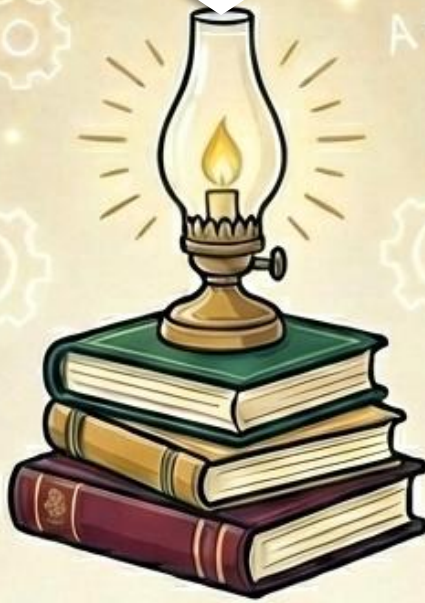




NIOS PYQ's SOLUTIONS

PREVIOUS YEARS' QUESTIONS & ANSWERS



APRIL-2025

Your Path to Success

SECTION - A

A. ☐
B. ☒
C. ☐



Q1 - Which one of the following is the correct electronic configuration of potassium?

- (A) 2, 8, 1, 8 (B) 2, 2, 8, 8
(C) 2, 8, 8, 1 (D) 2, 8, 8, 7

Answer - (C) 2, 8, 8, 1

Q2 - The derived SI unit of stress is :

- (A) kg ms^{-2} (B) $\text{kg m}^{-1}\text{s}^{-2}$
(C) $\text{kg m}^2\text{s}^{-2}$ (D) $\text{kg m}^2\text{s}^{-3}$

Answer - (B) $\text{kg m}^{-1}\text{s}^{-2}$

Q3 - Write general form of equation for the reaction of bases with non-metal oxides.

- (A) Base + Non-metal oxide $\rightarrow$ Salt + Water (B) Base + Non-metal oxide $\rightarrow$ Salt + Acid
(C) Base + Non-metal oxide $\rightarrow$ Element + Water (D) Base + Non-metal oxide $\rightarrow$ Salt + Metal oxide

Answer - (A) Base + Non-metal oxide $\rightarrow$ Salt + Water

Q4 - Balanced forces:

- (A) do not change the state of rest or motion of an object.
(B) can only pull an object.
(C) cannot deform an object.
(D) act in the direction of motion of an object.

Answer - (A) do not change the state of rest or motion of an object.

Q5 - Work done by a force will be maximum if on applying the force on a body

- (A) the body remains at rest.
(B) the force displaces the body at an angle of 30° with the direction of force.
(C) the body is displaced in the direction of force.
(D) the body is displaced in a direction opposite to the force applied.



Answer - (C) the body is displaced in the direction of force.

Q6 - The pancreatic juice does not contain the enzyme

- | | |
|-------------|-------------|
| (A) Trypsin | (B) Amylase |
| (C) Lipase | (D) Pepsin |

Answer - (D) Pepsin

Q7 - A green layer over old copper coin is generally due to

- (A) reduction leading to formation of copper oxide.
- (B) oxidation leading to formation of copper sulphate.
- (C) oxidation leading to formation of basic copper carbonate.
- (D) oxidation leading to formation of copper.

Answer - (C) oxidation leading to formation of basic copper carbonate.

Q8 - What is earthquake?

- | | |
|-------------------------------------|-----------------------|
| (A) Heavy rainfall | (B) Oceanic tide |
| (C) Sudden shaking of earth's crust | (D) Volcanic eruption |

Answer - (C) Sudden shaking of earth's crust

Q9 - Which of the following are the parts of neurons?

- (A) brain, spinal cord and vertebral column
- (B) dendrite, axon and cell body
- (C) sensory and motor nerve cells
- (D) sympathetic and parasympathetic nervous systems

Answer - (B) dendrite, axon and cell body

Q10 - Fertilisation usually takes place in a female reproductive system in

- | | |
|------------|--------------------|
| (A) Ovary | (B) Uterus |
| (C) Vagina | (D) Fallopian tube |

Answer - (D) Fallopian tube



Q11 - Which of the following group of animals is a primary consumer in a biotic community?

- (A) Carnivore (B) Scavenger
(C) Omnivore (D) Herbivore

Answer - (D) Herbivore

Q12 - The wavelength of a sodium light is 589 nm. It is the same as

- (A) 5.89×10^{-5} m (B) 5.89×10^{-7} m
(C) 5.89×10^{-9} m (D) 5.89×10^{-12} m

Answer - (B) 5.89×10^{-7} m

Q13 - What will be the pH of a solution in which the concentration of hydrogen ions is 1.0×10^{-9} mol L⁻¹?

- (A) 1.0×10^{-9} (B) -9
(C) -8 (D) 9

Answer - (D) 9

Q14 - What is the weight of an object of mass 20 kg? (Given $g = 9.8$ m s⁻²).

- (A) 196 kg (B) 19.6 kg
(C) 196 N (D) 1.96 N

Answer - (C) 196 N

Q15 - Three resistors of 1 Ω , 2 Ω and 3 Ω are connected in parallel. The combined resistance of the three resistors will be :

- (A) less than 1 Ω (B) between 1 Ω and 3 Ω
(C) greater than 3 Ω (D) equal to 2 Ω

Answer - (A) less than 1 Ω

Q16 - The image formed by a convex lens between focus and twice the focus is observed to be real, inverted and diminished than the object. Where should be the position of the object?

- (A) At 2F (B) Beyond 2F
(C) Between F and optical centre (D) Between F and 2F

Answer - (B) Beyond 2F



Q17 - Which of the following does not belong to the same homologous series?

(A) CH_4

(B) C_2H_6

(C) C_4H_8

(D) C_3H_8

Answer - (C) C_4H_8

Q18 - Match column I statement with the correct option of column II.

Column - I

(i) 10 kWh

(ii) 9.8 N

Column - II

(P) 3.6×10^8 J

(Q) 98 kg wt

(R) 746 J

(S) 1 kg wt

Answer - (a) 10 kWh $\rightarrow$ (P) 3.6×10^7 J (Option is Misprinted in Question Paper)

(b) 9.8 N $\rightarrow$ (S) 1 kg wt

Q19 - Complete the following sentence by options given in the bracket:

(first, protons, atom, electrons, valence)

(a) Helium has two _____ in its atom. These will occupy the _____ shell.

(b) The number of _____ electrons determines the combining capacity of an _____ of an element.

Answer - (a) electrons, first

(b) valence, atom

Q20 - Write TRUE(T) for correct statement and FALSE(F) for incorrect statement :

(a) Double bond is formed when two similar atoms share two pairs of electrons between them.

(b) The covalent compounds conduct electricity and are called good conductors of electricity.

