CLASS X (2019-20)

SCIENCE (CODE 086)

SAMPLE PAPER-19

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :

(i)   The question paper comprises of three sections-A, B and C. Attempt all the sections.

(ii) All questions are compulsory.

(iii) Internal choice is given in each sections.

(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.

(v)   All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.

(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.

(vii) This question paper consists of a total of 30 questions.

Section A

1. Name the part of the human eye where image of an object is formed. Write one characteristic (real, virtual, erect, inverted) of the image. [1]

   Ans :

   1. Retina
   2. Real/inverted

2. Define speciation. [1]

   Ans :

   Speciation: Formation of a new species from a pre-existing one.

3. **Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.**

   Ozone or tri-oxygen is an inorganic molecule with the chemical formula O_3. It is a pale bluish gas with a distinctively pungent smell. Ozone is an allotrope of oxygen and is less stable than oxygen. Although ozone is a poisonous gas but at higher levels of the atmosphere (in stratosphere) it acts as a protective blanket. It absorbs the harmful ultraviolet rays from reaching the earth's surface. It was found that this layer is depleting day by day due to the changes in human lifestyle.

   Chemicals released into the atmosphere from aerosol repellents, refrigerators, air conditioners, etc. are the main causes of depletion of ozone layer.

   3.1 Name the chemical which is mainly responsible for the depletion of ozone layer. [1]

   Ans : Chlorofluorocarbons are mainly responsible for the depletion of ozone layer.

   3.2 Scientists say that there is a hole in ozone layer. Is there actually a hole in ozone layer? Why do they say so? [1]

   Ans : No. The scientists call the decrease in the concentration of ozone in the stratosphere as ozone hole.

   3.3 Name the component required for the conversion of O_2 into O_3. [1]

   Ans : Ultraviolet radiations are needed for the conversion of O_2 into O_3.

   3.4 Study the graph given alongside.
   It indicates that the depletion of ozone layer is reducing after 1995. What may be the probable reason behind it? [1]

   Ans : The reason may be the reduction in consumption of products containing chlorofluorocarbons.

4. **Answer question numbers 4.1-4.4 on the basis of your understanding of the following paragraph and related studied concepts.**

   Children eat a lot of sugary foods such as cakes, pastries, chocolates etc. which can lead to tooth decay. Tooth decay is the gradual destruction of hard outer tissues of the tooth that leads to the formation of cavities or caries in tooth.

   Whenever we eat any food, some of the food particles stick in-between our teeth. The bacteria present in our mouth break down the sugar present in the food to form acid. This acid changes the pH of the mouth which may be the main cause of tooth decay.

   The pH Scale

   4.1 What is meant by saying that pH change may be the main cause of tooth decay? [1]

   Ans : Tooth decay starts when the pH of the mouth

falls below 5.5. Acid becomes strong enough to corrode hard enamel of tooth.

4.2 What is the critical pH at which tooth decay starts? [1]
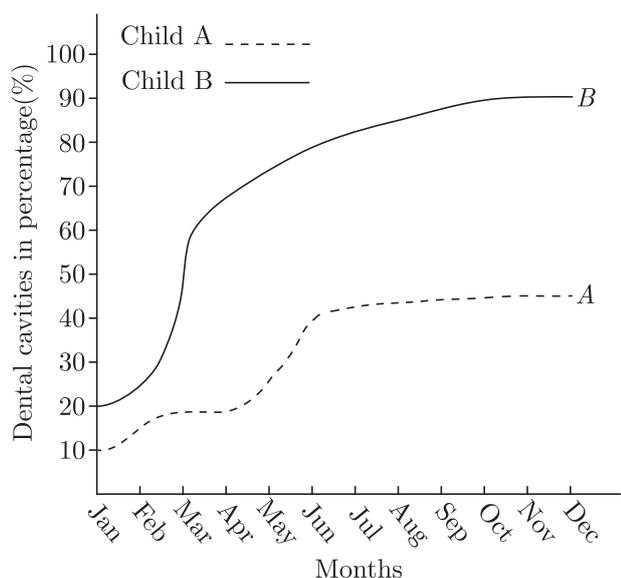
(a) 5.5   (b) 7

(c) 8.8   (d) 9

Ans : (a) 5.5

4.3 The nature of the toothpaste used for cleaning teeth is [1]

(a) acidic   (b) basic

(c) neutral   (d) corrosive

Ans : (b) basic

4.4 Based on the data shown in the graph below, which of the two children A and B, would have more teeth with cavities and why? [1]

