



NIOS PYQ's SOLUTIONS

PREVIOUS YEARS' QUESTIONS & ANSWERS



APRIL-2024

Your Path to Success

SECTION - A

A. ☐
B. ☒
C. ☐



Q1 - In ancient times people used to make measurements by using their :

- (A) thumb (B) hand-span
(C) first finger (D) all of the above

Answer - (D) all of the above

Q2 – Someone has written the mass of a body as given below in different ways. Which of these is written correctly as per rules ?

- (A) 100 mg (B) 100 mg
(C) 100/mg (D) 100 mgs

Answer - (A) 100 mg

Q3 - (i) In respect of ionic compounds, which one of the following properties is incorrect?

- (A) they are solid and hard.
(B) their melting and boiling points are high.
(C) they are soluble in organic solvents.
(D) they are good conductor of electricity in molten state.

Answer - (C) they are soluble in organic solvents.

OR

(ii) If two chlorine atoms share one of their electrons they both attain the stable configuration of a noble gas which is :

- (A) Neon (B) Argon
(C) Krypton (D) Xenon

Answer - (B) Argon



Q4 - (i) Identify which of the following is formed by transfer of electrons :

- (A) Oxygen (B) Nitrogen
(C) Hydrogen (D) Sodium chloride

Answer - (D) Sodium chloride

OR

(ii) Consider the formation of a compound in the following manner



X in the above reaction is:

- (A) solid sodium chloride (B) liquid sodium chloride
(C) gaseous sodium chloride (D) molten sodium chloride

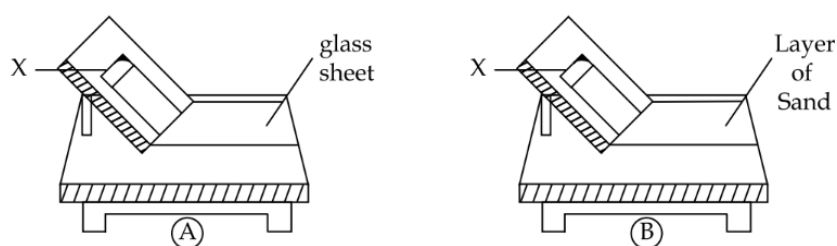
Answer - (A) solid sodium chloride

Q5 – Which of the following atoms has the largest atomic radius?

- (A) C (B) N
(C) O (D) F

Answer - (A) C

Q6 - In the following set ups A and B of an inclined plane on a table.



If a pencil cell 'X' is released from equal heights on the inclined plane in both the set up A and B one by one, the correct observation would be :

- (A) the distance moved by the cell on the table is more in set up A because this surface offers more friction as compared to the surface in set up B
(B) the distance moved by the cell on the table is more in set up A because this surface offers less friction as compared to set up B



(C) the distance moved by the cell on the table is less in set up A because this surface offers more friction as compared to set up B.

(D) the distance moved by the cell on the table is less in set up A because this surface offers less friction as compared to the surface in set up B

Answer - (B) the distance moved by the cell on the table is more in set up A because this surface offers less friction as compared to set up B

Q7 - The SI unit of ' g ' is:

(A) N

(B) Nm^2kg^{-2}

(C) ms^{-2}

(D) m

Answer - (C) ms^{-2}

Q8 - Which one of the following statements is not correct in regard of energy transformation?

(A) Photosynthesis: Solar energy $\rightarrow$ Chemical energy of food

(B) Electric bulb: electric energy $\rightarrow$ Light energy

(C) Loudspeaker: electric energy $\rightarrow$ Sound energy

(D) Physical exercise: Chemical energy of food $\rightarrow$ Kinetic energy

Answer - (D) Physical exercise: Chemical energy of food $\rightarrow$ Kinetic energy

Q9 - Rate of doing work is called _____

(A) Force

(B) Displacement

(C) Power

(D) Motion

Answer - (C) Power

Q10 - A mirror always forms a diminished image of an object, wherever you place the object in front of it. The mirror is:

(A) Plane

(B) Concave

(C) Convex

(D) None of these, as there is no mirror like this

Answer - (C) Convex



Q11 - (i) Which of the following is not a digestive gland?

- (A) Liver (B) Gastric gland
(C) Pancreatic islets (D) Wall of intestine

Answer - (C) Pancreatic islets

OR

(ii) Which one of the following blood group is a universal donor?

- (A) A (B) B
(C) AB (D) O

Answer - (D) O

Q12 - (i) Which of the following is used as a male contraceptive device ?

- (A) Vasectomy (B) Tubectomy
(C) Copper T (D) Hypophysectomy

Answer - (A) Vasectomy

OR

(ii) Which of the following human reproductive organ is not present in pair ?

- (A) Vas deferens (B) Fallopian tube
(C) Cervix (D) Ovary

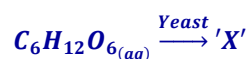
Answer - (C) Cervix

Q13 - Which of the following is not a method of artificial propagation in plants?

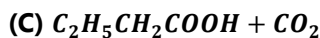
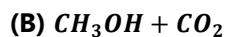
- (A) Cutting (B) Layering
(C) Gootee (D) Budding

Answer - (D) Budding

Q14 - (i) The following chemical reaction shows the fermentation of carbohydrate like glucose catalysed by an enzyme present in yeast.



What is likely to be the product of the reaction represented by 'X' ?



Answer - (A) $\text{CH}_3\text{CH}_2\text{OH} + \text{CO}_2$

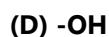
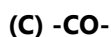
OR

(ii) Which of the word root given in Column-II correctly matches with the number of carbon atoms given in Column-I?

Column-I (No. of Carbon atom)	Column-II (Word root)
(A) 1	eth
(B) 2	but
(C) 3	prop
(D) 4	meth

Answer - (C) 3 → prop

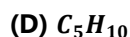
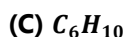
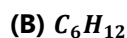
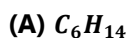
Q15 - (i) A four carbon containing compound Butanone has the functional group :



Answer - (C) -CO-

OR

(ii) The molecular formula of sixth member of homologous series of alkanes is :



Answer - (A) C_6H_{14}

Q16 - (i) Which one of the following statements is incorrect in respect of adaptive features in aquatic plants?

(A) They have reduced root system.

(B) The leaves are thin and narrow.

(C) The shoot system is well organized

(D) Upper surface of leaf is coated with wax.

Answer - (C) The shoot system is well organized



OR

(ii) Fins of fish help to:

(A) Swim

(B) Steer

(C) Maintain Balance

(D) All the above

Answer - (D) All the above

Q17 - (i) The trapping of a layer of cool air at the ground level by an overlying layer of warm and stagnant air is called:

(A) Thermal inversion

(B) Global warming

(C) Incineration

(D) Biological magnification

Answer - (A) Thermal inversion

OR

(ii) Which one of the following is not an example of natural environmental problems?

(A) Earthquakes

(B) Floods

(C) Tsunami

(D) Afforestation

Answer - (D) Afforestation

Q18 - Match Column - I statements with the right option of Column - II.

Column - I

Column - II

(i) SI unit of Pressure

(P) Kelvin

(ii) SI unit of Temperature

(Q) Celsius

(R) Pascal

(S) Candela

Answer - (i) SI unit of Pressure → (R) Pascal

(ii) SI unit of Temperature → (P) Kelvin

Q19 - Complete the following sentence by given options below.

(loss, chemical bonding, bad conductor, good conductor, gain)

(i) Atoms of elements in a molecule are held together by _____.