Answer - (a) True

(b) False

Q21 - Read the following passage and answer the questions (1) and (2) that follow it:

The brain, a very delicate organ is well protected within the bony cranium (brain box). It is further protected by three meninges (that is, membranous coverings) which continue backward over the spinal cord. These meninges are: (i) Dura mater, the outermost tough fibrous membrane, (ii) Arachnoid, the



thin delicate middle layer giving a web-like cushion, and (iii) Pia mater, the innermost highly vascular membrane, richly supplied with blood. The space between the covering membranes is filled with a watery fluid known as cerebrospinal fluid which acts like a cushion to protect the brain from shocks.

(1) Name two meninges which protect the brain.

Answer – Dura mater and Arachnoid

(2) The brain is encased within the _____

(a) Cranium

(b) Brainstem

(c) Nerves

(d) Meninges

Answer – (a) Cranium

Q22 – Read the passage and give answer to questions (i) and (ii) that follow it:

For fusion of their nuclei, pollen and ovule are brought together by several agencies like the wind, water, and insects. This transfer of pollen grain from anther to the stigma of a flower is called pollination. Self-pollination takes place when pollen of a flower falls on its own stigma and fertilizes the ovule. In Cross pollination pollen from one flower falls on the stigma of another flower of a different plant of the same species and then fertilizes the ovule of that flower.

(i) The transfer of pollen from anther to stigma is called

(a) Diffusion

(b) Adoption

(c) Fertilization

(d) Pollination

Answer – (d) Pollination

(ii) Name two types of pollination.

Answer – Self-pollination and Cross-pollination.

Q23 - Match the variation in metallic character as per the change specified in Column-I with the correct option of Column-II.

Column I

(a) In a Period (From left to right)

(b) In a Group (From top to bottom)

Column II

(P) decreases

(Q) increases

(R) remains same

(S) variation is uncertain



Answer – (a) In a Period (From left to right) → **(P) decreases**

(b) In a Group (From top to bottom) → **(Q) increases**

Q24 - Write TRUE (T) for correct statement and FALSE (F) for incorrect statement:

(a) Metals show electropositive character whereas non-metals show electronegative character.

(b) Sulphurous acid is called the king of chemicals.

Answer – (a) True

(b) False

Q25 – Fill in the blanks:

(a) Carbon cycle is the _____ cycle by which carbon is exchanged between _____ water and atmosphere (air) of the earth.

(b) Dead plants and animals return nitrogen to the soil as _____ compounds.

Answer – (a) biogeochemical, living organisms

(b) nitrogenous

Q26 – Write True (T) for correct statement and FALSE (F) for incorrect statement:

(a) Forest fires are caused by heat generated in the litter and other biomass in rainy season.

(b) Landslides are a major hazard in most mountains and hilly regions as well as in steep river banks and coastlines.

Answer – (a) False (b) True

Q27 – Read the following passage and answer questions (i) and (ii) that follow it:

If the net external force acting on a body is zero, the body at rest continues to remain at rest and the body in motion continues to move with a uniform velocity. This property of the body is called inertia. Inertia means 'resistance to change'.

(i) Name the quantity which causes the motion of a body initially at rest ?

Answer – Force

(ii) While sitting in a moving bus, why do you experience a jerk when the bus suddenly stops?

Answer – Due to inertia of motion.



Q28 - Read the given passage and answer the questions that follow it:

Work done by a force acting on an object is equal to the magnitude of the force multiplied by the distance moved in the direction of the force. Work has only magnitude and no direction. If force $F = 1 \text{ N}$ and the distance moved in the direction of the force, $s = 1 \text{ m}$ then the work done by the force will be 1 Nm .

(a) How much work is done on a 100 N stone that you carry horizontally across a 10 m road?

- (A) 1000 J (B) 100 J
(C) 0 (D) 10 N m^{-1}

Answer – (C) 0

(b) Work done in a system is the measure of –

- (A) force (B) useful work
(C) displacement (D) energy change

Answer – (D) energy change

(c) How much work is done on a 100 N stone when you lift it by 1 m ?

- (A) 1000 J (B) 100 J
(C) 0 (D) 100 kg

Answer – (B) 100 J

(d) A force of 80 N acts on a body of mass 4 kg . What is the amount of work done if the total distance moved by the body is 2 m and is in the direction of the force applied?

- (A) 160 J (B) 40 J
(C) 160 N m^{-1} (D) 80 J

Answer – (A) 160 J

(e) In which of the following situations work is done?

- (A) A person is climbing up a staircase.
(B) A satellite revolving around the earth in a circular orbit.
(C) Two teams play a tug of war and both pull with equal force.
(D) A person is standing with a heavy load on his head.

Answer – (A) A person is climbing up a staircase.



SECTION - B

 A. ☐
 B. ☒
 C. ☐


Q29 - Write the names of two strong acids.

Answer – Two very common strong acids are:

1. **Hydrochloric Acid** (HCl)
2. **Sulphuric Acid** (H_2SO_4)

OR

Write two differences between an electron and a neutron.

Answer –

1. **Charge:** An electron carries a negative electrical charge, while a neutron has no charge at all (it is neutral).
2. **Mass:** A neutron is quite heavy (1 a.m.u., similar to a proton), but an electron is extremely light (about 1837 times lighter than a neutron).

Q30 - How does variation take place in all the elements of a given group regarding the (a) number of filled shells (b) number of valence electrons? (c) what is the effect on the force of attraction between the electrons of the outermost shell and the nucleus as one moves downwards in a group? Explain.

Answer –

(a) Filled Shells: As you go down a group, a completely new electron shell is added at every step, so the number of filled shells **increases**.

(b) Valence Electrons: The number of outer (valence) electrons **remains exactly the same** for all elements in a given group.

(c) Force of Attraction: Because new shells make the atom bigger, the outermost electrons get further away from the center. Therefore, the nuclear pull (force of attraction) on them **decreases** as you move down.

Q31 - In a lens of focal length 10 cm, the sizes of the image and object are equal. Name the type of lens and mention the distance of object from the lens.

Answer – Only a **Convex Lens** can create a real image that is exactly the same size as the object. For this to happen, the object must be placed perfectly at $2F$ (twice the focal length).

Since focal length (f) = 10 cm, the distance of the object from the lens ($2f$) is $2 \times 10 = 20$ cm.



OR

Define (i) visual angle and (ii) power of accommodation

Answer – (i) Visual Angle: It is the angle made by an object directly at the center of our eye. A bigger visual angle makes the object look larger to us.

(ii) Power of Accommodation: It is the amazing ability of the eye lens to quickly change its thickness (focal length) so we can clearly focus on both near and far objects.

Q32 - Name four kinds of nucleotides in a DNA molecule.

Answer - The DNA molecule is built like a twisted ladder using four specific chemical bases (nucleotides):

1. **Adenine (A)**
2. **Thymine (T)**
3. **Cytosine (C)**
4. **Guanine (G)**

Q33 - What will happen if a copper wire is dipped in $AgNO_3$ solution? Explain the observation giving relevant chemical reaction.