Ans : Child B

Eating lots of chocolates, chips or candies leads to tooth cavity.

5. Consider the following statements about the characteristics of genes: [1]

A. Genes are specific sequence of bases in a DNA molecule.

B. A gene does not code for proteins.

C. In individuals of a given species, a specific gene is located on a particular chromosome.

D. Each chromosome has only one gene.

The correct statements that describe the characteristics of genes are

(a) A, B and C   (b) B, C and D

(c) A and C only   (d) B and D only

Ans : (c) A and C only

6. An ohmic conductor of circular cross-section has a resistance R. If it is melted and recast to half of its length with rectangular cross-section, its new resistance will be [1]

(a) 2R   (b) R

(c) $\dfrac{R}{2}$ (d) $\dfrac{R}{4}$

Ans : (d) $\dfrac{R}{4}$

7. Beams of light are incident through the holes A and B and emerging out of box through the holes C and D respectively as shown in the figure. Which of the following could be inside the box? [1]
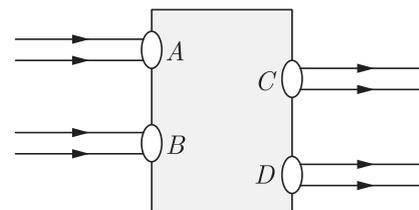
(a) A rectangular glass slab (b) A convex lens

(c) A concave lens   (d) A prism

Ans : (a) A rectangular glass slab

or

Light rays A, B and C fall on an optical device X and come out as P, Q and R. This optical device is a [1]
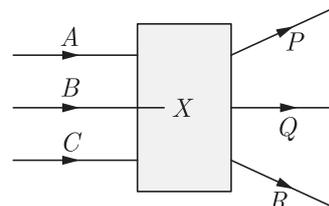
(a) concave lens.   (b) convex lens.

(c) glass slab.   (d) glass prism.

Ans : (b) convex lens

8. A shiny-brown substance X on heating in air turns black and a new compound Y is formed. Name the substance X and black compound Y. [1]

(a) X = Fe and Y = FeO

(b) X = Cu and Y = $Cu(OH)_2$

(c) X = Cu and Y = CuO

(d) X = Al and Y = Al_2O_3

Ans : (c) X = Cu and Y = CuO

9. Consider the following statements: [1]

A. The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points.

B. Magnetic field lines are closed curves.

C. If magnetic field lines are parallel and equidistant, they represent zero field strength.

D. Relative strength of magnetic field is shown by the degree of closeness of the field lines.

The correct statements are

(a) A and B only   (b) C and D only

(c) A, B and C   (d) A, B and D

Ans : (d) A, B and D

10. The defect of vision which arises due to gradual weakening of the ciliary muscles, and diminishing flexibility of the eye lens is [1]

(a) presbyopia   (b) myopia

(c) hypermetropia   (d) cataract

Ans : (a) presbyopia

or

The defect of vision in which the crystalline lens at old age becomes milky and cloudy is called [1]

(a) cataract   (b) presbyopia

(c) myopia   (d) colour blindness

Ans : (a)cataract

11. 'Atomic number is the fundamental property of an element'. Name the scientist who proposed it.   [1]
    (a) Bohr   (b) Newlands
    (c) Mendeleev   (d) Moseley