(ii) Metals form cations by _____ of electrons.



(iii) Formation of anions by non-metals takes place with the _____ of electrons.

(iv) Ethyl alcohol is a _____ of electricity in its aqueous solution.

Answer – (i) Chemical Bonding

(ii) loss

(iii) gain

(iv) bad conductor

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

(i) The electronic configuration of Argon is 2, 8, 8

(ii) In the formation of sodium chloride, sodium atom gains one electron and chlorine atom loses one electron.

(iii) Covalent bond is formed by mutual sharing of equal number of electrons between two atoms.

(iv) Ethyl alcohol produces H^+ ions in its aqueous solution.

Answer – (i) True

(ii) False

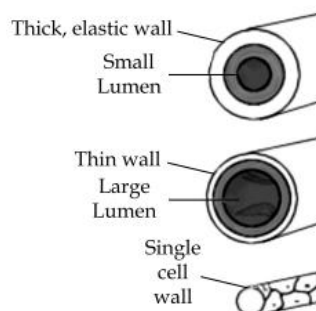
(iii) True

(iv) False

Q21 - Read the passage and answer the questions that follow it. (i) to (ii)

"Human circulatory system consists of:

- Centrally located muscular pump called heart and
- Blood vessels which are tube-like structures connected to the heart, these are Arteries, Veins and Capillaries."



(i) The blood vessels that carry blood from heart are termed as _____ and those that bring blood from various parts of the body to the heart is termed as _____.

(ii) Name the thin structures that allows the exchange of materials between blood and tissues.

Answer – (i) Arteries, Veins

(ii) Capillaries

Q22 – Read the Passage and answer the Questions (i) and (ii) that follow it.

"RTIs refer to infections of reproductive organs. These illnesses may occur due to poor genital hygiene. For example, Poor menstrual hygiene among girls. Importantly, RTIs include the illness that are transmitted from one Person to another Person during sexual contact and are known as STDs."

(i) Which one of the following is not STDs?

(A) Syphilis

(B) Gonorrhea

(C) AIDS

(D) Goitre

Answer – (D) Goitre

(ii) HIV/AIDS is not transmitted by:

(A) Unprotected sexual intercourse

(B) Infected blood

(C) Infected mother to her baby

(D) Kissing and hugging

Answer – (D) Kissing and hugging

Q23 - Write TRUE (T) for correct statement and FALSE (F) for incorrect statement.

(i) HENRY MOSELEY, an English Physicist discovered that the 'atomic mass' and not the 'atomic number' is the most fundamental property of elements.

(ii) F, Cl, Br, I and At are the non-metallic elements called halogens.

(iii) Metallic character increases in a Period from left to right.

(iv) $1\text{ pm} = 10^{-12}\text{ m}$

(v) If the electronic configuration of an element is 2, 8, 1 then it is a non-metal.

Answer – (i) False

(ii) True



(iii) False

(iv) True

(v) False

Q24 - Match Column - I formula with the right option of Column - II.

Column - I

(i) H_2SO_4

(ii) NaOH

Column - II

(P) Base

(Q) Aqua Regia

(R) King of Chemicals

(S) Neutral salt

Answer – (i) $H_2SO_4 \rightarrow$ (R) King of Chemicals

(ii) NaOH $\rightarrow$ (P) Base

Q25 – Fill in the blanks:

(i) A close interaction between two or more different organisms of different species living in close physical association is termed as _____.

(ii) The _____ rate of a population is the number of individuals dying per thousand per unit time.

(iii) The process of conversion of ammonia into nitrates is known as _____.

(iv) _____ is the inter-connected food chains.

Answer – (i) Symbiosis

(ii) Mortality

(iii) Nitrification

(iv) Food web

Q26 – Write TRUE (T) for correct statement and FALSE (F) for incorrect statements.

(i) Fish and aquatic invertebrates like prawns have gills for respiration.

(ii) Penguins have a hump to store fat.

(iii) Population growth curves are either J-shaped or S-shaped.

(iv) Abiotic components are the organisms which include plants, animals and micro-organisms in an ecosystem.



Answer – (i) True

(ii) False

(iii) True

(iv) False

Q27 – Read the passage carefully.

"According to Newton's Law of Gravitation, every particle in the universe attracts each other with a force. This force is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Mathematically,

$$F \propto \frac{m_1 m_2}{r^2}$$

where m_1 and m_2 are the masses of the two particles separated by a distance r , or

$$F = G \frac{m_1 m_2}{r^2}$$

where G is a constant of Proportionality. It is called Universal Gravitational Constant. Its value is same everywhere on the earth or in the universe.

The value of G in SI units is $6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$ "

(i) What is the force of gravity acting on an object of mass 2000 kg at the earth's surface ?

(A) $F = 1.962 \text{ N}$

(B) $F = 19.62 \text{ N}$

(C) $F = 1962 \text{ N}$

(D) $F = 19620 \text{ N}$

Answer – (D) $F = 19620 \text{ N}$

(ii) Two spherical objects have masses of $3.1 \times 10^5 \text{ kg}$ and $6.5 \times 10^3 \text{ kg}$. The gravitational attraction between them is 65 N. How far apart are their centres ?

(A) $4.5 \times 10^{-7} \text{ m}$

(B) $45.0 \times 10^{-1} \text{ m}$

(C) $0.45 \times 10^2 \text{ m}$

(D) $450 \times 10^{-2} \text{ m}$

Answer – $4.5 \times 10^{-2} \text{ m}$ (Options are miss printed)

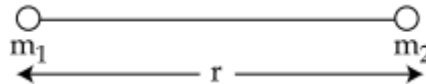


(iii) G is known as universal gravitational constant. Why?

- (A) Its value vary from place to place (B) Its value is same everywhere
(C) The value of G is very large (D) The value of G is very small

Answer – (B) Its value is same everywhere

(iv) The gravitational force between m_1 and m_2 is:

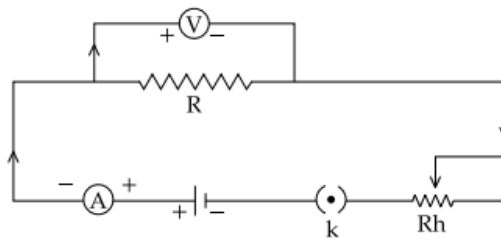


- (A) directly proportional to the double of distance between them.
(B) directly proportional to the square of the distance between them.
(C) indirectly proportional to the square of the distance between them.
(D) indirectly proportional to the actual distance between them.

Answer – (C) indirectly proportional to the square of the distance between them.

Q28 - Read the passage and answer the questions that follow it (i to vii).

"Given below is the circuit diagram to study relationship between Voltage and Current."



(i) In the circuit diagram the voltmeter is connected:

- (A) in series (B) in parallel
(C) in mixed combination (D) in no particular combination

Answer – (B) in parallel

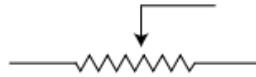
(ii) Which one of the following sets includes devices that are used in electrical circuits for their safety ?

- (A) Switch, tester and fuse (B) Tester, fuse and MCB
(C) Switch, fuse and MCB (D) MCB, switch and tester

Answer – (C) Switch, fuse and MCB



(iii) The following symbol in the above circuit diagram represents :



- | | |
|-------------------|-----------------|
| (A) Resistance | (B) Rheostat |
| (C) Electromagnet | (D) Transformer |

Answer – (B) Rheostat

(iv) Which law, the above circuit diagram represents ?

