

Grade 10 Science Maharashtra 2018

Part A Section I

Instructions:

Draw well-Labelled diagram wherever necessary

All questions are compulsory

Student should write the answers of question in sequence.

Q1. (A)

(a) Rewrite the following statements with suitable words in the blanks:

i) 1 calorie = _____ joule.

ii) The arrangement of elements in a group of three is known as _____ .

Solution:

i. 1 calorie = 4.18 Joule (indicating electric power)

ii. The arrangement of elements in a group of three is known as Dobereiner's Triads

(b) State whether the following statements are true or false:

i) Pollen, Bacteria, Fungal spores are also pollutants.

ii) Magnetic lines of force always cross each other.

Solution:

i) True

All these substances are pollutant as they are airborne and cause allergies

ii) False

Magnetic lines of force never cross each other, because if they do then force will be shown in two different directions

(c) Taking into consideration the relationship in the first pair, complete the second pair:



Solution:

Decomposition reaction

(B) Rewrite the following statements by selecting the correct options:

i) When crystals of copper sulphate are strongly heated, the residue obtained is

- (a) red in colour
- (b) blue in colour
- (c) green in colour
- (d) colourless

Solution:

(d) colourless

ii) Which type of mirror is used by a dentist?

- (a) Plane
- (b) Convex
- (c) Concave
- (d) Both (b) and (c)

Solution:

(c) Concave

iii) The equivalent resistance of the parallel combination of two resistors of 60Ω and 40Ω is

- (a) 24Ω
- (b) 100Ω
- (c) 50Ω
- (d) 240Ω

Solution:

(a) 24Ω

Given that R is the total resistance in parallel combination

$$1/R = 1/R_1 = 1/R_2$$

$$\text{Therefore, } 1/R = 1/60 + 1/40 = 100/(60 \times 40) = 1/24$$

Hence, $R = 24\Omega$

iv) The litmus paper or the litmus solution is obtained from plant.

- (a) Moss
- (b) Lichen
- (c) Rose
- (d) Hibiscus

Solution:

(b) Lichen

v) Which substance when used with butter having butyric acid can cure acidity?

- (a) Lime water
- (b) Soda water
- (c) Calcium carbonate
- (d) Lime juice

Solution:

(a) Lime Water

Q2. State any five of the following:

i) State Newlands law of Octaves.

Solution:

If the elements are found in the order of increasing atomic masses then the properties of every eighth element is kind of repeated from that of the first, same as that of the notes of a music.

E.g. Li, Be, B, C, N, O, F, Na

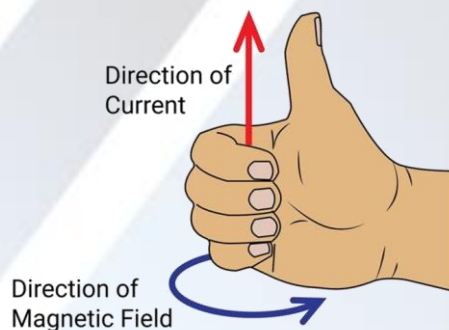
(1) (2) (3) (4) (5) (6) (7) (8)

First element Lithium(Li) and 8th element Sodium (Na) have the same properties.

ii) State the right-hand thumb rule.

Solution:

Right hand thumb rule is convenient rule to find out the direction of the magnetic field produced by a current flowing through an electrical conductor. Imagine holding the conductor in your right hand in a way so that your thumb points in the direction of the current. Then turn your fingers around the conductor, the direction of the fingers is the direction of the magnetic lines of force. Here, the forefinger indicates the direction of the magnetic field and the thumb reflects the direction of the motion of the conductor, while the middle finger will indicate the direction of the induced current.



iii) If a bulb of **60W** is connected across a source of 220 V , find the current drawn by it

Solution:

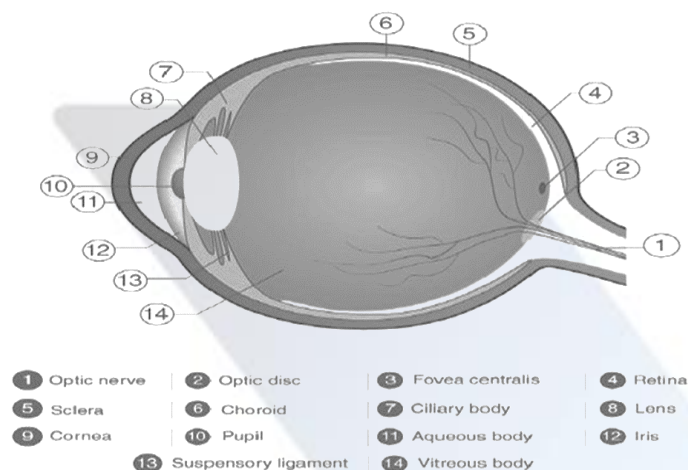
Given Power, $P = 60 \text{ W}$ and Voltage, $V = 220 \text{ V}$

Then to find the current drawn by it, use the given formula $I = P/V$

Hence, $I = 60/220 = 0.272 \text{ A}$

iv) Draw a neat and labelled diagram of structure of the human eye.

Solution:



v) Define:

a) Radius of curvature of spherical mirror.

b) Focal length of spherical mirror.

Solution:

a) Radius of curvature of spherical mirror is the radii (R_1 and R_2) of the spheres whose parts form surfaces of the mirror.

b) Focal length of spherical mirror is the distance between the optical centre and principal focus of the mirror.

vi) Give scientific reason:

The sun appears reddish early in the morning.

Solution:

During sunrise, the sun is observed to be very close to the horizon and sunlight has to travel a longer distance through the atmosphere to reach the observer. It is seen that blue and violet colours are more scattered than red colour. These colours are scattered away from the path of the light as the thickness of the atmosphere is more between the horizon and the observer. Thus, the light that reaches the

observer the first is mostly red and yellow. So, the colour of the sky is reddish orange.

Q3. Answer any five of the following:

i) Write the merits of the modern periodic table over Mendeleev's Periodic table.

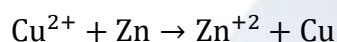
Solution:

1. In the modern periodic table the elements are arranged in accordance with their atomic number
2. Isotopes of the element is placed along with the parent elements
3. Explains periodicity of properties of element configuration
4. Lathinides and actinides are place separately ‘
5. The modern periodic table justifies anomalous pair of elements such as Ar and K that have the same atomic mass

ii) What is redox reaction? Explain with one example.

Solution:

Redox reactions are reactions where reduction and oxidation process take place simultaneously. Take the example of



In this reaction, you can see that copper undergoes reduction while Zn undergoes oxidation. So, this reaction is an example for redox reaction.

iii) What is Resistivity? Write the formula of resistivity. Write the SI unit of resistivity.

Solution:

Resistivity is known as the resistance of a conductor of unit length and unit area of cross section. Meanwhile, it is seen that resistance of the conductor, denoted as R is dependent on ' l ', the length and A , which is the area of cross section of the conductor.

Therefore, $R \propto L$ and $R \propto 1/A$

So, $R \propto 1/A$

And $R = \rho(1/A)$.

Here, ρ is a constant used to indicate the resistivity of the conductor.

The SI unit of resistivity is known as Ohm-meter ($\Omega - m$).

iv) Distinguish:

Degradable pollutants- Non-degradable pollutants

Solution:

Microbes can decompose and degrade these degradable pollutants, while the non-degradable pollutants cannot be decomposed. Degradable pollutants cannot be accumulated and are used up within a short span of time. Meanwhile, non-degradable pollutants can be accumulated often. For degradable pollutants as the name suggests degradation is quick and are used to manufacture energy manure, compost or biogas, whereas the process is slow for non-degradable pollutants that cannot be used to produce energy.

v) Kavita from 10th is using spectacles. The power of the lenses in her spectacles is -225 dioptre. Answer the following questions:

- Which lenses are used in her spectacles?
- State the defect of vision Kavita is suffering from.
- Find the focal length of the lenses used in her spectacles.

