxygen supply and the level of haemoglobin.

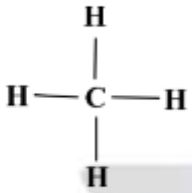
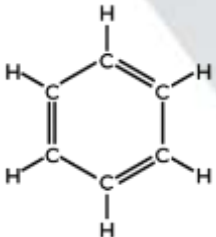
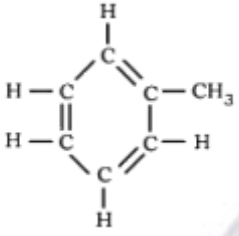
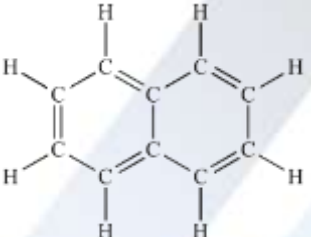
**Correct answer: (A)**

**Solution:**

Haemoglobin is responsible for transporting oxygen in the blood. A lower haemoglobin level results in reduced oxygen-carrying capacity. Since Person *A* has a lower haemoglobin level (9 m/dL) compared to Person *B* (13 m/dL), Person *B* will have a higher oxygen supply.

Q11. The structural formulae of hydrocarbons are given in **Column-A** and their uses are given in **Column-B**. Match them and write the answers along with its letters in the space provided:

$$4 \times 1 = 4$$

Column A	Column B
(A) 	(i) preparation of moth balls
(B) 	(ii) solvent for lacquers (iii) preparation of soap
(C) 	(iv) dry cleaning (v) used as fuel
(D) 	(vi) preparation of esters (vii) preparation of aspirin

**Solution:**

- (A) Methane → (v) Used as fuel  
 (B) Benzene → (iv) Dry cleaning  
 (C) Toluene → (ii) Solvent for lacquers  
 (D) Naphthalene → (i) Preparation of moth balls

Q14. Write any two advantages of bio-energy.

**Solution:**

Two advantages of bio-energy are:

- Helps keep the environment clean and free from pollution.
- Lowers the amount of carbon dioxide in the atmosphere.

Q15. What is red shift?

**Solution:**

When the light source moves away from the observer, the frequency of the light appears to decrease, causing the color of the light to shift towards the red end of the spectrum.

Q16. Name the two important non-metallic oxides which cause acid rain.

**Solution:**

Two important non-metallic oxides that cause acid rain are sulfur dioxide ( $\text{SO}_2$ ) and nitrogen dioxide ( $\text{NO}_2$ ). These gases are released into the atmosphere from industrial activities, vehicle emissions, and burning of fossil fuels.

Q17. Mention the properties of silica due to which it is used as sand bath in laboratory.

**Solution:**

Silica is used as a sand bath in laboratories due to its high melting point, which allows it to withstand extreme temperatures without breaking down.

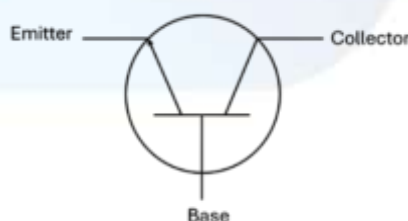
Q18. State the modern periodic law

**Solution:**

The modern periodic law states that the physical and chemical properties of elements are periodic functions of their atomic numbers. This means that when elements are arranged in increasing order of their atomic numbers, elements with similar properties appear at regular intervals in the periodic table.

Q19. Draw the circuit symbol of  $n-p-n$  transistor.

**Solution:**



Q20. Sclerenchyma fibres are used in coir industries to make gunny bags and ropes. Give scientific reason.

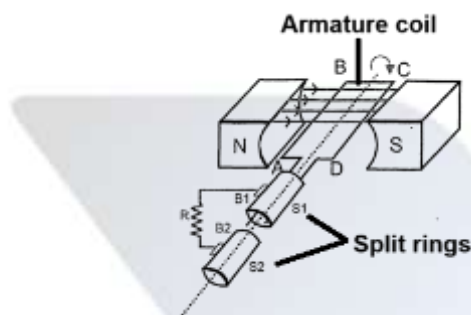
**Solution:**

Sclerenchyma fibers are used in coir industries to make gunny bags and ropes because they are thick-walled, heavily lignified, and provide high tensile strength.

Q21. Draw the diagram of a DC dynamo and label the following parts.

- (a) Split rings
- (b) Armature coil.

**Solution:**



Q22. What is annealing of glass? Name the colour obtained when (i) Ferric compounds, (ii) Cobalt compounds are added to the mixture of molten glass.

**OR**

What is pulping? How is an uncoated paper converted into coated paper?