- | | |
|-----------------------------------|---------------------|
| (A) Joule's Law of heating effect | (B) Kirchhoff's Law |
| (C) Ohm's Law | (D) Coulomb's Law |

Answer – (C) Ohm's Law

(v) Which one of the following is the SI unit of electrical energy?

- | | |
|-----------------|-------------------|
| (A) Volt ampere | (B) Kilowatt hour |
| (C) Watt second | (D) Joule |

Answer – (D) Joule

(vi) For the Verification of Ohm's Law in laboratory, which of the following items are required ?

- (A) cells, key, resistance wire, voltmeter, galvanometer
- (B) cells, key, resistance wire, ammeter, galvanometer
- (C) cells, key, resistance wire, voltmeter, ammeter
- (D) cells, key, resistance wire, galvanometer

Answer – (C) cells, key, resistance wire, voltmeter, ammeter

(vii) Which one of the following is the unit of potential difference ?

- | | |
|-------------------|------------------|
| (A) Joule/Coulomb | (B) Volt/Coulomb |
| (C) Ampere/second | (D) Ohm meter |

Answer – (A) Joule/Coulomb



SECTION - B

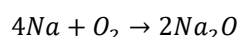
 A. ☐
 B. ☒
 C. ☐


Q29 - (i) Write the balanced chemical equation for the following statements.

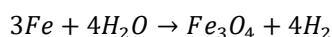
(a) Sodium element reacts with oxygen to form sodium oxide.

(b) Iron reacts with steam to form iron oxide and hydrogen gas.

Answer – (a) Sodium reacts with oxygen to form sodium oxide:



(b) Iron reacts with steam to form iron oxide and hydrogen gas:



OR

(ii) What is rust? Mention any two important conditions required for rusting.

Answer – Rust is a soft, flaky, reddish-brown layer that forms on iron when it slowly decays in the environment.

For iron to rust, two things are absolutely necessary:

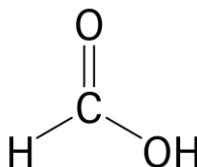
1. Oxygen (from the air)
2. Moisture (water or water vapor).

Q30 - Write the molecular formula and draw the structures of the following compounds.

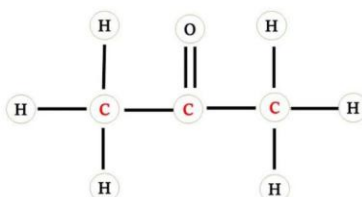
(i) Formic acid

(ii) Propanone

Answer – (i) Formic acid : HCOOH



(ii) Propanone : CH_3COCH_3



Q31 - Write any two postulates proposed by Niel's Bohr in Bohr's Model of hydrogen atom.

Answer – 1. Electrons spin around the nucleus only in special, fixed circular paths called "orbits" or "shells" without losing any energy.

2. An electron only absorbs or gives out energy when it jumps from one orbit to another.

OR

State any two results of α -ray scattering experiment explained by Rutherford.

Answer – 1. Most of the alpha particles passed straight through the gold foil, meaning most of the space inside an atom is totally empty.

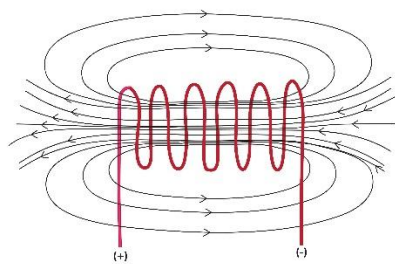
2. A very small number of particles bounced completely back, proving that the center (nucleus) is tiny, heavy, and positively charged.

Q32 - Explain how a person can get rid of suffering from 'acidity' i.e. irritation and occasional pain in the stomach.

Answer - Acidity happens when our stomach makes too much hydrochloric acid. To get rid of the pain, a person should take an "antacid" (like baking soda or milk of magnesia). These are mild bases that cancel out (neutralize) the extra acid and give quick relief, this process is called Neutralization.

Q33 - What is a solenoid? Draw a sketch to show the magnetic field pattern produced by a current carrying solenoid.

Answer - A solenoid is a long coil made of many tightly wrapped circular turns of insulated copper wire, shaped like a cylinder. When electricity flows through it, it acts exactly like a bar magnet.



OR

What is an electric generator? Write the name of its two types.

Answer - An electric generator is a helpful machine that changes mechanical energy (movement) into electrical energy (electricity) so we can power our homes. The two main types are:



1. AC Generator (Alternating Current)
2. DC Generator (Direct Current)

Q34 - Define the terms:

(i) Osmoregulation

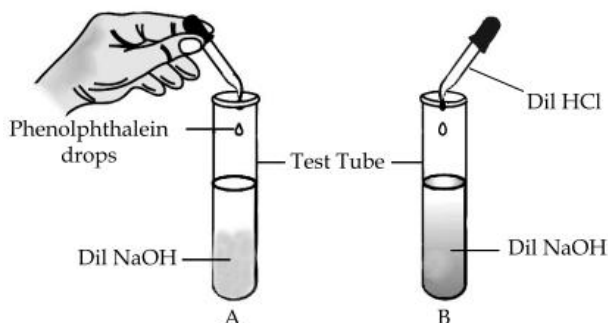
(ii) Dialysis

Answer –

(i) **Osmoregulation:** It is the way our body strictly controls the right amount of water and salt inside us so we don't dry out or swell up.

(ii) **Dialysis:** If a person's kidneys stop working, doctors use a machine to clean their blood and remove dirty waste. This artificial cleaning process is called dialysis.

Q35 - Look at the activity given below and answer the questions that follow it :



(a) What colour change will you observe in test tube A?

(b) What would happen in test tube B?

(c) What the process occurring in test tube B called as?

Answer –

(a) Test tube A contains NaOH (a base). When phenolphthalein is added, the liquid will turn a beautiful **Pink** color.

(b) When Dilute HCl (an acid) is added to tube B, it will cancel out the base. The pink color will completely fade away, becoming **colorless**.

(c) This chemical reaction where an acid cancels a base to make salt and water is called **Neutralization**.

OR



(ii) Name the constituents of Baking Powder. Why Baking Powder is used but not used Baking Soda in bakery ?

Answer - Baking powder is a dry mix of Baking Soda (sodium bicarbonate) and a mild edible acid (like tartaric acid).

If we only use plain baking soda in a cake, it leaves behind a chemical that tastes very bitter. By using baking powder instead, the tartaric acid nicely neutralizes the bitter taste while making the cake soft and spongy!

Q36 - (a) Write the molecular formula and chemical name of Bleaching Powder.

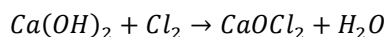
(b) Name the two materials used in the manufacture of Bleaching Powder.

(c) Write the chemical equation that takes place in the manufacture of Bleaching powder in Hasen-Clever Plant.

Answer – (a) Formula: $CaOCl_2$. Chemical name: Calcium oxychloride.

(b) It is made using two materials: dry slaked lime (Calcium hydroxide) and Chlorine gas.

(c) Chemical Equation for the Hasen-Clever Plant:



Q37 - (i) Calculate the value of acceleration due to gravity of the earth i.e. 'g'.

Given: mass of earth = 6×10^{24} kg and radius of earth = 6.4×10^6 m.

Answer – We use the formula: $g = G \times \frac{M}{R^2}$

- $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$
- Earth's Mass (M) = 6×10^{24} kg
- Earth's Radius (R) = 6.4×10^6 m

Calculation:

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

$$g = \frac{40.02 \times 10^{13}}{40.96 \times 10^{12}}$$

$$g = 9.77 \text{ m/s}^2$$

(Usually rounded to 9.8 m/s^2).