Solution:

- Concave lenses are used in her spectacles.
- Since, the power of the lenses she is using is negative, we can conclude that Kavita is suffering from Myopia or near sightedness
- Use the formula to find focal length, $f = 1/D = 1/2.5 = 0.4$ m

vi) Write the chemical name of bleaching powder and write its properties.

Solution:

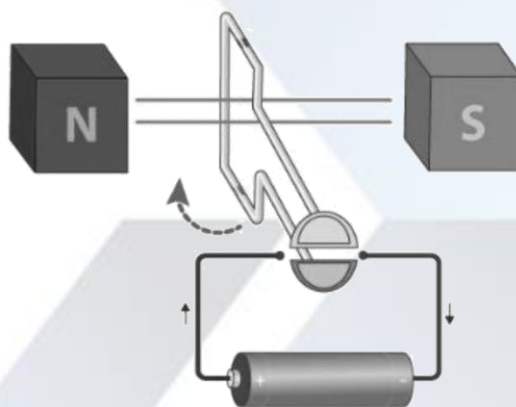
Calcium oxychloride or CaOCl_2 is the chemical name for bleaching powder. Used as an oxidising agent in many chemical reactions, bleaching powder is also a disinfectant.

Q4. Answer any one of the following:

i) Explain the construction and working of an electric motor.

Solution:

Given below is the picture as well as the principle and working of an electric motor.



Construction and Working of an Electric Motor

An electric motor converts electrical energy into mechanical energy. Let's explain its construction and working using the components: armature coil, strong magnet, split ring commutator, brushes, and battery.

Construction of an Electric Motor

Armature Coil: A rectangular coil of wire, usually copper, wound around a soft iron core. The coil is free to rotate around an axis.

Strong Magnet: Permanent magnets or electromagnets are placed around the armature coil to provide a magnetic field. In a simple motor, the magnets are positioned such that their poles face each other.

Split Ring Commutator: A split ring made of copper that is attached to the armature coil. The commutator reverses the direction of current flow through the coil at regular intervals to ensure continuous rotation.

Brushes: Carbon or metal brushes are in contact with the commutator. They provide a path for current to flow from the power source to the armature coil.

Battery: The power source that provides electrical energy to the motor. The battery is connected to the brushes to supply current to the armature coil.

Working of an Electric Motor

Current Flow: When the circuit is completed, current flows from the battery through the brushes to the commutator and into the armature coil.

Magnetic Interaction: The current-carrying armature coil generates a magnetic field, which interacts with the magnetic field of the permanent magnets. According to the left-hand rule, this interaction creates a force on the coil, causing it to rotate.

Commutation: As the armature coil rotates, the split ring commutator reverses the direction of current flow through the coil every half turn. This ensures that the torque (rotational force) remains in the same direction, allowing continuous rotation.

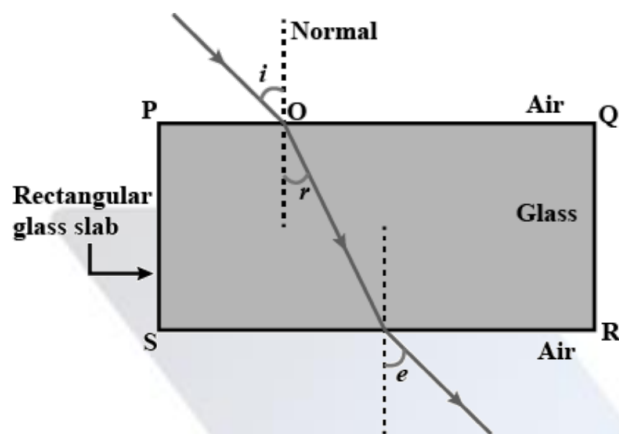
Rotation: The interaction between the magnetic fields and the continuous change in the direction of current keeps the armature coil rotating, converting electrical energy into mechanical energy.

ii) What is refraction of light? Draw the diagram of refraction of light in glass slab.

Write the laws of refraction.

Solution:

Refraction of light is the phenomenon of change that occurs in the direction of light when it obliquely travels from one transparent medium to another. Given below is the diagram of refraction of light in glass slab:



Part B

Section II

Instructions:

All questions are compulsory.