    Ans : (d) Moseley

12. The part of the human eye where most of the refraction of the light rays entering the eye occurs is   [1]
    (a) crystalline lens
    (b) outer surface of the cornea
    (c) outer surface of pupil
    (d) iris

    Ans : (b) outer surface of the cornea

or

When ciliary muscles are relaxed, focal length of eye lens is
(a) maximum
(b) minimum
(c) Neither maximum nor minimum
(d) Cannot say

Ans : (a) maximum

For question numbers 13 and 14, two statements are given–one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is correct explanation of the assertion.
(b) Both A and R are true but R is not the correct explanation of the assertion.
(c) A is true but R is false.
(d) A is false but R is true.

13. **Assertion :** Isotopes of an element are placed in the same position in Modern Periodic Table.
    Reason : The electronic configuration of all isotopes of an element is same.   [1]
    Ans : (a) Both A and R are true and R is correct explanation of the assertion.

14. **Assertion :** Our main aim of conservation should be to preserve the biodiversity.
    Reason : Loss of biodiversity may lead to loss of ecological stability.   [1]
    Ans : (a) Both A and R are true and R is correct explanation of the assertion.

Section B

15. The following diagram displays a chemical reaction. Observe it carefully and answer the following questions: [3]

Silver chloride

(a) Identify the type of chemical reaction that will take place in this case and define it. How will the colour of the salt change?
(b) Write the chemical equation of the reaction that takes place.

Ans :

(a) It is a photo-decomposition reaction (photolysis). It is defined as the chemical reaction in which a substance is broken down into simple substances on exposure to light (photons).
   The colour of the salt will change from white to grey.

(b) $2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(g)$
   White   Grey

or

What is an exothermic reaction? Why is respiration considered an exothermic reaction? Explain.   [3]

Ans :

i.   The chemical reaction which is accompanied by the evolution of heat is called an exothermic reaction.

ii   Respiration is oxidation of food. During respiration, glucose in the cells is oxidised into carbon dioxide with liberation of large amount of energy as shown in the equation:
   $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O +$ Energy
   Glucose   Oxygen   Carbon dioxide   Water
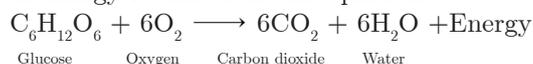
   Thus, respiration is an exothermic reaction.

16. (a) Write the name given to bases that are highly soluble in water. Give an example.
    (b) Name the major constituents of soda acid fire extinguisher. Write the chemical reaction taking palace in it
    (c) Why does bee-sting cause pain and irritation? Rubbing of baking soda on the sting area gives relief. Why?   [3]

Ans :

(a) Alkali
   Example: Sodium hydroxide (NaOH) is a base and is highly soluble in water.

(b) Sodium hydrogen carbonate and dilute sulphuric acid are the major constituents of soda acid fire.
   $2NaHCO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O + 2CO_2$

(c) This is because bee-sting injects formic acid that causes pain and irritation.
   Rubbing of baking soda, which is a base, neutralises the effect of formic acid and gives relief.

17. Write the number of periods in the Modern Periodic Table. State the change in valency and metallic character of elements as we move from left to right across a period. Also state the change, if any, in the valency and atomic size of elements as we move down a group.   [3]

Ans :

i.   No. of periods: 7
ii.   Valency across a period increases from 1 to 4, then decreases from 4 to zero.
iii. Metallic character of elements decreases as we move from left to right across a period.
iv.   Valency down a group remains the same.
v.   Atomic size of elements increases on moving down a group.

18. (a) State the role performed by plant hormones. Name a plant hormone which is essential for cell division.
    (b) Name and explain the role of plant hormone involved in phototropism.   [3]

    Ans :

    (a) Plant hormones are chemical compounds released for control and coordination, since plants do not have electrical impulses.
        Cytokinin is essential for cell division.
    (b) Auxin is involved in phototropism.
        It helps in bending the shoot towards the source of light which occurs due to the diffusion of auxin (synthesised at the shoot tip) towards the shady side of the shoot, This stimulates the cells to grow vigorously.