OR

(ii) An object falls from a height and reaches the ground in 0.5 s, let $g = 10 \text{ ms}^{-2}$

(a) What is the speed with which it strikes the ground?

(b) What is the average speed during the 0.5 s?

(c) What is the height from the ground from which it was dropped?

Answer – Since the object is dropped, its starting speed (u) is 0. Time (t) = 0.5 s. Acceleration (a) = 10 m/s^2 .

(a) Final Speed (v):

$$v = u + at$$

$$v = 0 + (10 \times 0.5) = 5 \text{ m/s}$$

(b) Average Speed:

$$\text{Average speed} = \frac{u + v}{2} = \frac{0 + 5}{2} = 2.5 \text{ m/s}$$

(c) Height dropped from (h):

$$h = ut + \frac{1}{2}at^2$$

$$h = 0 + \frac{1}{2}(10)(0.5)^2$$

$$h = 5 \times 0.25 = 1.25 \text{ meters}$$

Q38 - (i) Draw the generalized structure of a neuron (nerve cell) and label the following parts on it.

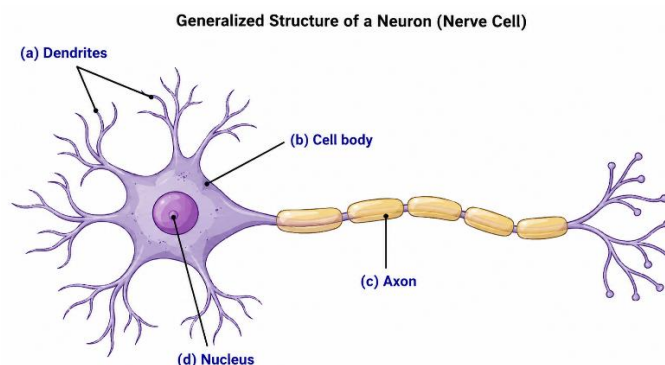
(a) Dendrites

(b) Cell body

(c) Axon

(d) Nucleus

Answer –



OR

(ii) (a) Name the hormone released by thyroid gland. What is its function in our body?

(b) Define hyperthyroidism

(c) Define hypothyroidism

Answer –

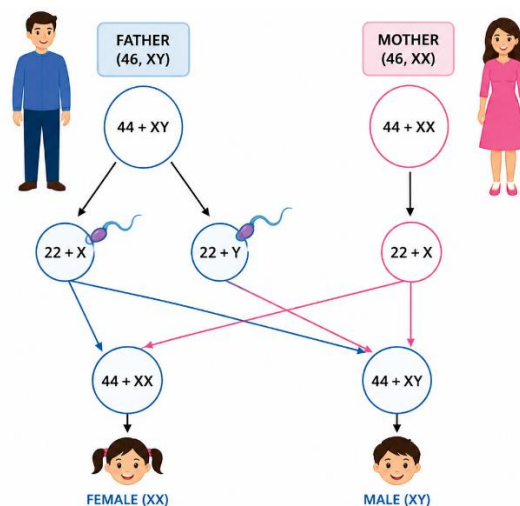
(a) The thyroid gland makes a hormone called **Thyroxine**. Its job is to manage how our body breaks down food (carbohydrates, proteins, fats) to give us the right amount of energy.

(b) **Hyperthyroidism** : This is a sickness where the gland goes out of control and makes *too much* thyroxine, making a person lose weight and feel restless.

(c) **Hypothyroidism** : This is when the gland becomes lazy and makes *too little* thyroxine, making a person feel tired and gain weight easily.

Q39 - With the help of a line diagram show the chromosomal basis of sex determination in humans.

Answer – In humans, females carry two identical 'X' chromosomes (XX), while males carry one 'X' and one small 'Y' (XY). When a baby is made, it always gets an 'X' from the mother. If the father gives his 'X', the baby becomes a girl (XX). If the father gives his 'Y', the baby becomes a boy (XY). The father's chromosome completely decides the baby's sex!



Q40 - What is meant by Population dispersal? Explain in brief about the two types of Population dispersal.

Answer - Population dispersal simply means how animals or people move from one living area to another. It happens in two ways:



1. **Immigration:** This is an inward movement, where new individuals move *into* an area and join the population, making it bigger.
2. **Emigration:** This is an outward movement, where individuals leave their home and move *out* to somewhere else, making the local population smaller.

Q41 - (i) State the term bio-magnification.

(ii) DDT is widely used for crop protection. How is it responsible for the decreased population of pelican birds?

Answer –

(i) Bio-magnification: When a toxic chemical enters a food chain, it doesn't get destroyed. Instead, the poison keeps building up and getting stronger as big animals eat smaller animals.

(ii) Farmers spray DDT on crops to kill bugs. Rain washes the DDT into rivers, where small fish eat it. When Pelican birds eat lots of these fish, massive amounts of DDT build up inside them. This poison makes the birds lay eggs with incredibly thin shells that break easily before the babies can hatch, causing their population to drop.

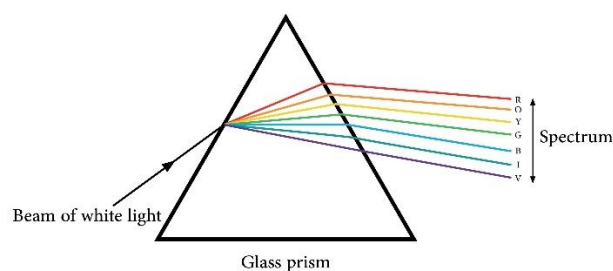
Q42 - (i) (a) Define dispersion of white light through a glass prism. Draw a diagram to illustrate it.

(b) Which of the colours bends least and which one bends the most?

(c) Why does prism show dispersion of white light?

Answer –

(a) When a single beam of pure white light enters a glass prism, it magically splits open into a beautiful band of seven rainbow colors (VIBGYOR). This splitting process is called the "dispersion of white light".



(b) In the rainbow band (VIBGYOR), the **Red** color bends the least, while the **Violet** color bends the absolute most.

(c) This happens because white light is actually a mix of all colors. Each color travels at a slightly different speed once it gets inside the thick glass prism. Because they move at different speeds, the glass bends each color at a completely different angle, separating them!



OR

(ii) (a) Draw diagrams of the following lenses :

Double Convex, Plano Convex, Double Concave, Convexo Concave

(b) Draw diagrams showing the following:

- myopic eye
- hypermetropic eye
- relaxed eye

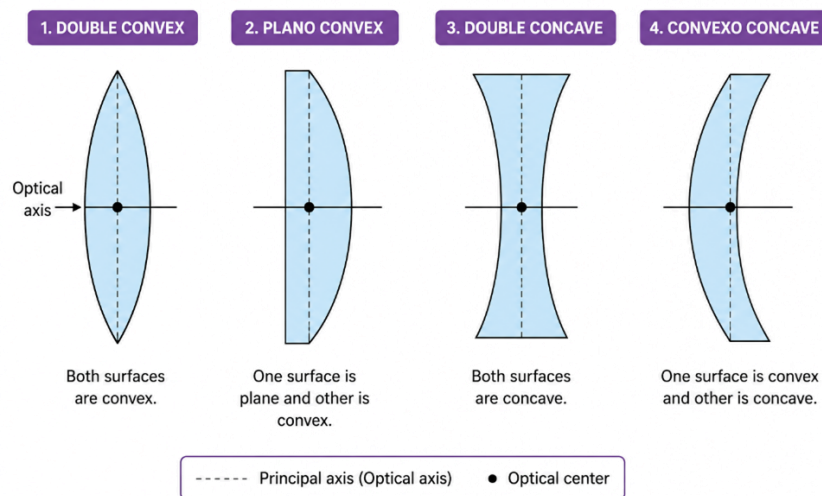
Answer – (a)

(i) **Double Convex:** Bulges outwards on both sides.