Draw well-labelled diagrams wherever necessary.

Q5. (A)

(a) Rewrite the following statements with suitable words in the blanks:

- i) There are _____ pairs of chromosomes in human being.
- ii) _____ is a functional group of alcohol.

Solution:

- i) There are 23 pairs of chromosomes in human beings.
- ii) -OH is a functional group of alcohol.

(b) State whether the following statements are true or false:

- i) There are two sets of chromosomes in zygote.
- ii) All animals and fungi are autotrophs.

Solution:

i) True.

There are two sets of chromosomes in zygote.

ii) False.

Animals and fungi are heterotrophs.

(c) Find the odd one out:

Amoeba, Euglena, Planaria, Paramecium.

Solution:

Planaria.

Amoeba, Euglena, and Paramecium are unicellular organisms, while Planaria is a multicellular organism.

(B) Rewrite the following statements by choosing the correct alternatives:

i) Acetic Acid _____.

- (a) is insoluble in water
- (b) turns blue litmus red
- (c) is pale yellow in colour
- (d) none of the above

Solution:

(b) turns blue litmus red

ii) _____ type of reproduction occurs in Hydra.

- (a) Binary fission
- (b) Multiple fission
- (c) Budding
- (d) Fragmentation

Solution:

(c) Budding

iii) Solution of Aluminium sulphate in water is _____.

- (a) Green
- (b) Colourless
- (c) Pink
- (d) Blue

Solution:

- (b) Colourless

iv) Reaction of iron nail with copper sulphate solution is a _____ reaction.

- (a) Combination
- (b) Displacement
- (c) Double displacement
- (d) Decomposition

Solution:

- (b) Displacement

v) The loss of water in the form of water vapour through stomata on leaves is known as _____.

- (a) Distillation
- (b) Diffusion
- (c) Osmosis
- (d) Transpiration

Solution:

- (d) Transpiration

Q6. Answer the following questions (any five):

i) Name four plant hormones.

Solution:

Plant hormones include ethylene, auxins, cytokinins, gibberellins, and Abscisic Acid (ABA).

ii) Why are metals used for making cooking vessels?

Solution:

Metals are used for making cooking vessels because they are good conductors of heat, durable, and have a high melting point, making them ideal for cooking vessels. Also heat quickly, cooking times can be shortened without compromising food quality. Metals are a wonderful material to use for cooking containers because they are also chemically inert.

iii) Suggest control measures of noise pollution.

Solution:

The control measures of noise pollution are use of soundproof materials, maintaining low volumes, using ear protection, and implementing noise regulations.

iv) What are alloys? Give two examples.

Solution:

Alloys are homogeneous mixtures of two or more metals or a metal and a non-metal in definite proportions. Examples: Brass (copper and zinc), Steel (iron and carbon).

v) Classify the following as voluntary actions and involuntary actions.

Sneezing, throwing ball, heart beats, writing.

Solution:

Voluntary actions: Throwing ball, Writing.

Involuntary actions: Sneezing, Heartbeats.

vi) Name any four life processes in living things.

Solution:

The four life processes in living things are Respiration, Digestion, Excretion, Reproduction.

Q7. Answer the following questions (any five):

i) Population explosion is the root cause for depletion of natural resources.

Explain.

Solution:

Nature contains two different kinds of natural resources. They are:

1. Renewable resources, including water, wind, and sun
2. Non-renewable resources including minerals, metal ores, and fossil fuels.

Population explosion is the root cause for depletion of natural resources. Due to the increased demand for housing, food, clothes, and other necessities brought on by population growth, forests and agricultural lands are being used up, depleting natural resources. The depletion of metal ores, minerals, and other resources is another consequence of urbanization. Therefore, we can conclude that the primary cause of the depletion of natural resources is the population increase.

ii) Human tail bone is a vestigial organ. Explain.