19. (a) Identify the glands that secrete
        (i) insulin
        (ii) thyroxin
    (b) Explain with an example how the timing and the amount of hormones secreted are regulated by the human body.   [3]

    Ans :

    (a) (i) Pancreas
        (ii) Thyroid
    (b) The timing and the amount of hormones released are regulated by a feedback mechanism.
        For example, glucose level in the blood is maintained constantly at 0.1% by the following feedback mechanisms:
        (i) High glucose level in the blood is detected by pancreatic cells.
        (ii) The pancreas responds by producing more insulin.

20. List in tabular form, two distinguishing features between the acquired traits and the inherited traits with one example of each.   [3]

    Ans :

	Acquired Traits	**Inherited Traits**
(i)	Do not bring about change in the DNA of the germ cell.	Bring change in the DNA of the germ cell.
(ii)	Cannot be passed on to the Progeny.	Can be passed on to the progeny.
(iii)	Do not help in evolution.	Help in evolution. (any two)
	Examples: Acquiring knowledge, loss of weight or.	Examples: Skin colour, colour of the eye.

or

(a) Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animals together to establish a common evolutionary origin? Justify your answer.
(b) "Birds have evolved from reptiles". State evidence to prove the statement.   [3]

Ans :

(a) No, the structure of the eye in each of the organisms is different and has different origin.
(b) Fossils of certain dinosaurs/reptiles show imprints of feathers along with their bones but they could not fly presumably because of their body structure.
    Later, they developed/evolved and adapted feathers for flight, thus becoming the ancestors of present-day birds.

21. With the help of a labelled diagram, explain why the sun appears reddish at the sunrise and the sunset. [3]

    Ans :

    i.   Light from the sun near the horizon passes through thicker layers of air and a longer distance through the earth's atmosphere before reaching our eyes.
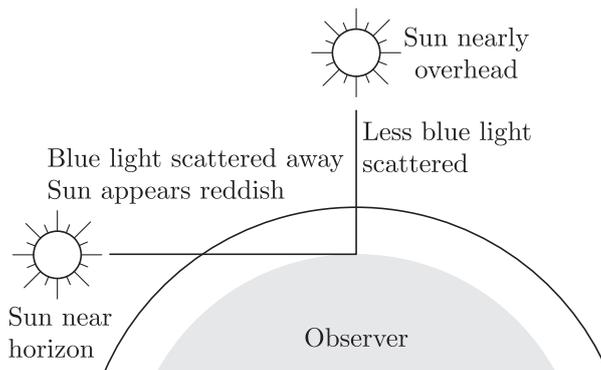

    ii.   Near the horizon most of the blue light and shorter wavelengths of sunlight are scattered away by the particles. Light of longer wavelength reaches us, thus giving the reddish appearance of the sun.

22. Define a solenoid. With the help of a suitable diagram show the pattern of magnetic field lines in and around a current carrying solenoid. State the region where field is uniform.   [3]

    Ans :

    i.   A solenoid is defined as a long coil of many circular turns of insulated metal wire wrapped closely in the shape of a cylinder.
    ii.   Pattern of magnetic field lines in and around the solenoid is as shown.
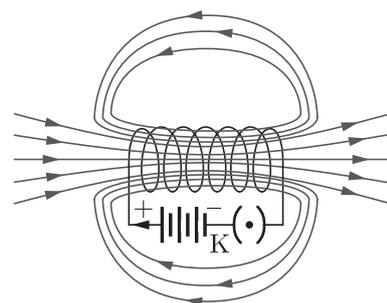
    iii. It is clear from the diagram that the magnetic field is uniform inside the solenoid.

23. State the factors on which the strength of an electromagnet depends. Differentiate between an electromagnet and a permanent magnet. List three uses of electromagnets. [3]

Ans :

The strength of an electromagnet depends on the following factors:

(a) Strength of the current: Greater the magnitude of the current, greater is the strength of an electromagnet.