(ii) **Plano Convex:** Flat on one side, bulged outward on the other.

(iii) **Double Concave:** Caved inward on both sides.

(iv) **Convexo Concave:** Curved inward on one side, outward on the other, like a crescent moon.



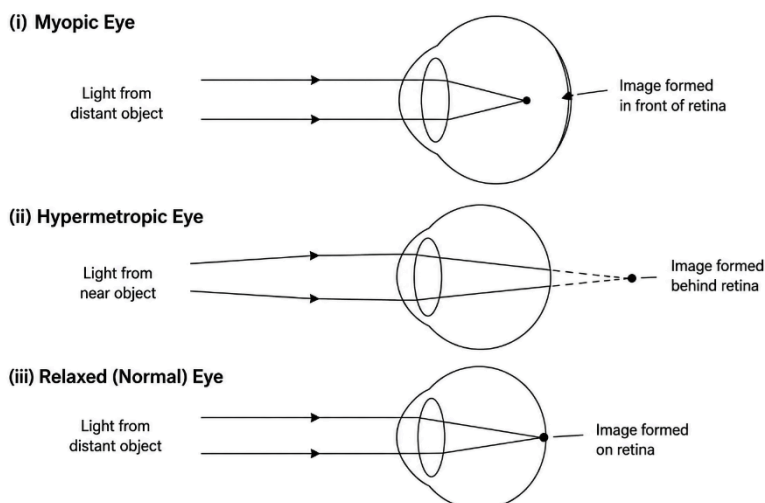
(b)

(i) **Myopic eye:** The image forms *in front* of the retina (nearsightedness).

(ii) **Hypermetropic eye:** The image forms *behind* the retina (farsightedness).

(iii) **Relaxed eye:** A healthy eye where the light focuses perfectly on the retina.





Q43 - (i) Part of the Modern Periodic table is given below where the atomic numbers of the elements of Group 'A' and 'B' are given in the Parentheses :

Group 'A'	Group 'B'
Li (3)	Be (4)
Na (11)	Mg (12)
K (19)	Ca (20)
Rb (37)	Sr (38)

- Give the electronic configuration of 'Ca'.
- Write the number of valence electrons in the atom 'K'.
- What is the total number of shells in the atom of 'Na'?
- Arrange the elements of Group 'B' in the increasing order of their atomic size.
- State whether 'Rb' is a metal or non-metal.
- Out of Na, Li, Be and Mg which has the biggest atom in size ?

Answer - (a) Calcium (Ca) has atomic number 20. Its electronic configuration is: **2, 8, 8, 2**.

(b) Potassium (K) has atomic number 19 (2, 8, 8, 1). So, it has **1** valence electron in its outermost shell.

(c) Sodium (Na) has atomic number 11 (2, 8, 1). It uses three layers, so the total number of shells is **3**.

(d) As we move down a group, atomic size grows. The increasing order for Group B is: **Be < Mg < Ca < Sr**.

(e) Rubidium (Rb) sits on the far-left side of the table in group 1, so it is a highly reactive **Metal**.



(f) When comparing Na, Li, Be, and Mg: Sodium (Na) is placed the lowest and furthest to the left among them, meaning it has the **biggest** atomic size.

(ii) (a) Why do elements of the same group have similar properties?

(b) How does the atomic size of elements vary in a period with increase in atomic number? State reason.

Answer - (a) Elements that sit in the same vertical column (group) always have the exact same number of electrons in their outermost shell (valence electrons). Because chemical reactions are driven by these outer electrons, the whole family behaves similarly and shares similar chemical properties!

(b) When you read across a period (row) from left to right, the atomic number goes up, meaning more positive protons are added to the center. This strong positive center pulls the negative outer electrons closer and tighter. Because of this powerful inward pull, the atomic size actually **decreases** as you move right across a period.

OR

(iii) (a) The Modern Periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all the three attempts.

(b) Define atomic number 'Z' of an element.

(c) State Modern Periodic Law.

Answer - (a) Early Attempts:

(i) **Dobereiner:** *Advantage:* He was the first to link chemical properties with atomic mass using "triads".

Limitation: He could only find three sets of triads, failing to classify most elements.

(ii) **Newland:** *Advantage:* He found a beautiful pattern where every 8th element behaved similarly (Law of Octaves).

Limitation: His rule completely broke down after the element Calcium.

(iii) **Mendeleev:** *Advantage:* He smartly left blank gaps in his table for undiscovered elements.

Limitation: He couldn't figure out where to properly place Hydrogen or isotopes.

(b) **Atomic Number 'Z':** It is simply the total number of positive protons found perfectly inside the nucleus of an atom.

(c) **Modern Periodic Law:** It states that "The physical and chemical properties of elements are periodic functions of their **atomic numbers**." (Not mass!).





$$A = \frac{m}{(m^2 + c)^2}$$



NIOS PYQ's SOLUTIONS

$$\sqrt{h-x^2}$$

$$fa = bc^2$$

PREVIOUS YEARS' QUESTIONS & ANSWERS



OCTOBER-2024

Your Path to Success

SECTION - A

A. ☐
B. ☒
C. ☐



Q1 - The symbol to represent the unit of physical quantity 'Luminous intensity' is _____.

- (A) A (B) K
(C) mol (D) cd

Answer - (D) cd

Q2 – Which one of the following is a correct electronic configuration of magnesium?

- (A) 2, 8, 1 (B) 2, 8, 3
(C) 2, 8, 8 (D) 2, 8, 2

Answer - (D) 2, 8, 2

Q3 - Litmus is an indicator to find out whether a given solution is acidic, basic or neutral. In basic solutions, it turns to _____ colour.

- (A) blue (B) yellow
(C) purple (D) red

Answer - (A) blue

Q4 - Which of the following is true about force?

- (A) Force is always in the form of a pull
(B) Force cannot move a stationary body
(C) Force cannot deform a body
(D) Force can change the direction of motion of a body

Answer - (D) Force can change the direction of motion of a body

Q5 – Work done by a force will be zero if on applying the force on a body

- (A) the force displaces the body at an angle of 60° with the direction of force.
(B) the body remains at rest.
(C) the body displaces in the direction of force.



(D) the body displaces in the direction opposite to the direction of the force applied.

Answer - (B) the body remains at rest.

Q6 - Which of the following is a symptoms of Kwashiorkor?

(A) Gain of muscles.

(B) Body develops loose folds of skin.

(C) Ribs become prominent

(D) Retardation of physical and mental growth

Answer - (D) Retardation of physical and mental growth

Q7 - Metals -

(A) are generally hard.

(B) exist in solid, liquid and gaseous states.

(C) are least malleable.

(D) do not show any metallic lustre.

Answer - (A) are generally hard.