**Solution:**

Annealing is the process of heating glass to a high temperature and then slowly cooling it to remove internal stresses, making it stronger and more durable.

- Ferric compounds are added: Green color.
- Cobalt compounds are added: Blue color.

**OR**

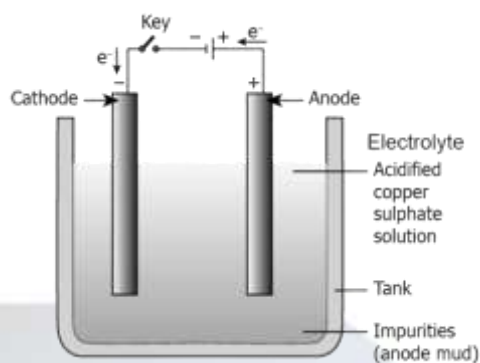
Pulping is the process of converting raw materials like wood into pulp by separating fibers.

Uncoated paper is coated with materials like clay to enhance its smoothness and finish for better printing.

Q23. Draw the diagram of the apparatus used in electroplating and label the following parts:

- (i) Electrolyte
- (ii) Anode

**Solution:**



Q24. Lymph plays an important role in protecting immune system of the body. Justify the statement.

OR

- (a) How is dermal tissue adapted to prevent excessive transpiration in plants?
- (b) Why do leaves of lotus plant float on water?

**Solution:**

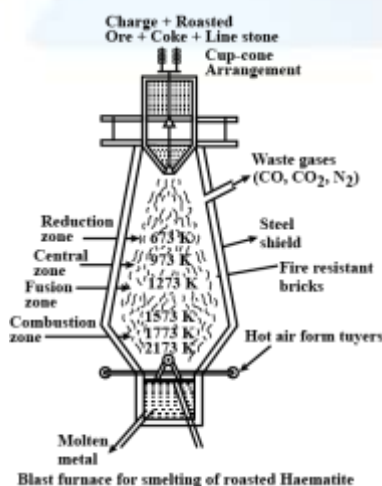
Lymph contains white blood cells, particularly lymphocytes, which help fight infections and diseases. It also transports fats and waste products, contributing to the body's immunity and defense.

OR

- (a) The dermal tissue in plants has a waxy cuticle that prevents excessive water loss by reducing transpiration. This helps retain water within the plant.
- (b) Lotus leaves have air spaces in their tissues, which make them buoyant, allowing them to float on the surface of water.

Q25. Draw the diagram of blast furnace used in the extraction of iron.

**Solution:**





Q26. Differentiate between Caucasoid man and Mongoloid man based on their physical features.

**Solution:**

Feature	Caucasoid Man	Mongoloid Man
<b>Skin Color</b>	Light to fair skin	Yellowish to brown skin
<b>Hair</b>	Straight or wavy, light (blonde, brown)	Straight, black hair
<b>Facial Features</b>	Narrow face, prominent nose, high forehead	Broad face, flat nose, epicanthic fold
<b>Eyes</b>	Narrow, often lighter (blue, green)	Almond-shaped, dark brown
<b>Height</b>	Generally taller stature	Shorter stature compared to Caucasoid

Q27. What is forward biasing and reverse biasing of a diode?

**OR**

What are extrinsic semiconductors? Name the two types of extrinsic semiconductors.

**Solution:**

When the positive terminal of the battery is connected to p-region and the negative terminal of the battery is connected to n-region of the junction diode, it is said to be forward biasing.

When the positive terminal of the battery is connected to n-region & the negative terminal is connected to p-region of the p-n junction it is said to be reverse biasing.

**OR**

The semiconductors which have the small traces of impurities [OR small traces of impurities are added to semiconductors] are called extrinsic semiconductors. Two types are

- i) n-type semiconductor
- ii) p-type semiconductor

Q28. Sodium ( Na ), Magnesium ( Mg ), Aluminium ( Al ) and Silicon ( Si ) are arranged in the decreasing order of their atomic size. Which element has the highest ionisation energy among them ? Justify your answer scientifically.

**Solution:**

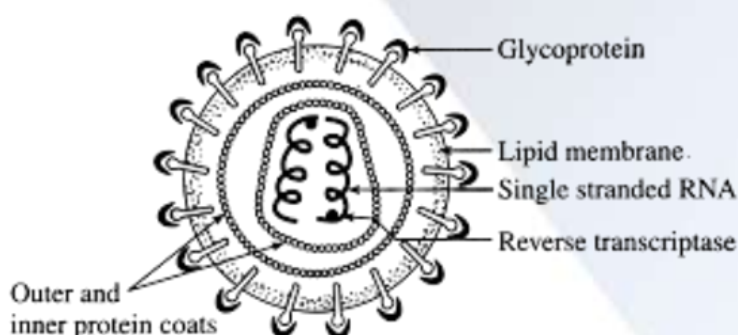
Ionization energy increases across a period (from left to right) due to the increasing nuclear charge, which attracts electrons more strongly.

