

Grade 10 Science Karnataka 2018

Note:

1. This Question Paper consists of 42 objective and subjective types of questions.
2. This question paper has been sealed by reverse jacket. You have to cut on the right side to open the paper at the time of commencement of the examination. Check whether all the pages of the question paper are intact.
3. Follow the instructions given against both the objective and subjective types of questions.
4. Figures in the right hand margin indicate maximum marks for the questions.
5. The maximum time to answer the paper is given at the top of the question paper. It includes 15 minutes for reading the question paper.
6. Four alternatives are given for each of the following questions / incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet.

- Q1. "Coal is a non-renewable source of energy." Because,
- (A) coal is replenished soon in the nature
 - (B) coal is abundant in nature
 - (C) the reserves of coal are depleting at a fast rate and it is difficult to replenish
 - (D) coal leaves residue when burnt.

Solution:

- (C) the reserves of coal are depleting at a fast rate and it is difficult to replenish

- Q2. The living component of xylem tissue is
- (A) xylem vessel

- (B) xylem parenchyma
- (C) xylem tracheid
- (D) xylem fibre.

Solution:

- (B) xylem parenchyma

Q3. Identify a property of amorphous silicon in the following.

- (A) Does not burn in the air
- (B) Has dark grey colour
- (C) Oxidizes at the surface level when heated in the air
- (D) Less reactive.

Solution:

- (C) Oxidizes at the surface level when heated in the air

Q4. A man who is standing at a distance of 850 m from a sound reflecting surface claps loudly. If the velocity of the sound in air is 340 ms^{-1} , then the time taken by the echo to reach him is

- (A) 5 s
- (B) 4 s
- (C) 2.5 s
- (D) 3 s

Solution:

- (A) 5 s

Q5. If the stages of human evolution is written in the descending order according to their cranial capacity, then the correct order obtained is

- (A) Homo habilis, Homo erectus, Homo sapiens, Australopithecus
- (B) Australopithecus, Homo habilis, Homo erectus, Homo sapiens
- (C) Homo sapiens, Homo erectus, Australopithecus, Homo habilis
- (D) Homo sapiens, Homo erectus, Homo habilis, Australopithecus.

Solution:

(D) Homo sapiens, Homo erectus, Homo habilis, Australopithecus.

Q6. Steam engine cannot be started instantaneously because,

- (A) the efficiency of the engine is low
- (B) steam should be produced by heating water
- (C) the engine is bulky
- (D) there is no spark plug.

Solution:

(B) steam should be produced by heating water

Q7. The principle of working of a motor is

- (A) there is a magnetic field around a current carrying conductor
- (B) when a magnetic field linked with a conductor changes, an induced emf is generated in the conductor
- (C) the change of current in one coil, induces emf in a neighbouring coil
- (D) a conductor carrying electrical current experiences mechanical force if kept in a magnetic field.

Solution:

(D) a conductor carrying electrical current experiences mechanical force if kept in a magnetic field.

Q8. Antheridium of pteridophytes can be compared to

- (A) Stamen of angiosperms
- (B) Megasporophyll of gymnosperms
- (C) Carpel of angiosperms
- (D) Archegonium of bryophytes.

Solution:

(A) Stamen of angiosperms

Q9. The gas released when the sunlight breaks down chlorofluorocarbons is

- (A) carbon dioxide
- (B) fluorine
- (C) carbon monoxide
- (D) chlorine.

Solution:

(D) chlorine.

Q10. The group of compounds which dissociate partially in aqueous solutions is

- (A) Hydrochloric acid, Nitric acid
- (B) Carbonic acid, Phosphoric acid
- (C) Sodium chloride, Acetic acid
- (D) Copper sulphate, Sugar solution.

Solution:

(B) Carbonic acid, Phosphoric acid

Q11. The processes related to organic compounds are given in Column-A and their procedures are given in Column-B. Match them and write the answer along with its letters :

Column -A

(A) Preparation Of Methane gas

(B) Substitution reaction

(C) Hydrogenation

Column- B

(i) Production of salts of fatty acids starting from oils or fats

(ii) Conversion of liquid oils into solid saturated fats

(iii) Heating fused sodium acetate with sodalime

(D) Saponification

(iv) Heating an aqueous solution of ammonium cyanate

(v) Burning of methane in air

(vi) Heating ethanol in the presence of acidified potassium permanganate

(vii) Exposing the mixture of methane and chlorine to ultraviolet light.