Answer - Copper is more reactive than Silver (Ag). When you dip the copper wire, it pushes the silver out of the liquid (displacement). The clear solution slowly turns **blue** (due to Copper Nitrate), and shiny grey **silver metal** sticks to the wire.

Equation: $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

OR

Nitrogen forms a series of oxides with oxygen. Write the names of any four oxides.

Answer –

1. Nitrous oxide (N_2O - Laughing gas)
2. Nitric oxide (NO)
3. Nitrogen dioxide (NO_2)
4. Dinitrogen tetroxide (N_2O_4)



Q34 - Write the names of the hardest (i) natural substances and (ii) synthetic substances.

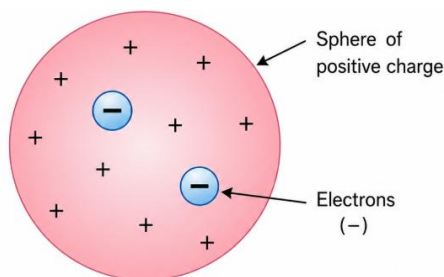
Answer – (i) Natural: Diamond (a pure form of Carbon) is the hardest substance found in nature.

(ii) Synthetic: Silicon Carbide (Carborundum) or Tungsten Carbide are extremely hard man-made (synthetic) materials used in factories for cutting.

Q35 - Describe Thomson's model of atom. Draw a diagram of helium atom according to this model.

Answer – J.J. Thomson described the atom like a **Watermelon**. He said the atom is a solid sphere of positive electrical charge (the red fleshy part of the melon). Inside this positive sphere, tiny negative electrons are stuck randomly (like the black seeds) to perfectly balance the charge.

According to him, 2 electrons are embedded in a uniform sphere of positive charge in a Helium atom.



OR

Calculate the number of electrons, protons and neutrons in ${}^{49}_{19}\text{K}$ and ${}^{40}_{18}\text{Ar}$.

Answer - Lower number = Protons = Electrons. Upper number = Mass. Neutrons = Mass - Protons.

(Note: Standard Potassium mass is 39, but we calculate based on the given questions.)

For Potassium (${}^{49}_{19}\text{K}$):

- Protons = **19**
- Electrons = **19**
- Neutrons = $49 - 19 = \mathbf{30}$

For Argon (${}^{40}_{18}\text{Ar}$):

- Protons = **18**
- Electrons = **18**
- Neutrons = $40 - 18 = \mathbf{22}$



Q36 - An element having 13 electrons form ions which has 10 electrons. It has three positive charges.

- (i) How many protons are there in its ionic form?
- (ii) What will be its atomic number and mass number if it has 14 neutrons?
- (iii) What will be the formula of its sulphate?

Answer – The element is Aluminium – Al.

(i) Protons in ionic form: Protons are safely locked in the nucleus and never change. Since the original atom had 13 electrons, it must have **13 protons**.

(ii) Atomic number and mass number: The atomic number is the proton count, so **Z = 13**. The mass number = Protons + Neutrons = 13 + 14 = **27**.

(iii) Formula of sulphate: The ion has a +3 charge (Al^{3+}). Sulphate has a –2 charge (SO_4^{2-}). Cross-multiplying gives the formula: $Al_2(SO_4)_3$.

Q37 - A constant force acting on a body of mass 4.0 kg changes its speed from 1.0 m s^{-1} to 2.5 m s^{-1} in 25 s. The direction of the motion of the body remains unchanged. What is the magnitude and direction of the force?

Answer – Given:

Mass (m) = 4.0 kg.

Starting speed (u) = 1.0 m/s.

Final speed (v) = 2.5 m/s.

Time (t) = 25 s.

Step 1: Find acceleration ($a = \frac{v-u}{t}$).

$$a = \frac{2.5 - 1.0}{25} = \frac{1.5}{25} = 0.06 \text{ m/s}^2$$

Step 2: Calculate Force ($F = m \times a$).

$$F = 4.0 \times 0.06 = 0.24 \text{ Newtons}$$

Direction: Since the speed increased, the force is pushing perfectly **in the direction of the motion**.

OR



**What is the magnitude of the gravitational force between the earth and a 5 kg object on its surface?
(Mass of the earth is 6×10^{24} kg and radius of the earth is 6.4×10^6 m)**

Answer – Given:

Mass of the Earth (M) = 6×10^{24} kg

Mass of the object (m) = 5 kg

Radius of the Earth (R) = 6.4×10^6 m

Formula:

$$F = \frac{G \cdot M \cdot m}{R^2}$$

$$F = \frac{6.67 \times 10^{-11} \times 6 \times 10^{24} \times 5}{(6.4 \times 10^6)^2}$$

$$F = 4.9 \times 10 = 49 \text{ Newtons}$$

Q38 - Define the terms (i) Oviparous (ii) Viviparous and (iii) Hermaphrodite. Give one example of each.

Answer –

(i) Oviparous: Animals that reproduce by laying eggs. The baby grows inside the egg outside the mother's body (e.g., Birds, Frogs).

(ii) Viviparous: Animals that give birth to fully formed live babies. The baby grows inside the mother's womb (e.g., Humans, Cows).

(iii) Hermaphrodite: A special creature that has both male AND female reproductive organs inside a single body (e.g., Earthworms, Leeches).

OR

Define the terms (i) adolescence (ii) puberty and (iii) menarche

Answer – (i) Adolescence: The teenage transition phase of life between childhood and adulthood where the body and mind grow rapidly.

(ii) Puberty: The specific biological time during adolescence when the reproductive organs mature and the person becomes capable of having a child.

(iii) Menarche: The very first time a young female experiences menstruation (her period), marking the start of her reproductive life.



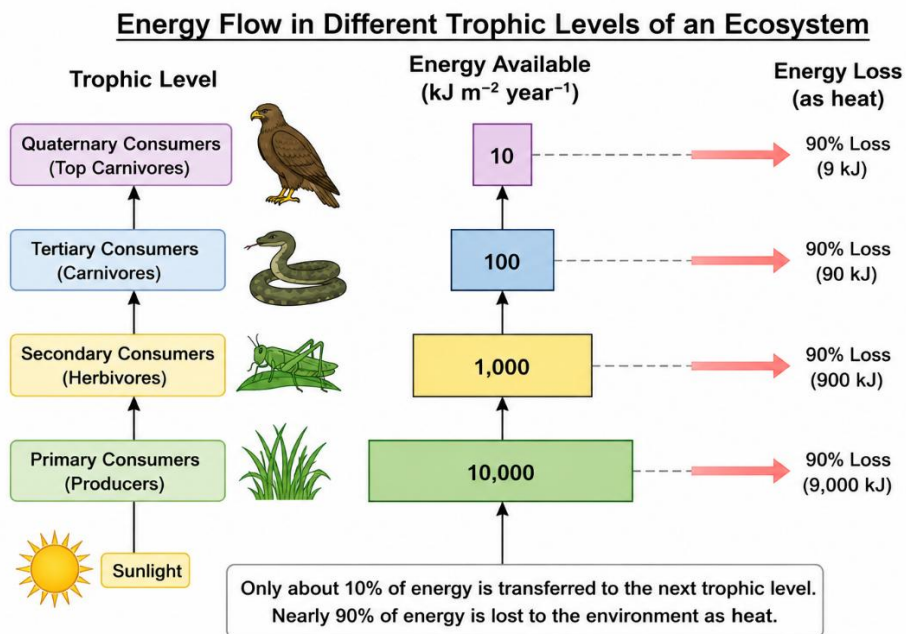
Q39 - Write three functions of spinal cord.