As we move across the periodic table from Na to Si, the number of protons increases, causing a stronger attraction between the nucleus and the outermost electron.

This increased nuclear charge and smaller atomic size in Silicon compared to Sodium, Magnesium, and Aluminium lead to a higher ionization energy for Silicon.

Q29. Draw the diagram showing the structure of HIV.

**Solution:**



Q30. The densities of 4 gases at standard temperature and pressure are given in the table:

Gas	Methane	Ammonia	Helium	Neon
Density	0.72 g/L	0.77 g/L	0.18 g/L	0.90 g/L

Among these gases, which gas diffuses very fast? State the law that helps you to take the decision.

**Solution:**

Helium will diffuse the fastest among the given gases.

This is based on Graham's law of diffusion, which states that the rate of diffusion of a gas is inversely proportional to the square root of its molar mass. Since helium has the lowest molar mass, it will diffuse the fastest.

Q31. Hydroponic and aeroponic methods are gaining significance in space research organisations. Give two reasons for this.

**OR**

Urban people should be encouraged to take up the practice of roof-top gardening.

Justify.

**Solution:**

Reasons for the significance of hydroponic and aeroponic methods in space research:

- Both methods allow for soil-free, space-efficient cultivation of plants, which is ideal for limited space environments like spacecraft.
- These methods use less water compared to traditional farming, which is crucial in space, where water supply is limited.

**OR**

- Roof-top gardens help absorb pollutants and release oxygen, contributing to cleaner air in urban areas.
- They help in insulating buildings, reducing the need for air conditioning in hot climates, and heating in colder weather.

Q32. What are ultrasonic waves? Write any two uses of ultrasonic waves in the field of medicine.

**OR**

What is an echo? Name the two devices which work on the principle of echo of ultrasonic waves.

**Solution:**

The sound waves having frequency more than 20000 Hz are called ultrasonic waves.

Applications in medical field. They are used to

- i) cure neuralgic & rheumatic pains
- ii) break gall stones
- iii) test internal organs
- iv) bloodless surgery

**OR**

The sound heard after reflection from a rigid surface is called echo. Two devices

- i) Sonar
- ii) Ultrasound scanner

Q33. Hydroelectric power plants are more ecofriendly than thermal power plants. Justify this statement.

**Solution:**

Hydroelectric power plants are more eco-friendly than thermal power plants because:

Hydroelectric plants do not release harmful gases like carbon dioxide ( $\text{CO}_2$ ), sulfur dioxide ( $\text{SO}_2$ ), or nitrogen oxides ( $\text{NO}_x$ ) into the atmosphere, unlike thermal plants that burn fossil fuels.

Hydroelectric power uses water, a renewable resource, while thermal plants rely on non-renewable fossil fuels that contribute to resource depletion.

- Q34. The general formula of a group of organic compounds is  $C_nH_{2n+1}OH$ . Write the molecular formula of first two members of this group. Examine whether these two compounds are in homologous series, based on their molecular formula.

**Solution:**

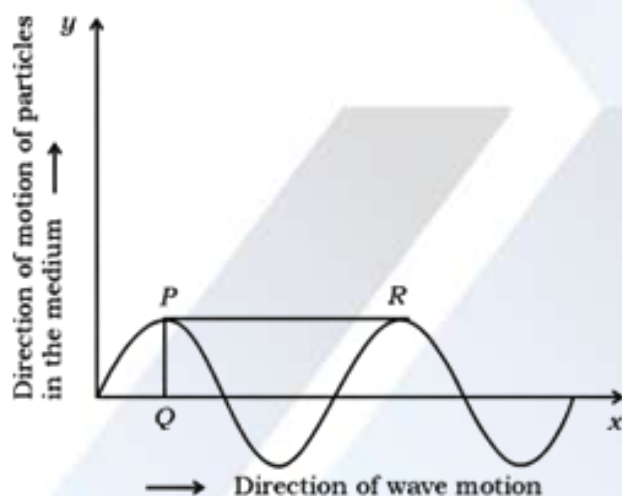
The first two members of the series  $C_nH_{2n+1}OH$  (alcohol) are:

Methanol ( $CH_3OH$ ) -  $n = 1$

Ethanol ( $C_2H_5OH$ ) -  $n = 2$

These compounds form a homologous series because they have the same functional group ( $-OH$ ) and differ by a constant unit ( $CH_2$ ).