Solution:

(A) (iii) Heating fused sodium acetate with sodalime

(B) (vii) Exposing the mixture of methane and chlorine to ultraviolet light.

(C) (ii) Conversion of liquid oils into solid saturated fats

(D) (i) Production of salts of fatty acids starting from oils or fats

Answer the following questions.

Q12. Nowadays bio-diesel is used in transportation vehicles as an alternate to diesel. Write two advantages of this measure.

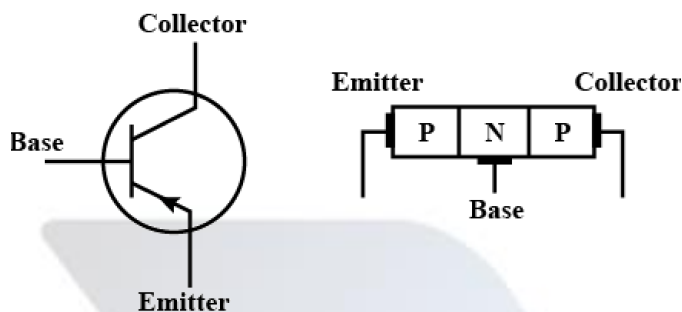
Solution:

Two advantages are:

- It is environmentally friendly and helps reduce pollution.
- It is a renewable energy source that lowers carbon dioxide levels in the atmosphere.

Q13. Write the circuit symbol of $p - n - p$ transistor.

Solution:

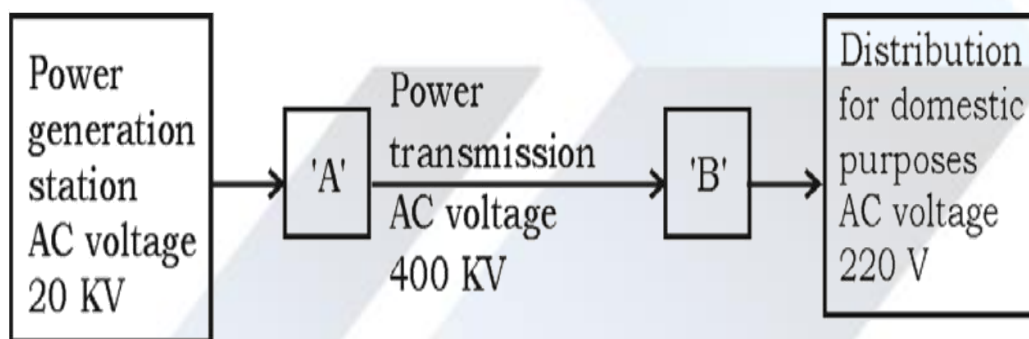


Q14. Name the family and the order to which man belongs.

Solution:

Family: Humans belong to the family Hominidae and the order Primates.

Q15. The schematic diagram indicating the transmission of electricity is given below :



Name the devices to be used in the places indicated as 'A' and 'B'.

Solution:

Devices at A — Step-up transformer and devices at B — Step-down transformer.

Q16. How is silicon carbide prepared ? Write one of its uses.

Solution:

Silicon carbide is prepared by heating a mixture of silicon and coke in an electric furnace. Silicon carbide is used in

- i) Cutting and grinding tools
- ii) Polishing granite.

Q17. In the manufacture of sugar, the container of the sugarcane juice is connected to a vacuum pump. Why?

Solution:

In sugar manufacturing, a vacuum pump is used in the sugarcane juice container to:

- Evaporate water at a lower temperature and pressure.
- Obtain sugar without overheating.
- Ensure smooth evaporation.

Q18. A person is having the symptoms of thirst and frequent urination for a long time. The blood capillaries in the retina of this person have ruptured causing blood entering into the vitreous humour making it opaque. Name the eye disorder found in this person.

Solution:

The eye disorder affecting this person is diabetic retinopathy. It occurs due to prolonged high blood sugar levels, leading to damage in the blood capillaries of the retina, causing vision problems.

Answer the following questions.

Q19. "Manufacture of ethyl alcohol from molasses is a good example for fermentation." Give reasons.

Solution:

The manufacture of ethyl alcohol from molasses is an example of fermentation because:

- Sucrose undergoes decomposition due to the action of yeast.
- The process is carried out at an optimal temperature of around 308 K.
- Molasses is diluted with water before fermentation.
- Carbon dioxide is released as a byproduct.
- Enzymes like invertase and zymase catalyze the reaction.

Q20. In animal breeding, write the two differences between outbreeding and hybridization.