Answer – Functions of the spinal cord are :

1. It acts as the body's main highway, carrying feeling (sensory) messages from the skin and organs straight up to the brain.
2. It carries action (motor) commands down from the brain to our muscles so we can move.
3. It acts as an emergency control center, automatically controlling sudden **reflex actions** (like pulling a hand away from fire) without waiting for the brain's permission.

Q40 - Draw a labelled diagram of energy flow in different trophic levels of an ecosystem.

Answer –



Q41 - Classify broadly the three causes of forest fire.

Answer – The Causes of forest fire are :

1. **Natural Causes:** Lightning strikes hitting dry trees, or extreme summer heat causing dry leaves to catch fire spontaneously.
2. **Accidental Causes:** Human mistakes like leaving a burning campfire, throwing a glowing cigarette into dry grass, or sparks from power lines.
3. **Intentional (Man-made) Causes:** People deliberately setting fire to clear the forest land for farming or building (slash-and-burn).



Q42 - (a) When white light is refracted by a prism

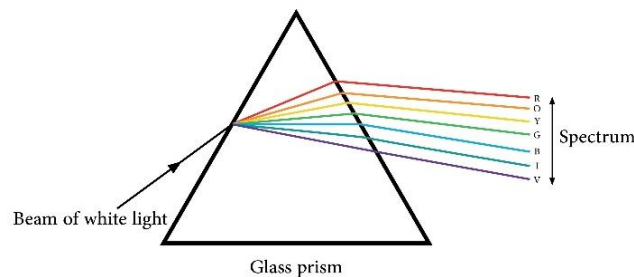
- (i) Which colour is deviated the most?
- (ii) Which colour is deviated the least?
- (iii) Draw a labelled diagram to show the colours of white light obtained in the spectrum.
- (iv) Write a natural phenomenon of dispersion of light.

(b) Write the nature of the image formed by concave lens.

Answer – (a) (i) The **Violet** colour bends (deviates) the absolute most.

(ii) The **Red** colour bends the least because it moves fastest in glass.

(iii)



(iv) A beautiful natural phenomenon of dispersion is the **Rainbow** in the sky after rain.

(b) A concave lens always creates an image that is **Virtual, Erect (straight up), and Diminished (smaller than the object)**, no matter where you place the object.

OR

(a) In your house one light bulb is fused but all the rest are working.

(b) In your sister's doll's house one light bulb is fused and all the rest are also not working.

In case of the above situations, decide how are the light bulbs connected (in series or in parallel)?

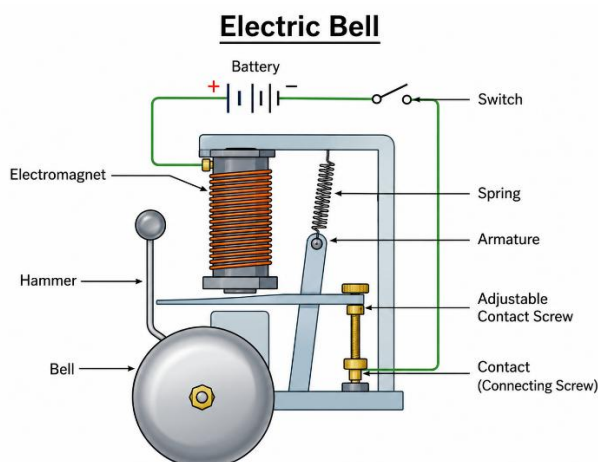
(c) Draw a labelled diagram of an electric bell.

Answer – (a) In House: Since one bulb fused but the rest kept working independently, your house is wired in a **Parallel circuit**.

(b) In Doll's House: Because one fused bulb broke the entire chain and stopped the rest from working, the doll's house is wired in a cheap **Series circuit**.



(c)



Q43 - What is meant by (i) ionic bond and (ii) covalent bond? Compare ionic and covalent compounds on the following properties: physical state, electrical conductivity and solubility.

Answer –

(i) Ionic Bond: A chemical bond formed when a metal completely *gives away* (transfers) its outer electrons to a non-metal. This creates strong positive and negative ions that attract each other like magnets!

- **Example:** Sodium Chloride (NaCl / Table Salt).

(ii) Covalent Bond: A chemical bond formed when two non-metals *share* pairs of electrons equally so both atoms can have full outer shells and become stable.

- **Example:** Hydrogen gas (H_2) or Water (H_2O).

Comparison Table:

Property	Ionic Compounds	Covalent Compounds
Physical State	They are hard, solid crystals at room temperature.	They are usually soft solids, liquids, or gases.
Electrical Conductivity	They conduct electricity brilliantly when melted or dissolved in water (because ions are free to move).	They do NOT conduct electricity (because they do not form free ions).
Solubility	They dissolve very easily in water.	They generally do not dissolve in water (but dissolve easily in organic liquids like oil).

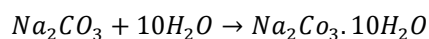
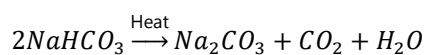
OR



Write chemical formula for washing soda. How is it manufactured? Give two uses of washing soda.

Answer - Chemical Formula: $Na_2CO_3 \cdot 10H_2O$ (Sodium carbonate decahydrate).

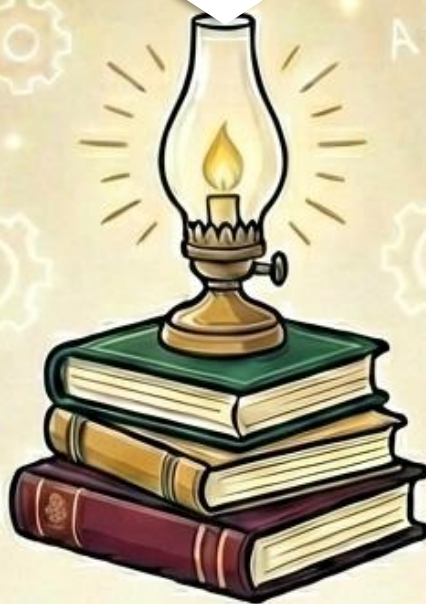
Manufacture: It is made from baking soda ($NaHCO_3$). When you heat baking soda, it breaks down into dry sodium carbonate (soda ash). Then, you dissolve this ash in water and let it crystallize. It absorbs 10 water molecules to become pure washing soda!