Q8 - Select the most devastating natural disaster from the following:

(A) Depletion of fossil fuels

(B) Forest fire

(C) Depletion of ozone layer

(D) Loss of ecosystem

Answer - (B) Forest fire

Q9 - Two neurons are connected to each other through:

(A) Their axons

(B) Synapses

(C) Their dendrites

(D) Node of Ranvier

Answer - (B) Synapses

Q10 - The function of uterus in human female is:

(A) Growth and development of the embryo

(B) To provide opening for ovum to pass

(C) To provide a common duct for passage of urine and sperms

(D) To produce ova

Answer - (A) Growth and development of the embryo



Q11 - The abiotic component of an ecosystem is :

- (A) Carnivores
- (B) Primary producers
- (C) Precipitation
- (D) Herbivores

Answer - (C) Precipitation

Q12 - A mass of 1 μg can also be written as:

- (A) 10^{-5} g
- (B) 10^{-6} g
- (C) 10^{-9} g
- (D) 10^{-12} g

Answer - (B) 10^{-6} g

Q13 - pOH of a solution is 9.5. The solution is:

- (A) Acidic
- (B) Basic
- (C) Neutral
- (D) Partially acidic partially basic

Answer - (A) Acidic

Q14 - What is the mass of an object whose weight is 78.4 N? (Given $g = 9.8 \text{ ms}^{-2}$)

- (A) 8.0 N
- (B) 0.8 kg
- (C) 8.0 kg
- (D) 0.8 N

Answer - (C) 8.0 kg

Q15 - You are given two resistors of 2Ω and 6Ω . Combining these two resistors what other resistances can you obtain?

- (A) 8Ω and 6Ω
- (B) 8Ω and 1.5Ω
- (C) 2Ω and 8Ω
- (D) 6Ω and 2Ω

Answer - (B) 8Ω and 1.5Ω

Q16 - The image formed by a concave mirror is between centre of curvature and focus, observed to be real, inverted and diminished than the object. Where should be the position of the object?

- (A) Beyond the centre of curvature
- (B) At the centre of curvature
- (C) Between the principal focus and the centre of curvature
- (D) Between the pole of the mirror and its principal focus



Answer - (A) Beyond the centre of curvature

Q17 - Diamond is used -

- (A) as a dry lubricant for moving machine parts
- (B) for cutting of glass and drilling of rocks
- (C) for making pencil leads
- (D) for making electrodes in dry cells and in electric arcs.

Answer - (B) for cutting of glass and drilling of rocks

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

Column - I

- (a) 10 N
- (b) 10 W

Column - II

- (P) $10^8 \text{ g cm}^2 \text{ s}^{-2}$
- (Q) $10^8 \text{ g cm}^2 \text{ s}^{-3}$
- (R) 10^5 g cm s^{-2}
- (S) 10^6 g cm s^{-2}

Answer - (a) 10 N $\rightarrow$ (S) 10^6 g cm s^{-2}

(b) 10 W $\rightarrow$ (Q) $10^8 \text{ g cm}^2 \text{ s}^{-3}$

Q19 - Complete the following sentences by using the options given in bracket:

(Decreasing, protons, increasing, nucleus, atom, electrons)

- (a) The shells in atoms are occupied in the _____ order of their energies.
- (b) The particles namely _____ and neutrons in the nucleus are called nucleons.

Answer - (a) increasing

(b) protons

Q20 - Write True (T) for correct statement and False (F) for incorrect statement:

- (a) Ionic compounds do not conduct electricity in their molten state and in aqueous solutions.
- (b) Some covalent compounds are solid also. They have low melting point, low boiling point.

Answer - (a) False

(b) True



Q21 - Read the passage given below and answer the questions that follow it:

"The nervous system and the endocrine system work together as a team to control and coordinate all our activities. Sometimes we may not even be aware of the role that the nervous and endocrine systems play in our health and well-being and receive response to an urgent or dangerous situation."

(a) Name the two systems which control and coordinate all our body activities.

Answer – Nervous system and Endocrine system.

(b) Which one of the following is usually executed in response to a dangerous situation?

(A) Feel of hunger

(B) Role of digestive juices

(C) Role of relevant muscles in the hands and the fingers to pick up the food and put it into the mouth.

(D) Immediate removal of hand if it comes in contact with a hot object

Answer – (D) Immediate removal of hand if it comes in contact with a hot object

Q22 – Read the passage given below and answer the questions that follow it:

Reproduction by single individuals takes place in many ways in lower organisms like bacteria and protozoa and some algae. In plants, asexual reproduction is by vegetative propagation. Animals like sponges and hydra reproduce both asexually and sexually.

(i) Which one of the following methods would you suggest to grow banana plants genetically similar enough to the plants already available in a farmer's field?

(A) Budding

(B) Sexual reproduction

(C) Binary fission

(D) Vegetative propagation

Answer – (D) Vegetative propagation

(ii) Name two types of asexual reproduction in lower organisms.

Answer – Budding and Binary fission.



Q23 - Match column I with the correct option of column II:

Column I (Element)

(a) Carbon

(b) Silicon

Column II (Nature)

(P) Metalloid

(Q) Alloy

(R) Metal

(S) Non-metal

Answer – (a) Carbon → (S) Non-metal

(b) Silicon → (P) Metalloid

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

(a) Al_2O_3 and CO_2 both show acidic as well as basic properties.

(b) Graphite is soft, black and slippery solid. It is also a good conductor of electricity and heat.

Answer – (a) False

(b) True

Q25 – Fill in the blanks:

(a) Atmospheric nitrogen is the biggest source of _____.

(b) Tsunami occurs due to _____ under the ocean.

Answer – (a) Nitrogen

(b) Earthquakes

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

(a) Depletion of ozone layer is a natural disaster.

(b) Heterotrophs are called decomposers which feed on plants and animals.

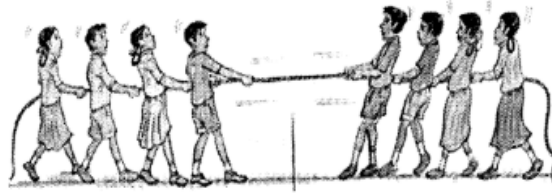
Answer – (a) False

(b) False

Q27 – Read the passage given below and answer the questions that follow it:

"In the game of tug-of-war, when the two teams pull the rope with equal force, the rope remains stationary. When one of the teams applies greater force, it is able to pull the other team."





- (a) What name is given to the forces acting on the rope when any team does not move?
 (b) What type of force is applied when one of the team is able to pull the rope?

Answer – (a) Balances Force (b) Unbalanced Force

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

"Mechanical Energy is the capacity of doing work that a body possesses by virtue of its position (potential energy) or by virtue of its motion (kinetic energy). Mechanical energy can be either in the form of kinetic energy or potential energy or the sum of two."

- (a) How much work is done on a stone weighing 100 N 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) How much potential energy does the stone have on the other side of the road?

- (A) Same as it had initially (B) 100 J
 (C) 1000 J (D) Zero

Answer – (A) Same as it had initially

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

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

Answer – (B) 100 J

- (d) What power is expended if you lift the stone (100 N) a distance of 1 m in a time of 1 s?

- (A) 1000 J (B) 100 J
 (C) 100 J s (D) 100 W



Answer – (D) 100 W

(e) What is the potential energy of the stone in the lifted position relative to its starting position?

(A) 100 J

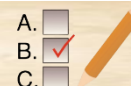
(B) 1000 J

(C) 0

(D) 100 J s^{-1}

Answer – (A) 100 J

SECTION - B



Q29 - Name the acids present in the following substances:

(i) Vinegar

(ii) Tamarind

Answer – (i) Vinegar: Contains Acetic acid.