Solution:

The vestiges of a structure that was once functional in certain ancestors but has since lost its function due to evolution are known as vestigial organs. Several of these vestigial structures suggest connections to monkeys and other mammals. The human tailbone, also known as the coccyx, is the remains of a tail that our ancestors once had and utilized to help balance their bodies. As humans began to walk on their legs, it was still utilized for movement. However, as evolution progressed, these organs became obsolete.

iii) What is anodising? Give its applications.

Solution:

Anodizing is an electrolytic procedure that thickens the natural oxide layer on metal items' surfaces. This increases corrosion and wear and improves paint primer and adhesive adhesion compared to bare metal. Because the component to be treated serves as the anode electrode in an electric circuit, this procedure is

known as anodizing. This aids in keeping the metal from corroding. Architectural finishing is another application for this.

iv) Write the changes that occur in the age group 11 to 21 years in boys.

Solution:

For boys between the ages of 11 and 21, the following changes take place:

- 1) Male vocal cord development causes adolescent boys' voices to shift.
- 2) Increased facial, chest, armpit, and pubic hair
- 3) Boys also develop testicles and a scrotum when reaching puberty.

v) Name different types of neurons and give one function of each.

Solution:

There are three different types of neurons, each with a distinct function: sensory, motor, and association neurons. But the brain must successfully convey this information to the body's other systems, and vice versa.

- 1) Sensory Neurons: Transmit sensory information to the brain.
- 2) Motor Neurons: Convey signals from the brain to muscles.
- 3) Interneurons: Connect neurons within the brain and spinal cord.

When sensory input is received, sensory neurons are responsible for converting environmental external stimuli into the corresponding internal stimuli. They transmit or carry sensory information to the brain or spinal cord by projecting to other parts of the nervous system. However, sensory neurons are activated by exercise such as visible sound, heat, light, physical contact, or chemical signals like smell, taste, and so on.

Motor neurons, which receive their inputs from other neurons either directly or indirectly control muscles by projecting their axons outside of the CNS.

As an alternative, the association or interneurons (also known as mixed neurons) serve as a mediator between the sensory and motor neuron types. They are found in the central nervous system and only act locally, which means that their axons only link to motor or sensory neurons that are close by. By transmitting a signal to

the spinal cord and back rather than all the way to the brain, interneurons can save time and avoid injury.

vi) How is sex determined in the human beings?

Solution:

22 pairs of autosomes and one pair of sex chromosomes make up the 26 pairs of chromosomes that make up a human diploid cell. The X and Y chromosomes are these. Each human being or child receives a single set of chromosomes from each parent. Therefore, the 44 + XY chromosome will be found in human males, and the 44 + XX chromosome will be found in human females. Therefore, it can be claimed that males are heterogametic and females are homogametic. However, meiosis, also known as the reduction process, takes place during gamete formation, resulting in a haploid gamete that receives only one set of chromosomes. In this case, the male gamete (sperm) is 22 + X or 22 + Y, and the female gamete (ovum) is 22 + X. The chromosomes then turn diploid once more when the male and female gametes combine to form a zygote. The child receives the same number of chromosomes as its parents in this way. Meanwhile, the type of sperm (X or Y) that fertilizes the ovum determines the baby's sex. Therefore, in humans, the father determines the sex of the child.

Q8. Answer any one of the following questions:

i) What are covalent compounds? Write any three features and give two examples.

Solution:

The formation of a covalent compound occurs when two or more nonmetal atoms share valence electrons. Covalent bonds, which are created when two nonmetal atoms start sharing electrons, are defined as shared valence electrons. Atoms have positively charged nuclei that attract electrons. In the meanwhile, some of the

covalent compounds' characteristics are listed here. Among them are:

- i. Low melting and boiling points.
- ii. Several colors
- iii. Poor conduction of heat and electricity
- iv. Brittle Solids

Since water is generated by exchanging the electrons of hydrogen and oxygen (both nonmetals), "Water, H₂O" might be an example of how two nonmetals can build a covalent bond by sharing electrons. The CO₂ could be another example.

- ii) Draw well labelled diagram of human excretory system. Write the functions of:
 - a) Kidney
 - b) Ureter
 - c) Urinary bladder

Solution:

The Human Excretory System

The human excretory system controls the balance of water and electrolytes and eliminates waste from the body. The kidneys, ureters, bladder, and urethra are the main parts of the excretory system.