Two Uses:

1. Used widely in homes for laundry to remove tough dirt and grease.
2. Used to completely remove the "permanent hardness" from well-water.





NIOS PYQ's SOLUTIONS

PREVIOUS YEARS' QUESTIONS & ANSWERS



OCTOBER-2025

Your Path to Success

SECTION - A

A. ☐
B. ☒
C. ☐



Q1 - Which of the following is the unit of luminous intensity?

- (A) Candela (B) Light year
(C) Meter (D) Mole

Answer - (A) Candela

Q2 – Which of the following is the correct expression for pascal, the SI unit of pressure in terms of base units?

- (A) kg/m^2 (B) $\text{kg} \cdot \text{m}/\text{s}^2$
(C) $\text{kg}/(\text{m} \cdot \text{s}^2)$ (D) m^2/kg

Answer - (C) $\text{kg}/(\text{m} \cdot \text{s}^2)$

Q3 - If the radius of the Earth were doubled while its mass remained the same, what would happen to the weight of an object on its surface?

- (A) It doubles. (B) It halves.
(C) It reduces to one-fourth of its initial value. (D) It remains the same.

Answer - (C) It reduces to one-fourth of its initial value.

Q4 - A force of 50 N is applied to an object of mass 10 kg. What is the net force acting on the object if it is moving with a constant velocity?

- (A) 5 N (B) 10 N
(C) 50 N (D) 0 N

Answer - (D) 0 N

Q5 – A nail is left in a damp place and develops a reddish-brown coating over it with time. Which statement best explains this change?

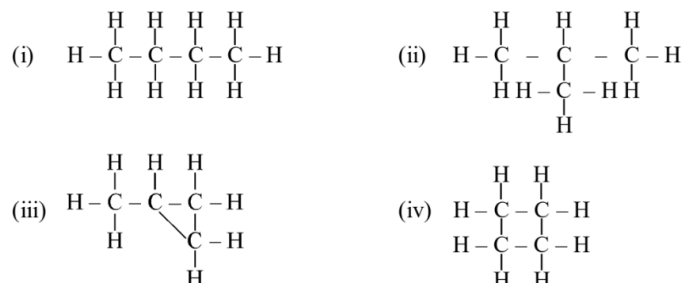
- (A) The iron reacts with carbon dioxide of air to form iron carbonate.
(B) The iron reacts with oxygen and water to form iron oxide.
(C) The nail absorbs moisture and forms iron hydroxide.



(D) The nail is covered with brownish dust particles from the air.

Answer - (B) The iron reacts with oxygen and water to form iron oxide.

Q6 - Look at the following structural formulae for butane.



The correct formulae of its isomers are:

(A) (i) and (iii)

(B) (ii) and (iv)

(C) (i) and (ii)

(D) (iii) and (iv)

Answer - (C) (i) and (ii)

Q7 - Neutrons are found in the:

(A) Electron cloud surrounding the nucleus

(B) Nucleus of an atom

(C) Crystal lattice of a solid

(D) Radiations emitted by a radioactive material

Answer - (B) Nucleus of an atom

Q8 - Mendeleev left gaps in his periodic table -

(A) For unknown elements yet to be discovered

(B) To make separate groups of metals and non-metals

(C) To maintain the order in accordance with atomic weight

(D) To group isotopes

Answer - (A) For unknown elements yet to be discovered

Q9 - Methyl orange turns yellow in:

(A) Acidic solution

(B) Neutral solution

(C) Basic solution

(D) Both acidic and basic solutions

Answer - (C) Basic solution

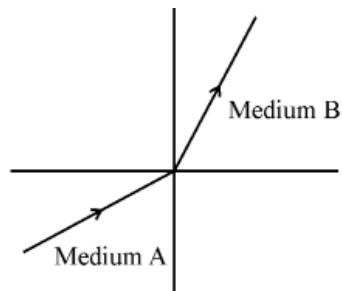


Q10 - If the pOH of a solution is 3, what is its pH?

- (A) 3 (B) 11
(C) 7 (D) 14

Answer - (B) 11

Q11 - A light ray passes from medium A to medium B as shown in the diagram. What can you conclude about the speed of light in medium B compared to medium A?



- (A) Speed of light is greater in medium B than in medium A.
(B) Speed of light is slower in medium B than in medium A.
(C) Speed of light is the same in both media.
(D) Light is totally internally reflected in medium A.

Answer - (B) Speed of light is slower in medium B than in medium A.

Q12 - During a power surge, which component in the circuit is most likely to prevent damage to your devices?

- (A) Switch (B) Electric meter
(C) Earth wire (D) Fuse or circuit breaker

Answer - (D) Fuse or circuit breaker

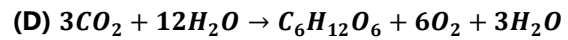
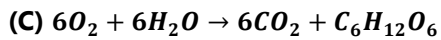
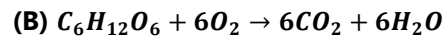
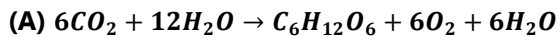
Q13 - How kinetic energy is affected when mass increases but speed remains the same?

- (A) Decreases (B) Remains the same
(C) Increases (D) Becomes zero

Answer - (C) Increases



Q14 - Which equation correctly represents photosynthesis?



Answer - (A) $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

Q15 - Which part of Bryophyllum helps in vegetative propagation?

(A) Roots

(B) Stem

(C) Leaf edges

(D) Flowers

Answer - (C) Leaf edges

Q16 - In a spinal reflex, the receptor detects the stimulus and sends a signal to the:

(A) Effector

(B) Motor neuron

(C) Sensory neuron

(D) Brain

Answer - (C) Sensory neuron

Q17 - Thalassemia is a disorder related to:

(A) Red blood cells

(B) White blood cells

(C) Platelets

(D) Plasma

Answer - (A) Red blood cells

Q18 - Match Column-I with the right option in Column-II:

Column – I (Prefix)

Column – II (Symbol)

(a) Kilo

(P) k

(b) Milli

(Q) m

(R) M

(S) μ (*micro*)

Answer - (a) Kilo → (P) k

(b) Milli → (Q) m



Q19 - Match the elements in Column-I with their correct electronic configurations in Column-II:

Column – I (Element)

Column – II (Electronic Configuration)

(a) Nitrogen (N)

(P) 2, 4, 1

(B) Magnesium (Mg)

(Q) 2, 8, 2

(R) 2, 5

(S) 2, 8, 1

Answer - (a) Nitrogen (N) → (R) 2, 5

(b) Magnesium (Mg) → (Q) 2, 8, 2

Q20 - Write TRUE (T) for correct statement and FALSE (F) for incorrect statement:

(i) Ionic bonds are formed by the sharing of electrons.

(ii) Covalent compounds generally have low melting and boiling points.