Solution:

The two differences between outbreeding and hybridization are:

Outbreeding	Hybridization
Involves mating superior males of one breed with superior females of another breed.	Involves crossing superior males and females from two distinct species.
Helps combine the favorable traits of both breeds in the offspring.	The offspring often exhibit characteristics that differ from both parent species.

Q21. What is Doppler effect? Mention the two applications of Doppler effect.

Solution:

The Doppler effect refers to the perceived change in the frequency of a wave due to the relative motion between the wave source and the observer. The applications of Doppler effect are -

- Tracking artificial satellites
- Measuring the velocity of submarines
- Studying the motion of stars and galaxies relative to Earth
- Analyzing the rings of Saturn

OR

List the uses of ultrasonic waves due to their high frequency.

Solution:

Ultrasonic waves are used

- Mixing immiscible liquids to form a homogeneous mixture
- Manufacturing alloys and emulsions for photographic films
- Dry cleaning to remove grease and dirt

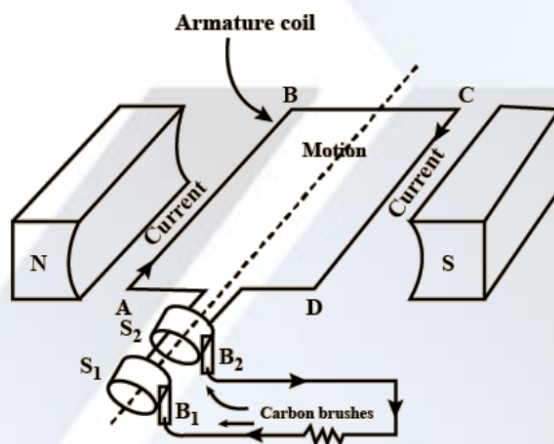
- Acting as insect repellents
- Killing bacteria
- Treating neuralgic and rheumatic pain
- Performing bloodless surgeries
- Breaking gallstones
- Applications like SONAR and ultrasound scanning

Q22. Draw the diagram of AC dynamo and label the following parts :

- Armature
- Brushes.

Solution:

The Armature and the brushes of the AC dynamo are as shown in the figure.



Q23. Observe the table in which the sizes of different DNA fragments are given and answer the questions:

DNA fragments	A	B	C
Size (in base pairs)	700	1500	3000

- In the process of separating DNA fragments, which fragment moves faster ?
- Explain the process of separating the DNA fragments.

Solution:

(a)A

(b) The process of separating the DNA fragments are:

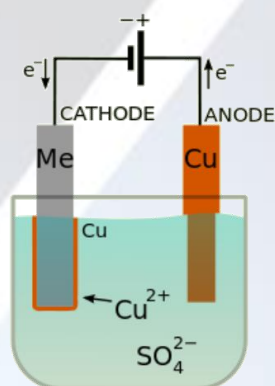
- DNA fragments are separated using gel electrophoresis, based on their size and net electrical charge.
- Smaller fragments move faster than larger ones, forming a series of bands that resemble a fingerprint.

Q24. Draw the diagram of the apparatus used in electroplating and label the following part :

The substance to be electroplated.

Solution:

The given figure illustrates an electrolytic cell consisting of copper anodes and a copper sulphate solution as the electrolyte.



Q25. What is monohybrid cross? Write the genotypic ratio and phenotypic ratio of Mendel's monohybrid cross.

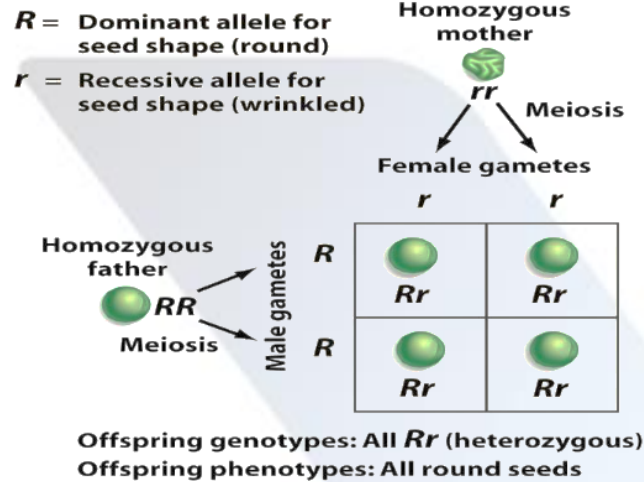
Solution:

A monohybrid cross involves the fertilization between two heterozygous organisms for a single gene, resulting in a characteristic genotypic ratio of 1:2:1 (1 homozygous dominant, 2 heterozygous, 1 homozygous recessive) and a phenotypic ratio of 3:1 (3 dominant phenotypes to 1 recessive phenotype).