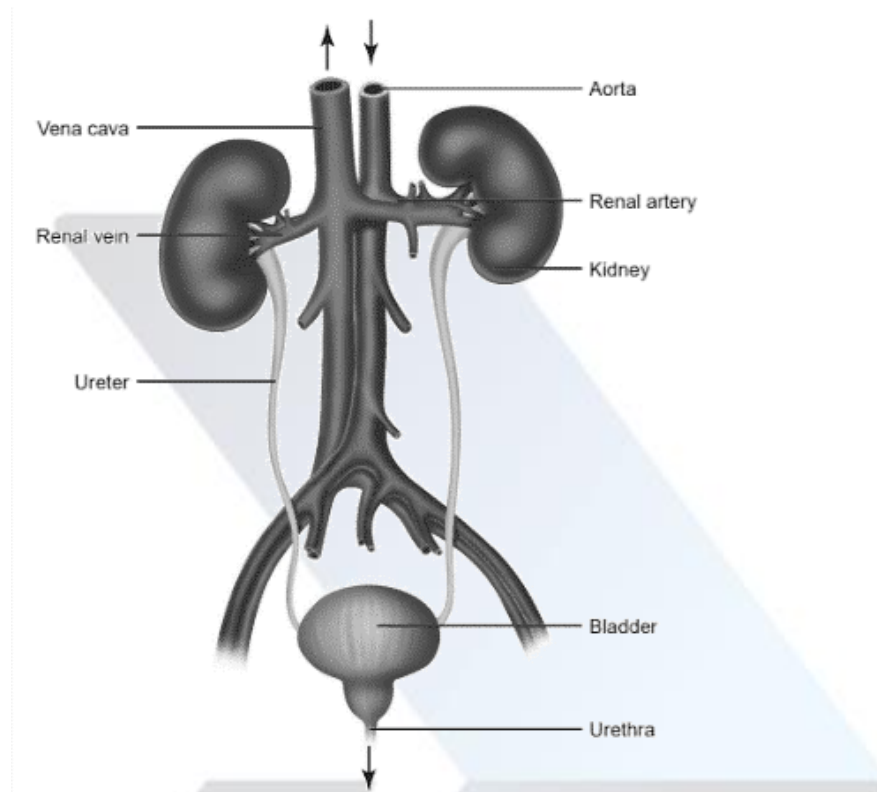


Diagram of the Human Excretory System

a) **Kidney:** Filters blood to remove waste and excess substances, producing urine.
Function: The kidneys filter blood to eliminate toxins, waste, and excess chemicals. Through the excretion of urine, they maintain electrolyte balance, regulate blood pressure, and manage the volume and content of bodily fluids.

Specific Features:

Filtration: The renal artery brings blood into the kidneys, where it travels via a system of microscopic blood channels known as nephrons. Excess and waste materials are sorted out here.

Reabsorption: Vital nutrients, electrolytes, and water are returned to the circulation.

Secretion: Extra ions and waste materials are released into the urine.

Excretion: The renal pelvis collects and transports urine, which contains waste materials and excess compounds, to the ureters.

b) Ureter: Transports urine from the kidneys to the urinary bladder.

Function: The ureters are tubes that carry urine from the kidneys to the urinary bladder.

Detailed Functions:

Transport: Smooth muscle contractions (peristalsis) in the walls of the ureters help propel urine down to the urinary bladder.

c) Urinary Bladder: Stores urine until it is excreted.

Function: The urinary bladder stores urine until it is expelled from the body.

Detailed Functions:

Storage: The bladder can expand to hold about 400-600 ml of urine.

Expulsion: When the bladder is full, stretch receptors trigger the urge to urinate.

The bladder contracts to expel urine through the urethra.

Urethra:

Function: The urethra is the tube that carries urine from the bladder to the outside of the body.

Detailed Functions:

Expulsion: The external urethral sphincter, which is under voluntary control, allows the release of urine during urination.