Answer – (i) False (ii) True

Q21 - Read the passage given below and answer the following questions :

Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. For example, when we jump off the ground, we push the ground downward, and the ground pushes us upward with equal force, helping us jump into the air. This law explains : how birds fly? How rockets are launched and even how do we walk? The action and reaction forces always occur in pairs and act on different objects.

(i) When a soldier fires a bullet, what is the reaction force according to Newton's third law?

(A) The force on the bullet to push it forward

(B) The force on the gun due to which it recoils back

(C) The air resistance on the bullet

(D) The sound of the gunshot

Answer – (B) The force on the gun due to which it recoils back

(ii) What happens to the soldier when he fires a bullet, illustrating Newton's third law ?

(A) He moves forward slightly.

(B) He feels no force.

(C) He feels a backward kick or recoil of the gun.

(D) He jumps up.

Answer – (C) He feels a backward kick or recoil of the gun.



Q22 – Fill in the blanks:

Strictly speaking the Coulomb's law is applicable only for _____ charges kept separated by a _____.

Answer – point, distance.

Q23 - Read the passage given below and answer the questions that follow :

"Magnification is the ratio of the height of the image to the height of the object. It can also be expressed as the ratio of the image distance to the object distance ($m = v/u$)."

(i) A student uses a lens to form an image with magnification +1.5. Which of the following phrases gives the correct characteristics of the image?

- | | |
|------------------------|-------------------------|
| (A) Real and inverted | (B) Virtual and smaller |
| (C) Virtual and larger | (D) Real and upright |

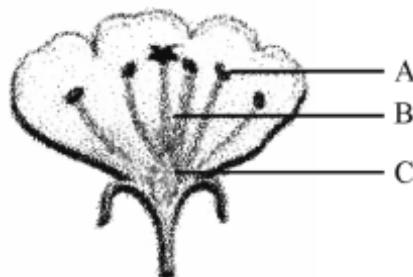
Answer – (C) Virtual and larger

(ii) A magnification of +0.2 is recorded during an experiment. What kind of lens and image could this represent ?

- | | |
|---------------------------------------|---|
| (A) Convex lens forming real image | (B) Concave lens forming diminished image |
| (C) Convex lens forming virtual image | (D) Concave lens forming real image |

Answer – (B) Concave lens forming diminished image

Q24 - Study the diagram of angiospermic flower given below and answer the questions :



(a) The labels A, B and C respectively are

- | | |
|--------------------------------|---------------------------------|
| (i) Anther, Style and Ovary | (ii) Stamen, Stigma and Ovule |
| (iii) Anther, Style and Stigma | (iv) Stamen, Filament and Ovary |

Answer – (i) Anther, Style and Ovary



(b) Which of the following is the function of part labelled as C ?

- (i) Contains ovules which develop into seeds.
- (ii) Attracts pollinators.
- (iii) Protect rising buds.
- (iv) Receive pollens.

Answer – (i) Contains ovules which develop into seeds.

Q25 – State whether the following statements are True (T) or False (F):

- (i) Roasting is the process of heating ores in the presence of oxygen.
- (ii) Calcination converts carbonate ores into oxides by heating.

Answer – (i) True

(ii) True

Q26 – Match the donor blood group in Column-I with the correct recipient blood group in Column-II.

Column-I (Donor)

(A) Blood Group A

(B) Blood Group O

Column-II (Recipient)

(1) Blood Group A, B, AB and O

(2) Blood Group A and AB

(3) Blood Group B and AB

(4) Blood Group AB only

Answer – (A) Blood Group A → (2) Blood Group A and AB

(B) Blood Group O → (1) Blood Group A, B, AB and O

Q27 – State whether the following statements are True (T) or False (F) :

- (i) Birds have hollow bones to make their bodies heavier for better balance during flight.
- (ii) Camels store fat in their humps, which helps them survive in desert conditions.

Answer – (i) False

(ii) True

Q28 - Read the passage given below and answer the questions that follow it.

"Some people cannot see distant objects clearly, while others struggle to see nearby objects. In these cases, corrective lenses are often prescribed. These conditions arise due to changes in the shape of the eye or issues with the eye lens. Concave or convex lenses of appropriate power help adjust the focus and form clear images on the retina."



(i) A student complains that he cannot see the blackboard clearly but can read his book easily. Which defect of vision is he most likely suffering from?

- (A) Hypermetropia (B) Myopia
(C) Presbyopia (D) Cataract

Answer – (B) Myopia

(ii) A person has difficulty in reading small print but can see distant objects clearly. What kind of lens would help him for reading a book?

- (A) Concave lens (B) Convex lens
(C) Cylindrical lens (D) No lens needed

Answer – (B) Convex lens

(iii) An elderly person finds it hard to focus on both near and distant objects. Which type of corrective lens should be recommended?

- (A) Single concave lens (B) Single convex lens
(C) Bifocal lens (D) No lens can help

Answer – (C) Bifocal lens

(iv) Two students in a class are using spherical of power +2 D and +4 D. Their defect in vision is

- (A) Myopia (B) Hypermetropia
(C) Presbyopia (D) Cataract

Answer – (B) Hypermetropia

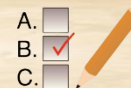
(v) Which of the following best describes astigmatism, a common vision defect ?

- (A) A condition where a person can see nearby objects clearly but not distant ones
(B) A defect in the eye caused by uneven curvature of the lens, leading to distorted vision.
(C) A complete loss of vision due to damage in the optic nerve.
(D) A condition in which the eye cannot adjust the focal length for near vision.

Answer – (B) A defect in the eye caused by uneven curvature of the lens, leading to distorted vision.



SECTION - B



Q29 - Dobereiner arranged certain elements in groups of three called triads. In one such triad, the atomic masses of lithium and potassium are 7 and 39, respectively.

(a) Identify the third element in the triad.

(b) Explain how this arrangement justifies Dobereiner's law of Triads.

Answer – (a) The third element in this triad is **Sodium** (*Na*).

(b) According to Dobereiner's law, the atomic mass of the middle element should be the mathematical average of the first and third elements. If we add Lithium (7) and Potassium (39) together and divide by 2, we get exactly 23:

$$\text{Average Mass} = \frac{7 + 39}{2} = \frac{46}{2} = 23$$

Since 23 is the exact atomic mass of Sodium, this arrangement perfectly verifies the law.

Q30 - (a) What was the basic idea of J.J. Thomson's plum pudding model of the atom?

(b) Name one drawback of this model.

Answer – (a) J.J. Thomson's basic idea was the **Watermelon Model**. He proposed that an atom is a solid sphere of completely uniform positive charge, with tiny negative electrons scattered randomly inside it like black seeds in a watermelon.

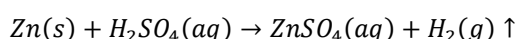
(b) One major drawback is that it completely failed to explain how positive and negative charges stayed together without neutralizing each other, and it could not explain Rutherford's alpha-ray scattering experiment.