Genotypic ratio 1:2:1

Phenotypic ratio 3:1

A cross between two homozygotes



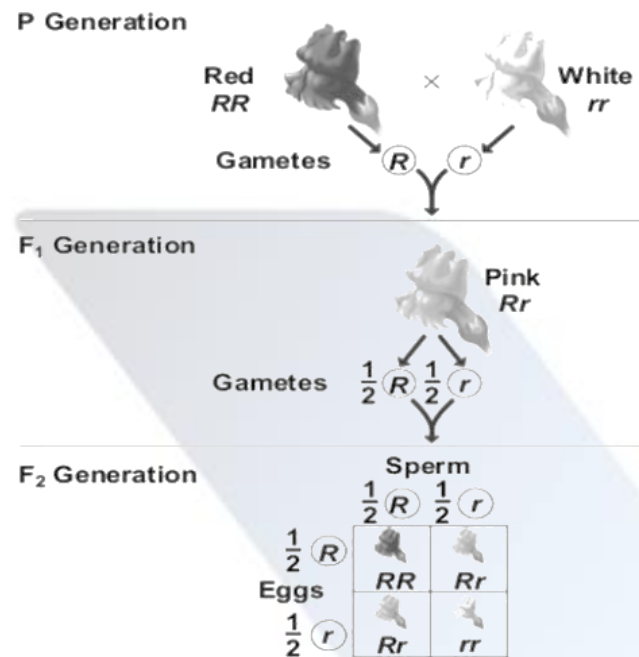
OR

Carl Correns conducted hybridization experiment using Four O' Clock plants.

Draw the checker board of F_2 generation for the incomplete dominance phenomenon, when he crossed a homozygous plant having red flowers (RR) with another homozygous plant with white flowers (WW). Mention its genotypic ratio.

Solution:

Carl Correns's work on four o'clock plants led to the discovery of the concept of incomplete dominance. His experiments showed that a cross between red (RR -dominant characteristic) and white (rr - recessive character) flowered four o' clock plants yielded pink flowered four o'clock plants demonstrating incomplete dominance as shown in the schematic diagram above. In the F_2 generation the parent traits can be seen again. The phenotypic ratio in the F_2 generation is 1:2:1 (white:pink:red) and the genotypic ratio is also 1:2:1 (rr : Rr : RR).

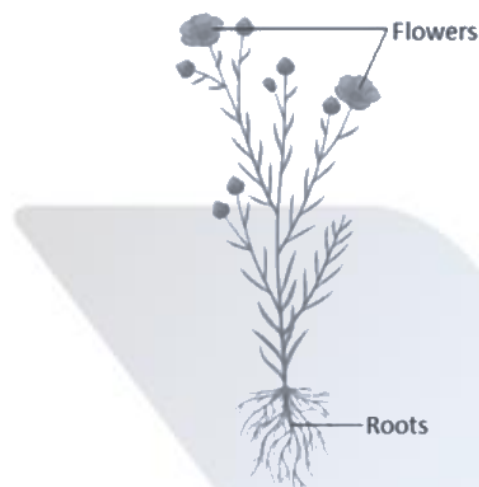


Q26. Draw the diagram of a dicot plant and label the following parts:

- (i) Flower
- (ii) Root.

Solution:

Dicots are one of the two types of flowering plants or angiosperms. They are called dicots because they have two embryonic leaves or cotyledons in the seed. The dicots often undergo secondary growth. Also, the floral parts in dicots occur in multiples of 4 or 5. A flower, sometimes known as a bloom or blossom, is the reproductive structure found in flowering plants. The roots in dicots are often fibrous.



Q27. State Boyle's law. Write the mathematical form of Boyle's law. Give an example for this law.

Solution:

Boyle's law states that "At constant temperature, the volume of a fixed mass of dry gas is inversely proportional to its pressure."

$$V \propto 1/P$$

$$V = K/P$$

$$PV = K$$

Mathematical form

Example when the balloon is breached due to pressure applied the balloon but this is an easy example for Boyle's law.

OR

State Graham's law of diffusion. Write the mathematical form of Graham's law of diffusion. Give an example for this law.

Solution:

Graham's Law which is popularly known as Graham's Law of Effusion, was formulated Thomas Graham in the year 1848. Thomas Graham experimented with the effusion process and discovered an important feature: gas molecules that are lighter will travel faster than the heavier gas molecules.