(ii) Tamarind: Contains Tartaric acid.

OR

Write two differences between an electron and a proton.

Answer – 1. Charge: An electron carries a negative electrical charge, while a proton carries a positive electrical charge.

2. Mass: A proton is quite heavy (1 a.m.u), but an electron is extremely light—about 1837 times lighter than a proton.

Q30 - How does variation take place (a) in the force of attraction between nucleus and valence electrons in a period from left to right? (b) the atomic radii of elements in a period from left to right?

Answer – (a) As you move from left to right across a period, the atomic number goes up, meaning more protons are added to the nucleus. Because of this, the positive force of attraction from the nucleus on the outer electrons **increases steadily**.

(b) Because this stronger nuclear pull drags the outer electrons closer to the center, the overall atomic radius (size of the atom) **decreases** from left to right.



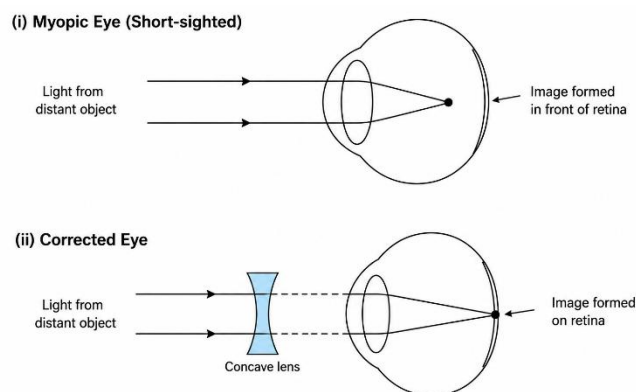
Q31 - Write two characteristics of an image formed by a plane mirror.

Answer – 1. The image is always **virtual and erect** (upright). It cannot be captured on a screen.
2. The image is of the **exact same size** as the actual object, but it is laterally inverted (your left hand looks like the right hand in the mirror).

OR

Draw diagrams of a myopic eye and corrected eye.

Answer – In a myopic (nearsighted) eye, the eyeball is too long, so the image focuses in front of the retina, making distant objects blurry. We fix this by placing a concave lens in front of the eye to push the focus back onto the retina.



Q32 - Give two examples of plant features / characteristics which are controlled by a pair of factors of Gregor John Mendel.

Answer - Gregor Mendel studied pea plants and found traits controlled by paired factors (genes).

Two examples are:

1. **Height of the plant:** Controlled by factors for Tallness (T) or Dwarfness (t).
2. **Colour of the seeds:** Controlled by factors for Yellow colour (Y) or Green colour (y).

Q33 - State two ways to prevent the rusting of iron.

Answer - 1. Painting or Oiling: Applying a coat of paint, grease, or oil blocks the iron from touching the oxygen and moisture in the air.

2. Galvanization: Coating the iron object with a thin layer of Zinc metal, which protects the iron underneath from rusting.

OR



Write one example of each of the following:

(a) a metal which is so soft that it can be cut with knife and a non-metal which is the hardest substance.

(b) a metal and a non-metal which exist as liquid at room temperature.

Answer – (a) A metal so soft you can cut it with a knife: **Sodium**.

The hardest non-metal substance: **Diamond** (a form of Carbon).

(b) A metal that is liquid at room temperature: **Mercury**.

A non-metal that is liquid at room temperature: **Bromine**.

Q34 - Write the names and molecular formulae of the saturated hydrocarbons having -

(a) one carbon atom

(b) five carbon atoms

Answer – Saturated hydrocarbons are called Alkanes and follow the rule C_nH_{2n+2} .

(a) **One carbon atom:** Name is **Methane**, Formula is CH_4 .

(b) **Five carbon atoms:** Name is **Pentane**, Formula is C_5H_{12} .

Q35 - What was the model of the atom proposed by Rutherford after explaining the results of α -ray scattering experiment in 1911?

Answer – Rutherford proposed the "Nuclear Model of the Atom," which stated three main things:

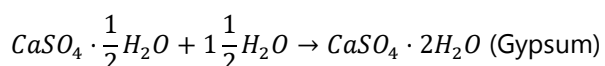
1. An atom has a very tiny, incredibly heavy, and positively charged center called the **nucleus**.
2. Almost all the mass of the entire atom is packed tightly inside this tiny nucleus.
3. The negatively charged electrons revolve very fast around the nucleus in circular paths, just like planets orbiting around the sun.

OR

A chemical compound becomes hard on mixing proper quantity of water. Name the chemical compound and write its chemical formula. Write the chemical equation to show what happens when water is added to this compound in proper quantity? Write its two uses.

Answer - Name & Formula: The compound is **Plaster of Paris**. Its chemical formula is $CaSO_4 \cdot \frac{1}{2}H_2O$.

Chemical Equation: When water is added, it turns into a hard solid rock called Gypsum.



Two Uses: It is used by doctors to set fractured bones, and by artists to make statues and toys.

Q36 - A, B, C, D, E and F belong to same period of the periodic table and have atomic radii 0.64 Å, 1.52 Å, 0.66 Å, 1.06 Å, 0.70 Å and 0.88 Å respectively. Assume none of them is a noble gas.

(a) Arrange the elements in the order of increasing atomic number.

(b) Name two elements one metal and one non-metal.

(c) Which element is likely to form strong acidic oxide?

Answer – (a) Increasing Atomic Number: We arrange them from the largest radius to the smallest radius:

B → D → F → E → C → A.

(b) Identify Types: Element **B** (largest radius, on the far left) is a **Metal**.

Element **A** (smallest radius, on the far right) is a **Non-metal**.

(c) Acidic Oxide: Strong non-metals form acidic oxides. Since **A** is the strongest non-metal on the far right, it will form a strong acidic oxide.

Q37 - A hammer of mass 400 g, moving at 40 ms^{-1} , strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer?

Answer – Given:

Mass (m) = 400 g = 0.4 kg.

Starting speed (u) = 40 m/s.

Final speed (v) = 0 m/s (because it stops).

Time (t) = 0.01 s.

Step 1: Calculate acceleration (a) using $a = (v - u)/t$.

$$a = \frac{0 - 40}{0.01} = -4000 \text{ m/s}^2$$

Step 2: Calculate Force (F) using Newton's law $F = m \times a$.

$$F = 0.4 \text{ kg} \times (-4000 \text{ m/s}^2) = -1600 \text{ Newtons}$$

The nail exerts a force of **1600 N** in the opposite (stopping) direction.

OR



**What is the magnitude of the gravitational force between the earth and a 1 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 – We use Newton's universal formula for gravity: $F = G \frac{M \times m}{R^2}$

- $G = 6.67 \times 10^{-11}$
- Mass of Earth (M) = 6×10^{24} kg
- Mass of object (m) = 1 kg
- Radius of Earth (R) = 6.4×10^6 m

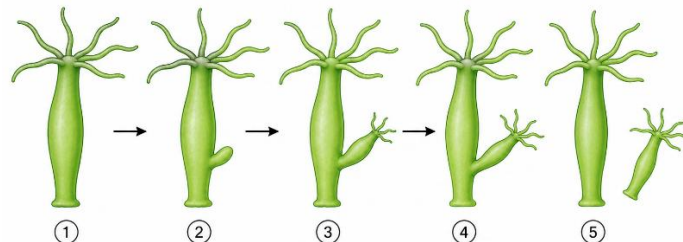
$$F = \frac{(6.67 \times 10^{-11}) \times (6 \times 10^{24}) \times 1}{(6.4 \times 10^6)^2}$$

$$F = \frac{40.02 \times 10^{13}}{40.96 \times 10^{12}} = 9.77 \text{ Newtons}$$

(Usually rounded to **9.8 N**).