OR

What happens when dil. H_2SO_4 reacts with Zinc? Give the equation of the chemical reaction.

Answer – When grey Zinc granules are added to dilute Sulphuric Acid (H_2SO_4), a brisk chemical displacement reaction happens. The zinc dissolves away to form a colorless salt solution called **Zinc Sulphate**, and bubbles of highly flammable **Hydrogen gas** are released.

Chemical Equation:



Q31 - An element X has an atomic number of 8.

(a) How many valence electrons does it have?

(b) What is its valency ?

Answer – (a) An element with atomic number 8 has an electronic arrangement of 2,6. Therefore, it has **6 valence electrons** sitting in its outer shell.

(b) Since it has 6 outer electrons, it needs to grab 2 more electrons to reach a stable octet configuration ($8 - 6 = 2$). This means its combining capacity, or **valency, is 2**.

Q32 - What are autosomes? How many pairs of autosomes does a human cell have?

Answer - Autosomes are the standard chromosomes inside a cell that control all regular body characteristics, physical traits, and growth features, but they do **not** play any role in determining whether a baby is born male or female. A normal human cell carries exactly **22 pairs** (44 total) of autosomes.

OR

State two laws of Heredity as given by Mendel.

Answer – Two foundational laws of Heredity discovered by Gregor Mendel are:

1. **Law of Segregation:** It states that the two factors (alleles) controlling a trait separate completely from each other during the creation of reproductive gametes.
2. **Law of Dominance:** It states that in a pair of contrasting factors, one dominant factor can completely hide the expression of the recessive factor.

Q33 - Why are detritus food chains important in ecosystems?

Answer - Detritus food chains are vital because they start directly with dead, decaying organic matter (like fallen leaves or waste) rather than living plants. They act as nature's cleaning system, using decomposers to break down waste, release locked up mineral nutrients back into the soil, and safely recycle energy.

OR

Mention any two ways by which forests can be replenished.

Answer – Forests can be successfully replenished using two major ecological methods:

1. **Reforestation:** Planting thousands of new tree saplings across old forest lands that were previously cleared or destroyed by humans.



2. **Afforestation:** Planting new trees and creating completely fresh forest layers on lands that never had trees growing on them before.

Q34 - Why does the amount of energy become lesser as we go up to a higher trophic level in a food chain?

Answer – This happens because of Lindeman's **10% Law of Energy**. When an animal eats food, a massive 90% of that energy is permanently spent on daily life activities like running, breathing, generating body heat, or is lost as waste. Only a tiny 10% is stored in its flesh to be passed up.

Q35 - A stone is dropped from the top of a 40 m high tower. Calculate its speed after 2 s. Also find the speed with which the stone strikes the ground.

Answer – Given Data:

Height (h) = 40 m,

Starting speed (u) = 0 m/s (dropped),

Gravity acceleration (g) = 9.8 m/s² (or 10 m/s² for simple steps).

Let's use 10 m/s².

(1) Speed after 2 seconds (v_1):

$$v_1 = u + gt$$

$$v_1 = 0 + (10 \times 2) = 20 \text{ m/s}$$

(2) Speed when striking the ground (v_2): Using the third equation of motion:

$$v_2^2 = u^2 + 2gh$$

$$v_2^2 = 0^2 + 2 \times 10 \times 40 = 800$$

$$v_2 = \sqrt{800} = 28.28 \text{ m/s}$$

OR

An object of mass 50 kg is accelerated uniformly from a velocity of 3 m/s to 9 m/s. Calculate the change in momentum of the object. Also find the magnitude of force exerted on the object in one second.

Answer - Given Data:

Mass (m) = 50 kg,

Initial speed (u) = 3 m/s,



Final speed (v) = 9 m/s,

Time (t) = 1 s.

(1) Change in Momentum (Δp):

$$\Delta p = m(v - u)$$

$$\Delta p = 50 \times (9 - 3) = 50 \times 6 = \mathbf{300 \text{ kg} \cdot \text{m/s}}$$

(2) Magnitude of Force (F): According to Newton's second law, Force is the rate of change of momentum:

$$F = \frac{\Delta p}{t}$$

$$F = \frac{300 \text{ kg} \cdot \text{m/s}}{1 \text{ s}} = \mathbf{300 \text{ Newtons}}$$

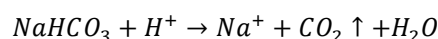
Q36 - (a) Give the constituents of baking powder.

(b) Why cake swells on adding baking powder in dough? Write the chemical equation of the reaction involved.

Answer – (a) Baking powder is a dry blend made of two active items: **Baking Soda** (Sodium Bicarbonate) and a mild, safe solid food acid called **Tartaric Acid**.

(b) When liquid is added to the dough, these items react under heat. The tartaric acid breaks down the baking soda, releasing lots of **Carbon Dioxide** gas (CO_2). This gas bubbles up, gets trapped in the dough, and forces the cake to rise and become soft and spongy.

Chemical Equation:



Q37 - (a) State Joule's law of heating.

(b) A 5Ω resistor is connected to 10 V battery for 2 mins. Calculate the heat produced in joules.

Answer – (a) Joule's law states that when electrical current travels through a resistor, it creates heat. The heat produced (H) is directly proportional to the square of the current (I^2), the resistance value (R), and the time (t).

(b) Calculation:

- Resistance (R) = 5Ω
- Voltage (V) = 10 V
- Time (t) = 2 mins = $2 \times 60 = 120$ seconds

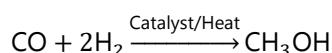


First, find the heat using formula $H = \frac{V^2}{R} \cdot t$:

$$H = \frac{10^2}{5} \times 120 = \frac{100}{5} \times 120 = 20 \times 120 = \mathbf{2400 \text{ Joules}}$$

Q38 - Explain how methanol is prepared industrially and what is its significance in industries?

Answer – Industrial Preparation: Methanol (CH_3OH) is manufactured in large chemical factories by taking a hot gas mixture of Carbon Monoxide (CO) and Hydrogen (H_2) and compressing it under high pressure using a special catalyst at high heat.



Significance: It is highly important as an industrial liquid solvent to dissolve chemicals. It is also used as a base raw material to make plastics, paints, and synthetic wood resins.

OR

Name three types of aliphatic hydrocarbons based on C-C bond formation. Also mention their general formulae.

Answer – Aliphatic hydrocarbons are grouped into three basic families based on their carbon-carbon bonds:

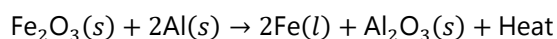
1. **Alkanes:** These contain only single covalent bonds between carbon atoms. Their general formula is $\text{C}_n\text{H}_{2n+2}$.
2. **Alkenes:** These contain at least one double covalent bond between carbon atoms. Their general formula is C_nH_{2n} .
3. **Alkynes:** These contain at least one triple covalent bond between carbon atoms. Their general formula is $\text{C}_n\text{H}_{2n-2}$.