- Q35. The graph of a wave motion is given below. Observe the graph and answer the following questions:



- (a) What type of wave is represented in the graph?  
 (b) What do PQ and PR indicate with respect to the wave?

**Solution:**

**a:** Transverse wave

**b:** PQ → amplitude of the wave

PR → wavelength

- Q36. Write the two differences between petrol engine and diesel engine.

**Solution:**

The two differences between petrol engine and diesel engine are:

Petrol Engine	Diesel Engine
Spark plug is required	Does not require spark plug
The compression ratio of air & petrol is low	The compression ratio of air and diesel is high

Q37. A student catches small aquatic creatures swimming in a pond and keeps them in his aquarium assuming them to be fishes. After a few days he observes that four limbs are developed in those creatures. Then,

- to which class of vertebrates do you include those aquatic creatures ?
- name the process that has caused development of four limbs in them.

**Solution:**

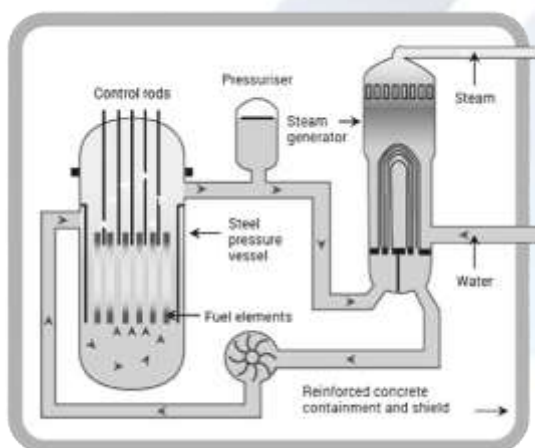
(i) The aquatic creatures belong to the class Amphibia (e.g., frogs or tadpoles), as they undergo metamorphosis and develop four limbs.

(ii) The process that has caused the development of four limbs in them is metamorphosis.

Q38. Draw the diagram of a nuclear power plant and label the following parts.

- Control rods
- Radiation shield.

**Solution:**



Q39. Name the steps in the manufacture of common sugar from sugarcane and explain the first step.

OR

- What is fermentation? Give one example.

(b) Write the balanced chemical equations of the reactions taking place in the manufacture of ethyl alcohol from sugar.

**Solution:**

The manufacture of common sugar from sugarcane involves several steps. First, sugarcane is crushed to extract the juice. The extracted juice is then treated to remove impurities. Next, the clarified juice is heated to evaporate excess water, resulting in a thick syrup. This syrup is cooled, allowing sugar crystals to form. The sugar crystals are separated from the molasses, and the final step involves drying the crystals and packaging them for sale.

The first step is the crushing of sugarcane. In this step, sugarcane stalks are passed through mechanical crushers to extract the juice. The juice contains sucrose, which is the primary component used to produce sugar.

**OR**

Fermentation is a biochemical process in which microorganisms like yeast convert sugars into simpler substances, usually producing alcohol and carbon dioxide.

Example: The conversion of glucose into ethyl alcohol (ethanol) and carbon dioxide by yeast.

The reaction for the manufacture of ethyl alcohol (ethyl alcohol fermentation) is:



This shows that glucose ( $C_6H_{12}O_6$ ) is converted into ethyl alcohol ( $C_2H_5OH$ ) and carbon dioxide ( $CO_2$ ) during fermentation.

Q40. (a) Bryophytes are used in pots. Why?

(b) Explain alternation of generations in Bryophytes.

**Solution:**

(a) Bryophytes are used in pots because they help in maintaining moisture. They can absorb and retain water effectively, which is useful in gardens and pots to keep the soil moist. They also act as decorative plants, adding a lush, green appearance.

(b) Alternation of generations in Bryophytes involves two distinct stages: the gametophyte and the sporophyte. The dominant stage is the gametophyte, which produces gametes (sperm and egg). Fertilization leads to the formation of a diploid sporophyte, which is attached to and dependent on the gametophyte. The sporophyte produces haploid spores that germinate and grow into new gametophytes, completing the cycle.

- Q41. (a) Explain the expansion stroke of a petrol engine.  
 (b) There is no spark plug in diesel engine. Why?

**Solution:**

(a) Expansion stroke of a petrol engine: During the expansion stroke, the fuel-air mixture, which has been compressed in the previous stroke, is ignited by the spark plug. The spark causes combustion, producing a high-pressure gas that forces the piston to move downwards. This movement generates power, which is transmitted to the crankshaft, driving the vehicle.