According to Graham's Law, at constant pressure and temperature, molecules or atoms with lower molecular mass will effuse faster than the higher molecular mass molecules or atoms. Thomas even found out the rate at which they escape through diffusion. In other words, it states that rate of effusion of gas is inversely proportional to the square root of its molecular mass. This formula is generally used while comparing the rates of two different gases at equal pressures and temperatures. Formula can be written as:

$$\frac{\text{Rate}_1}{\text{Rate}_2} = \sqrt{\frac{M_2}{M_1}}$$

M_1 is the molar mass of gas 1

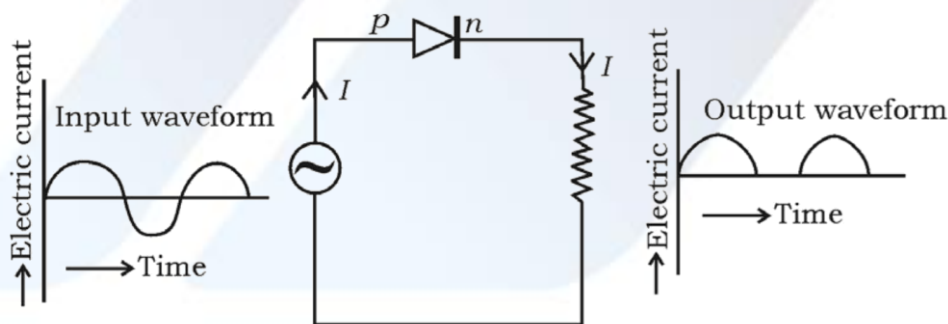
M_2 is the molar mass of gas 2

Rate $_1$ is the rate of effusion of the first gas

Rate $_2$ is the rate of effusion for the second gas

It states that rate of diffusion or effusion is inversely proportional to its molecular mass.

Q28. Observe the following figure. Which property of diode is indicated here ? Explain that property.



Solution:

In the above figure, rectifying property of a diode is indicated. A rectifier is a device that transforms an alternating current into a direct current. A transformer, a diode and a load resistor make up a half-wave rectifier. As shown in the diagram, the primary coil of the transformer is connected to the ac mains while the

secondary coil is to a load resistor through the diode. The p-n junction diode is forward-biased during the positive half-cycle of the input voltage sine wave, and hence it conducts through the resistor. The current flowing in the circuit generates a voltage across the load that has the same shape as the positive half-cycle of the input voltage. The p-n junction diode is reverse-biased during the next half-cycle of the input voltage sine wave. As a result, no current flows in the circuit during this time, and hence no voltage appears across the resistor. Since only the positive half-cycle of the input appears across the load, the input ac voltage is transformed into a pulsating dc voltage and this process is repeated. This process is known as half-wave rectification.

Q29. How is greenhouse effect caused? Explain. Name the greenhouse gases.

Solution:

Cause of Greenhouse Effect are-

- Certain gases in the atmosphere trap infrared radiation emitted by the Earth's surface after absorbing solar energy.
- This leads to an increase in atmospheric temperature, known as the greenhouse effect.

The greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrogen oxides.

Q30. Draw the diagram of an electrolytic cell used in the purification of copper and label the electrode having impure copper.

Solution:

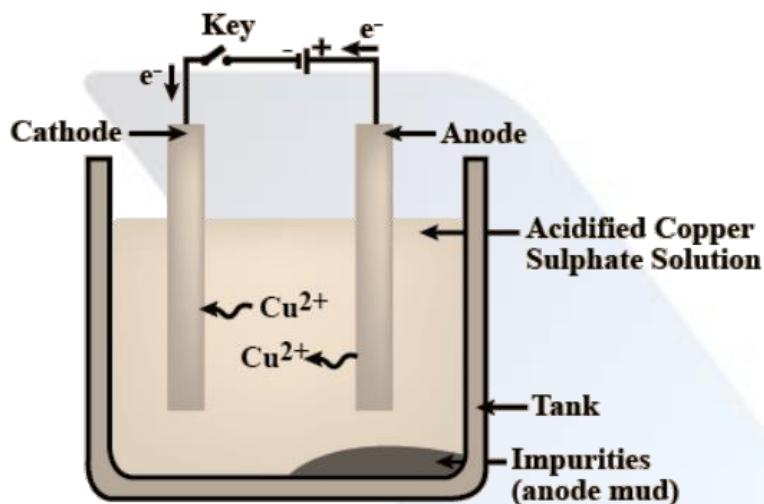
Anode- Impure Copper metal rod

Cathode- Pure Copper metal rod

Electrolyte- Acidified copper sulphate solution

Process of refining -On the application of high voltage the pure copper metal ions from the impure copper metal rod i.e. anode dissolves into the electrolyte and the

same amount of Cu^{2+} ion gets deposited over the cathode rod as shown in the diagram. Thus the impure metal can be refined by electrolytic method.