Q39 - Answer the following questions related to the Thermite process:

- (a) Name the metal used to reduce iron oxide in the Thermite reaction.
- (b) Write a balanced chemical equation for the Thermite reaction.
- (c) Mention one use of the Thermite process in real life.

Answer – (a) The reducing metal used in this reaction is **Aluminium powder** (Al).

(b) Balanced Equation:



(c) Real-Life Use: Because this reaction creates an incredible amount of heat, the iron is produced as a molten liquid. This liquid iron is used by engineers to weld broken railway tracks together or repair heavy machinery cracks right on site.

Q40 - (a) What are mesophytes ?

(b) Explain two structural features of mesophytes.

Answer - (a) Mesophytes are normal, everyday land plants that grow in environments with moderate temperatures and an average, balanced supply of water (neither a desert nor a swamp). Examples are mango and wheat.

(b) Structural Features:

1. **Well-developed Roots:** They have an organized root system with root caps to absorb moisture efficiently from normal soil depths.
2. **Broad Leaves with Stomata:** Their leaves are broad and flat, featuring breathing pores (stomata) on the underside to regulate gas exchange.

Q41 - Define symbiosis. Give one example of a symbiotic association. Mention one point of difference between commensalism and symbiosis.

Answer – Symbiosis is a close, long-term biological partnership where two different living species live together, and both help each other survive. A great example is **Lichen**, where an alga (makes food) and a fungus (gives shelter) live as one body.

Difference: In symbiosis, **both** organisms get a clear benefit. In commensalism, only one organism benefits while the other partner is completely unaffected (neither helped nor hurt).

OR

Categorise living organisms on the basis of mode of nutrition.

Answer – Living organisms are divided into three main categories based on how they get their nutrition:

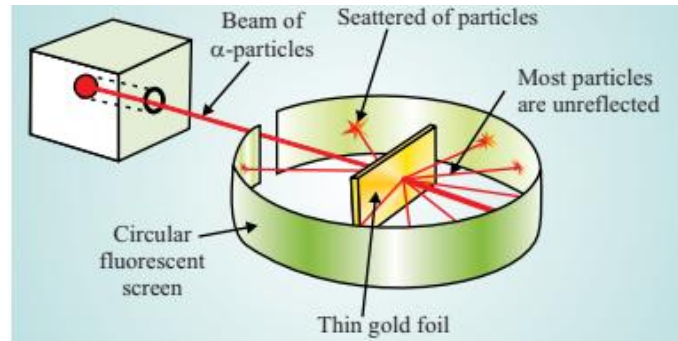
1. **Autotrophs (Producers):** Green plants that trap sunlight to make their own food through photosynthesis.
2. **Heterotrophs (Consumers):** Animals that must eat other plants or animals to get energy.
3. **Saprophytes (Decomposers):** Fungi and bacteria that release enzymes to digest and absorb energy from dead, rotting organic waste.



Q42 - (a) Diagrammatically illustrate the scattering experiment of Rutherford.

(b) Write the characteristics of the model of an atom as given by Rutherford.

Answer – (a) Alpha-Ray Scattering Experiment:



(b) Characteristics of Rutherford's Atomic Model:

1. **The Nucleus:** An atom contains an extremely tiny, heavy, dense center called the nucleus, which holds all the positive charge and nearly all the atom's mass.
2. **Empty Space:** Most of the atom is completely empty space, which is why most alpha particles pass straight through.
3. **Orbiting Electrons:** The light, negative electrons revolve around this dense nucleus in circular pathways at very high speeds, similar to planets orbiting the sun.

OR

How were cathode rays produced using a Discharge tube? Give any four properties of Cathode rays.

Answer – Production of Cathode Rays:

Cathode rays are produced using a sealed glass Discharge Tube. Inside this tube, two metal plates (electrodes) are attached to a high voltage source. A vacuum pump sucks out the air to create an extremely low gas pressure. When electricity is turned on, an invisible stream of negative particles shoots out from the negative plate (cathode) towards the positive plate.

Four Properties:

1. They travel in perfectly straight lines.
2. They are made of tiny material particles that carry kinetic energy.
3. They carry a negative electrical charge (deflect toward positive plates).
4. They produce a bright green glow (fluorescence) when they strike glass.



Q43 - Explain the process of DNA replication. Also mention the names of 4 bases present in DNA.

Answer - Process of DNA Replication:

DNA replication is the biological method where a cell copies its DNA code before dividing. First, special enzymes unzip the twisted double-helix structure down the middle, separating the base pairs like a zipper. This leaves two single strands with exposed bases. Next, free nucleotides floating in the cell find their matching partners on each open strand. Another enzyme glues them together, forming two completely identical sets of DNA ladders.

The 4 Chemical Bases:

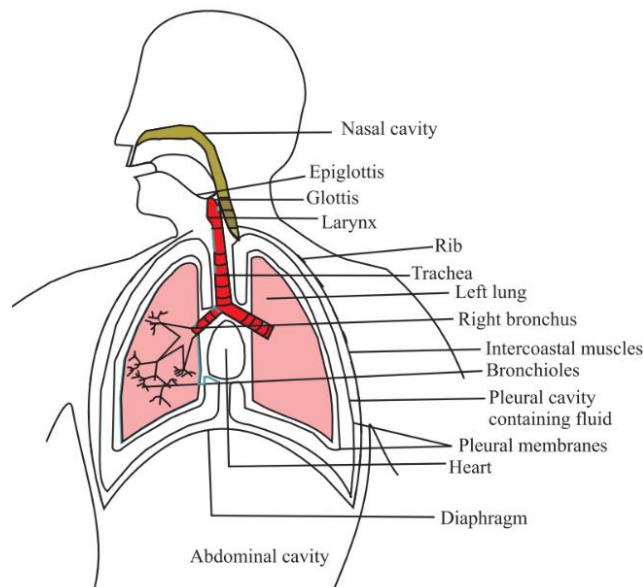
1. Adenine (A)
2. Thymine (T)
3. Cytosine (C)
4. Guanine (G)

OR

(a) Draw a well-labelled diagram of the human respiratory system.

(b) Differentiate between inhalation and exhalation.

Answer - (a) Human Respiratory System:



(b) Differences Between Inhalation and Exhalation

Feature	Inhalation	Exhalation
Definition	Taking oxygen-rich fresh air inside the lungs from the environment.	Pushing carbon dioxide-rich used air out of the lungs into the environment.
Diaphragm Movement	It contracts, moves downwards, and flattens out to expand the chest cavity space.	It relaxes, moves upwards back to its original dome shape, and squeezes the chest space.
Rib Cage Movement	The ribs move upwards and outwards to pull fresh air inside the lungs.	The ribs move downwards and inwards to press and squeeze the used air out.
Air Pressure Inside Lungs	Air pressure inside the lungs decreases, which pulls outside air inside.	Air pressure inside the lungs increases, which forces the internal air out.





Thank you!



We hope you found this material helpful. We wish you the very best for your examination.



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