**OR**

(b) No spark plug in diesel engine: In a diesel engine, the fuel is ignited by the heat generated due to high compression of air in the cylinder. The air is compressed to a very high pressure and temperature, which is sufficient to ignite the diesel fuel when it is injected. Therefore, a spark plug is not needed in diesel engines.

- Q42. What is bio-technology? List any two advantages and two limitations of biotechnology.

**OR**

- (a) Why did Mendel choose pea plants for his experiments? Give any four reasons.  
 (b) State Mendel's law of independent assortment.

**Solution:**

Biotechnology is the use of living organisms, cells, or biological systems to develop products and applications that improve human life, such as medicines, crops, and environmental solutions.

Advantages of Biotechnology:

- Biotechnology helps in the development of vaccines, antibiotics, and other life-saving drugs.
- Genetically modified crops can be made resistant to pests and diseases, increasing food production.

Limitations of Biotechnology:

- Genetic modification of organisms raises ethical issues, especially in areas like human cloning or modifying food crops.
- Release of genetically modified organisms (GMOs) into the environment may have unintended consequences on biodiversity.

**OR**

Mendel choose pea plants for his experiments because:

- Short generation time.
- Distinct traits for easy observation.
- Self-pollination for controlled breeding.
- True-breeding varieties for consistent traits.

(b) Mendel's law of independent assortment: It states that genes for different traits are inherited independently of each other during gamete formation.

Q43. (a) Which stage is attained by the star after the steady state? Explain that stage.

(b) State Hubble's law.

(c) A satellite is to be launched from the surface of the earth. Name the factors on which the escape velocity of the satellite depends.

**OR**

(a) "Multistage rockets reduce the fuel consumption." How? Explain.

(b) Explain how a neutron star is formed.

(c) In which stage of the star, does nuclear fusion reaction begin?

**Solution:**

(a) Red giant stage.

- The radiation pressure increases beyond the gravitational pull and the star begins to swell.
- Surface area of the star increases and the temperature decreases.
- Star emits low frequency radiation. The star becomes red in colour.

(b) Hubble's law: The velocity of recession of a celestial body is proportional to its distance from us.

(c) Escape velocity depends on:

- i) Radius of the earth
- ii) Acceleration due to gravity.

**OR**

(a) Multistage rockets reduce fuel consumption by discarding empty fuel stages as they use up their fuel. This reduces the total weight of the rocket, allowing the remaining stages to accelerate faster and use fuel more efficiently.



(b) A neutron star is formed from the remnants of a massive star after it undergoes a supernova explosion. The core left behind is so dense that protons and electrons combine to form neutrons, resulting in a star composed almost entirely of neutrons.

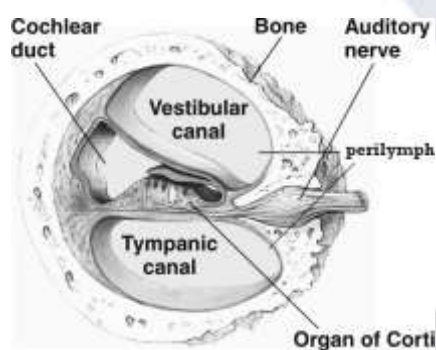
(c) Nuclear fusion reactions begin in the Main Sequence stage of a star, where hydrogen atoms fuse to form helium, releasing energy and maintaining the star's stability.

Q44. Draw the diagram showing the internal structure of human ear and label the following parts :

(a) Organ of Corti

(b) Auditory nerve

**Solution:**



Q45. (a)  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

In this reaction, explain the experiment that you conduct to decide the product as a basic oxide.

(b) Name the method of concentration of Haematite ore and explain the method.

**Solution:**

(a) To decide whether MgO (magnesium oxide) is a basic oxide, you can perform an experiment where you dissolve it in water. When MgO reacts with water, it forms magnesium hydroxide  $\text{Mg}(\text{OH})_2$ , which is basic in nature. The experiment is as follows: Take a small amount of magnesium oxide (MgO) in a beaker.

Add water to it and stir the mixture.

Test the resulting solution with litmus paper. If the solution turns blue, it indicates that the product is a basic oxide.

(b) The method of concentration of Haematite ore is called froth flotation. In this process:

- The powdered ore is mixed with water and treated with chemicals to create a froth.

- The Haematite particles, being denser, sink to the bottom, while the impurities float on top as froth.
- The froth containing the impurities is removed, leaving behind the concentrated Haematite ore.