Q31. Among the following, identify the wrong statements with respect to a whale and write them correctly.

- (i) A pair of lungs are respiratory organs
- (ii) They do not have mammary glands
- (iii) Heart is four chambered
- (iv) They are oviparous.

Solution:

In the following pair of for statement, the statement (i) and (iii) are correct and (ii) and (iv) are wrong with respect to a whale.

Correct statements

- (ii) They have mammary glands (They are mammals).
- (iv) They are viviparous - embryo develops inside the body of the parent.

OR

The organisms, (i) Amphioxus, (ii) Balanoglossus, belong to which sub-phyla of Chordata and why?

Solution:

(i) Amphioxus – Belongs to Sub-phylum Cephalochordata because the notochord extends throughout the length of its body.

(ii) Balanoglossus – Belongs to Sub-phylum Hemichordata as the notochord is confined to the anterior half of its body.

Q32. The molecular formula of the first member of a certain group of organic compounds is CH_2O (HCHO). Determine the name and the molecular formula of the third member of this group if the members of this group are in homologous series. What is the general name for this group of organic compounds?

Solution:

The molecular formula of the first member of a certain group of organic compounds is CH_2O (HCHO). The name and the molecular formula of the third member of this group is propanal, and its molecular formula is $\text{C}_3\text{H}_6\text{O}$. The members of this group are in a homologous series. The general name for this group is aldehydes.

Q33. How is safety glass manufactured? Mention the use of safety glass.

Solution:

Safety glasses are type of glass which when struck gets broken into small unharmed pieces. These can be manufactured by two ways-

1. By laminating two sheets of ordinary glass together
2. By strengthening glass sheets by heat treatment.

It is used in vehicle window, shower doors etc.

OR

Name the types of paper having the following properties and mention one use of each.

- (i) Porous and semipermeable
- (ii) Non-sticking property.

Solution:

- i) Filter paper – It is porous and semipermeable, used for separating fine solids from liquids or air / in dip tea bags.
- ii) Wax paper – It has a non-sticking property, used for wrapping food items like ice cream and cookies.

Q34. The wavelength of a wave is 3 m . If the velocity of the wave is 330 ms^{-1} , then find the frequency of that wave. Calculate the time period if the frequency of that wave is reduced to half of its value.

Solution:

We are given:

Wavelength (λ) = 3 m

Velocity (v) = 330 m/s

Frequency (f) calculation using the wave equation:

$$v = f \cdot \lambda$$

Rearranging for frequency (f) :

$$f = \frac{v}{\lambda}$$

Substituting the values:

$$f = \frac{330}{3} = 110 \text{ Hz}$$

Frequency (f) = 110 Hz.

Time Period (T) Calculation when Frequency is Halved

Frequency is halved:

$$f_{\text{new}} = \frac{110}{2} = 55 \text{ Hz}$$

The time period (T) is the reciprocal of the frequency:

$$T = \frac{1}{f}$$

Substituting f_{new} :

$$T = \frac{1}{55} = 0.01818 \text{ s (or approximately 0.018 s)}$$

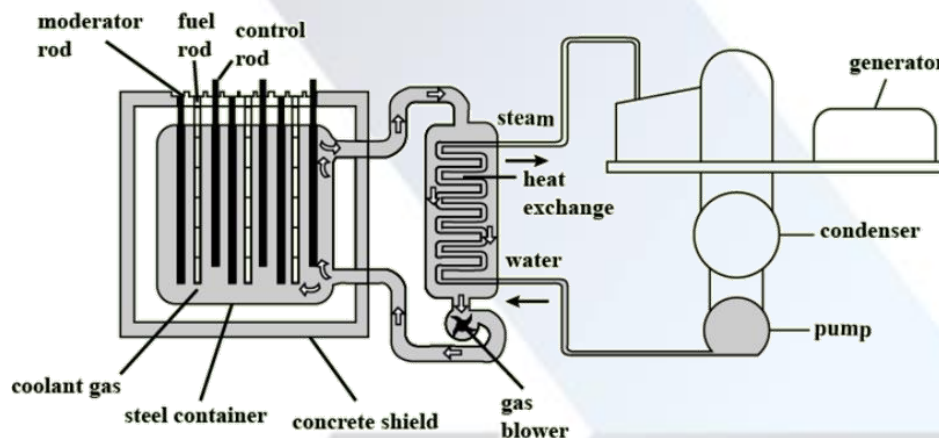
Answer the following questions.