Q38 - With the help of a diagram show the process of budding in Hydra.

Answer – Budding is an asexual way of making babies. In a mature Hydra, a tiny bump (bud) appears on the side of its body. This bud slowly grows longer and develops its own mouth and little tentacles. Once it is fully grown and strong enough, it detaches from the parent's body to live as a free, independent Hydra.



OR

Name three plants which may arise from stem.

Answer – Growing new plants from a cut piece of a stem is a type of artificial vegetative propagation. Three common plants grown this way are:

1. **Potato** (grown from underground stem tubers).
2. **Sugarcane** (grown by planting cut stem segments).
3. **Rose** (grown by planting stem cuttings).



Q39 - Name three types of neurons. Write their function.

Answer – 1. Sensory Neurons: These act like messengers, carrying feeling signals from our sense organs (like eyes or skin) all the way up to the brain.

2. **Motor Neurons:** These carry action commands *away* from the brain and spinal cord, telling our muscles and glands to move or react.

3. **Relay (or Inter) Neurons:** These are found inside the brain and spinal cord. Their job is to connect the sensory and motor neurons together so they can communicate.

Q40 - Name two types of food chains. Write two significances of food chain and food web.

Answer - Two Types of Food Chains:

1. Grazing Food Chain (starts with green living plants).
2. Detritus Food Chain (starts with dead, rotting organic matter).

Two Significances:

1. They show us exactly how life-sustaining energy flows step-by-step from the sun, to plants, and then to animals in an ecosystem.
2. They maintain ecological balance by ensuring that no single animal population grows too large or gets totally wiped out.

Q41 - Write three serious consequences of rise in global temperature in the last hundred years.

Answer – 1. Melting Ice & Rising Seas: The excessive heat is melting huge polar glaciers, causing sea levels to rise and flood coastal cities.

2. **Extreme Weather:** It is causing highly dangerous weather patterns, creating severe droughts in some places and massive, destructive hurricanes in others.

3. **Extinction of Animals:** Many animals (like polar bears) are rapidly losing their natural habitats, pushing them closer to permanent extinction.

Q42 - (a) Reema claims to have obtained an image twice the size of the object with a concave lens. Is she correct? Give a reason for your answer.

(b) A lens forms an erect, magnified and virtual image of an object.

(i) Name the lens.

(ii) Draw a ray diagram to show the formation of image.

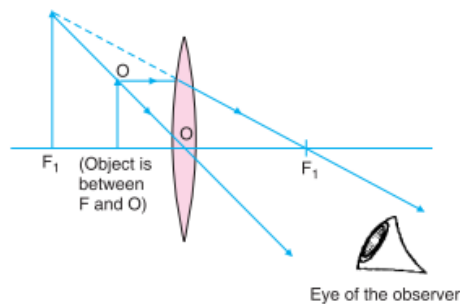


(c) What do you mean by dispersion of light? Show it with the help of a neat labelled ray diagram.

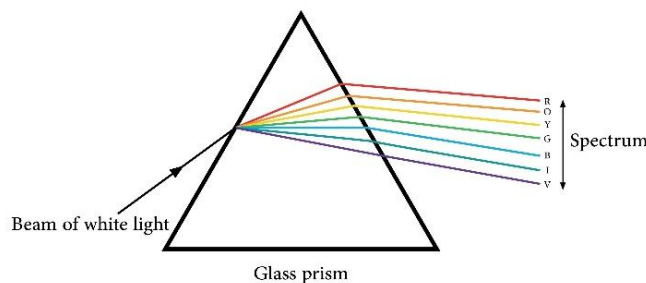
Answer – (a) No, Reema is completely incorrect. A concave lens is a diverging lens, meaning it **always** creates an image that is smaller (diminished), virtual, and erect, no matter where you place the object. It is physically impossible for a concave lens to magnify an image to twice its size.

(b) (i) To get an erect, magnified (larger), and virtual image, we must use a **Convex Lens** (specifically when the object is placed very close to it, acting like a magnifying glass).

(ii)



(c) Dispersion of light is the beautiful phenomenon where a single beam of pure white light splits open into its seven constituent colors (VIBGYOR) when passing through a transparent object, like a glass prism. This happens because each color bends at a different angle inside the glass.



OR

(a) What does the direction of thumb indicate in the right-hand thumb rule? In what way this rule is different from Fleming's left-hand rule?

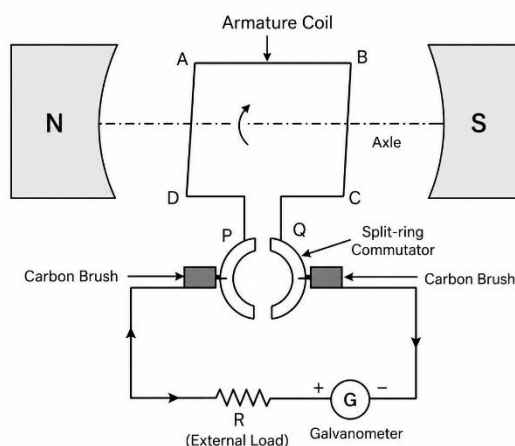
(b) Draw a labelled circuit diagram of a DC generator.

Answer – (a) In the **Right-hand thumb rule**, we imagine gripping a wire. The thumb points in the direction of the **electrical current**, and our curled fingers show the circular shape of the magnetic field it creates.

It is very different from **Fleming's left-hand rule**. The right-hand rule is used to *find the magnetic field* created by a plain wire. But Fleming's rule is used to *find the physical force/motion* (thumb) acting on a wire when you place it inside an already existing magnetic field.



(b)



Q43 - How are electrons distributed amongst the shells around a central nucleus? Explain.

Answer - Electrons are neatly arranged into shells around the nucleus following the strict rules of the **Bohr-Bury scheme**:

- Maximum Capacity Rule:** The maximum number of electrons any shell can hold is determined by the mathematical formula $2n^2$ (where 'n' is the shell number).
 - 1st shell (K) takes $2 \times (1)^2 = 2$ electrons.
 - 2nd shell (L) takes $2 \times (2)^2 = 8$ electrons.
 - 3rd shell (M) takes $2 \times (3)^2 = 18$ electrons.
- The Octet Rule:** Even if an outer shell has the capacity to hold more (like the M shell), the outermost shell of any atom is never allowed to hold more than **8 electrons**. This makes the atom stable.
- Stepwise Filling:** Electrons are lazy and always fill the inner shells closest to the nucleus first before they start filling the outer shells.

OR

(a) What is Bleaching powder? Give its chemical formula. How is it manufactured?

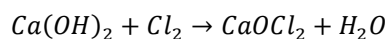
(b) Give two uses of washing soda.

Answer - (a) Bleaching powder is a pale yellowish powder that gives off a very strong smell of chlorine. It is highly useful in cleaning and purifying water.

Chemical Formula: $CaOCl_2$ (Calcium oxychloride).



Manufacture: It is manufactured in large factories by passing dry chlorine gas over solid, dry slaked lime. The chemical reaction is:



(b) Two Uses of Washing Soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$):

1. It is heavily used in homes and laundries for washing dirty clothes and removing the "permanent hardness" from well water.
2. It is an important chemical used in factories to manufacture glass, soap, and paper products.





Thank you!



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



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