Q35. Draw the diagram of a nuclear power reactor and label the following parts.

- (i) The part that confines neutrons to the core
- (ii) Radiation shield.

Solution:

The outlay of the nuclear power reactor with all its parts is shown in the figure.



Q36. Explain the Haversian system of bone tissue.

Solution:

The Haversian system is the structural unit of compact bone tissue.

1. A central Haversian canal contains blood vessels and nerves.
2. Surrounding the canal is a matrix called ossein, mainly composed of calcium phosphate.
3. Ossein is arranged in concentric layers called lamellae.
4. Lacunae, fluid-filled spaces, are present between lamellae.
5. Each lacuna contains a bone cell (osteocyte).
6. The lamellae are interconnected by fine canals called canaliculi.
7. Osteocytes are connected through protoplasmic strands extending via canaliculi.
8. Volkman's canals connect the Haversian canals of neighboring systems.

OR

Explain the structure of cartilage tissue.

Solution:

The structure of cartilage tissue:

1. Matrix: A translucent, glossy matrix composed of chondrin.
2. Chondrocytes: Cells called chondrocytes are embedded in spaces known as lacunae.
3. Cell Arrangement: Chondrocytes may be present singly or in groups.
4. Fibers: The matrix contains elastic and collagen fibers (white and yellow fibers).
5. Refractive Index: These fibers are not visible due to the same refractive index as the matrix.
6. Perichondrium: Cartilage is externally surrounded by a connective tissue layer called the perichondrium.

Q37. Explain intake stroke and compression stroke in the working of a petrol engine.

Solution:

Intake Stroke:

- The vaporized mixture of petrol and air enters through the inlet valve.
- The outlet valve remains closed.
- The piston moves downward, creating a vacuum that pulls in the fuel-air mixture.

Compression Stroke:

- Both inlet and outlet valves remain closed.
- The piston moves upward, compressing the fuel-air mixture.
- The temperature and pressure of the mixture increase, making it ready for ignition.

OR

Explain the working of a diesel engine.

Solution:

The working of a diesel engine involves the following steps:

Intake Stroke:

- Filtered air (without fuel) enters the cylinder.
- The piston moves downward, allowing air intake.

Compression Stroke:

- The air is compressed to a high pressure (compression ratio: 14:1 to 25:1).
- Compression heats the air enough to ignite fuel.

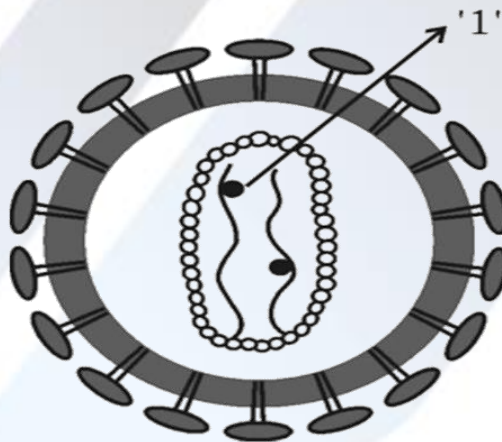
Power Stroke:

- Diesel fuel is injected as fine droplets (micelles).
- The fuel ignites spontaneously, producing high-pressure gases that push the piston downward.

Exhaust Stroke:

- The piston moves upward, pushing burnt gases out through the exhaust valve.

Q38. Observe this figure and answer the questions given below :



- Name the part labelled as ' 1 '.
- Name the heredity material of this virus.
- 'The person infected by this virus is attacked by various diseases.' Explain.

Solution:

(i) The labeled part represents an enzyme called reverse transcriptase. This enzyme converts viral RNA into DNA, allowing the virus to integrate into the host's genetic material.

(ii) The genetic material of this virus is RNA (Ribonucleic Acid).

(iii) The virus shown in the diagram is HIV (Human Immunodeficiency Virus).

- HIV attacks the immune system, specifically CD4 (T-helper) cells, which are crucial for immune defense.
- As the immune system weakens, the body loses its ability to fight infections, making the person vulnerable to various diseases and opportunistic infections.

Q39. The atomic numbers of five elements A, B, C, D and E are 6, 8, 3, 7 and 9 respectively.

(i) Which is the element having the highest electropositivity among these elements? Why?

(ii) Which is the element having the least metallic character among these elements? Why?

(iii) What is your conclusion about the relationship between metallic character and electropositivity of an element?

Solution:

(i) The element 'C' (Lithium, atomic number 3) has the highest electropositivity among these elements. This is because it is an alkali metal and readily loses one electron to attain a stable electronic configuration.

(ii) The element 'E' (Fluorine, atomic number 9) has the least metallic character. As we move from left to right across a period in the periodic table, metallic character decreases while non-metallic character increases due to a higher effective nuclear charge, which enhances the tendency to gain electrons.

(iii) The ability of an element to lose electrons and form positive ions is called electropositivity (or metallic character). Metals are highly electropositive as they easily lose electrons. Metallic character and electropositivity are directly

proportional—elements with greater metallic character are also more electropositive.

Answer the following questions.

Q40. (a) Explain the red giant stage of a star. Which is the factor that decides the next stage of a star after its red giant stage?

Solution:

- During the red giant stage, a star exhausts the hydrogen fuel in its core. The core contracts due to gravity, while the outer layers expand and cool.
- The expansion occurs because the outward radiation pressure from hydrogen shell burning (fusion in a shell around the core) exceeds the inward gravitational pull.
- As the star expands, its surface area increases, and its surface temperature decreases. This causes the star to emit more low-frequency radiation, giving it a reddish appearance.

The next stage of the star after the red giant phase depends on its mass.

(b) Define escape velocity with respect to earth. What do R and g indicate in the mathematical formula of escape velocity?

Solution:

Escape velocity is the minimum velocity an object must have to break free from Earth's gravitational pull without further propulsion. For Earth, it is approximately 11.2 km/s.

R → radius of the earth.

g → acceleration due to gravity.

OR

(a) Explain the supernova stage of a star. Mention the main feature of a black hole.

Solution:

A supernova occurs in stars that are at least five times more massive than the Sun. During this stage, multiple nuclear reactions take place, where helium fuses to

form a carbon core, and carbon nuclei undergo fusion to produce heavier elements like oxygen, magnesium, and silicon. As the process continues, an iron core forms, and when fusion can no longer sustain the star, it collapses and explodes in a violent event known as a supernova. This explosion releases tremendous energy, scattering heavy elements into space.

The main feature of a black hole is its intense gravitational force and extremely high density, which prevents even light from escaping its pull.

(b) State the law of conservation of momentum. "Propellants are necessary for the working of rockets." Why?

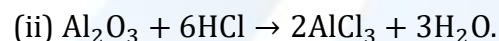
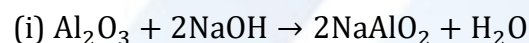
Solution:

The law of conservation of momentum states that the total momentum of a system remains constant if no external force acts on it.

Propellants are necessary for the working of rockets because:

- They provide the thrust required to launch the rocket.
- Rockets operate in space, where there is no atmospheric oxygen.
- Propellants contain both fuel and an oxidizer, allowing combustion to occur even in a vacuum, ensuring continuous thrust generation.

Q41. (a) Observe the following chemical equations:



What is the conclusion that you take about the nature of aluminium oxide with the help of these equations. Give reason for your conclusion.

Solution:

Aluminium oxide is **amphoteric** in nature. This means it can react with both acids and bases to form salt and water. In the first equation, aluminium oxide reacts with a base (NaOH) to form sodium aluminate and water. In the second equation,

it reacts with an acid (HCl) to form aluminium chloride and water. This dual behavior confirms its amphoteric nature.

(b) Molten cryolite is mixed with molten alumina in the extraction of aluminium by electrolysis. Why? Name the substances that are used as anode and cathode in this method.

Solution:

Molten cryolite is added to molten alumina during aluminium extraction by electrolysis because it acts as a solvent, lowering the melting point of alumina and forming an efficient electrolyte at a lower temperature. This helps in avoiding high-temperature electrolysis, which prevents the loss of aluminium as vapour.

The electrodes used are -

- Anode → Graphite rods
- Cathode → Carbon lining

Q42. Draw the diagram showing the internal structure of human ear and label the following parts:

(i) Malleus

(ii) Auditory nerve.

Solution:

The malleus is one of the three ear ossicles located in the middle ear. It plays a role in transmitting sound vibrations from the eardrum to the inner ear.

Auditory nerves connect the inner ear region to the brain to transmit auditory signals.