(b) Number of turns in the coil: More the number of turns in the coil, greater is the strength of an electromagnet.

(c) Nature of the material used as the core: Soft iron produces a very strong magnetic field.

Differences between a permanent magnet and an electromagnet:

	Permanent Magnet	Electromagnet
(i)	It shows permanent magnetism.	It loses its magnetism on switching off the current.
(ii)	Its polarity cannot be changed.	The polarity can be changed by reversing the direction of current.
(iii)	Its strength cannot be changed.	Its strength can be changed by changing the current through the coil.

Uses:

(a) Electromagnets are used in cranes to lift heavy loads in scrap-yards.

(b) They are used in hospitals for extracting splinters of steel or iron from the injured eyes.

(c) They are used in instruments like electric bell, telephone, earpiece etc. and also in commercial generators.

or

With the help of a diagram, describe an activity to draw magnetic field lines around a bar magnet. [3]

Ans :

Activity:

(a) Place a bar magnet at the centre of a sheet of white paper fixed on a drawing board and mark its boundary using a sharp pencil.

(b) Place a small compass needle near the north pole of the magnet and mark the positions of its two ends.

(c) Now move the needle to a new position such that its south pole occupies the position previously occupied by its north pole and mark the positions of its two ends as before.

(d) Now again move the needle to a new position such that its south pole occupies the position previously occupied by its north pole and mark the positions of its two ends as before.

(e) In this way, proceed step by step till you reach the south pole of the magnet as shown in figure (i).

(i)
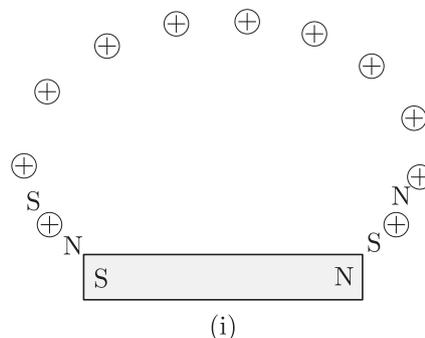
(f) Join the points marked on the paper using a sharp pencil to make a smooth curve. This curve represents a magnetic field line.

(ii)
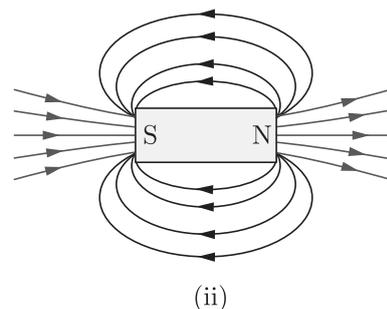
(g) Repeat the above procedure and draw as many lines as you can, on both sides of the magnet. You will get a pattern shown in figure (ii). These lines represent the magnetic field around the magnet and are known as magnetic field lines of the magnet.

24. Name the major component of biogas. List two advantages of using biogas over fossil fuels. What is the use of the residual slurry? [3]

Ans :

The major component of biogas is methane gas (75%).

(i) Advantages of biogas over fossil fuels:

(a) It burns completely and leaves no residue.

(b) It is renewable, convenient and efficient source of energy than fossil fuels.

(c) It provides a safe disposal for animal wastes and other bio wastes. In a way, it helps in recycling biodegradable waste but fossil fuels cannot do so.

(d) It is an environment friendly fuel. It produces very less pollution as compared to fossil fuels.

(ii) The residual slurry is used as manure in the crop fields as it contains various useful plant nutrients like nitrogen and phosphorous.

Section C

25. Describe an activity with diagram to illustrate that the reaction of metal carbonates and metal bicarbonates with acids produces carbon dioxide. Write the relevant equations of all the reactions that take place. Name any two forms in which calcium carbonate is found in nature. [5]

Ans :

(i) To illustrate that the reaction of metal carbonates and metal bicarbonates with acids produces carbon dioxide:
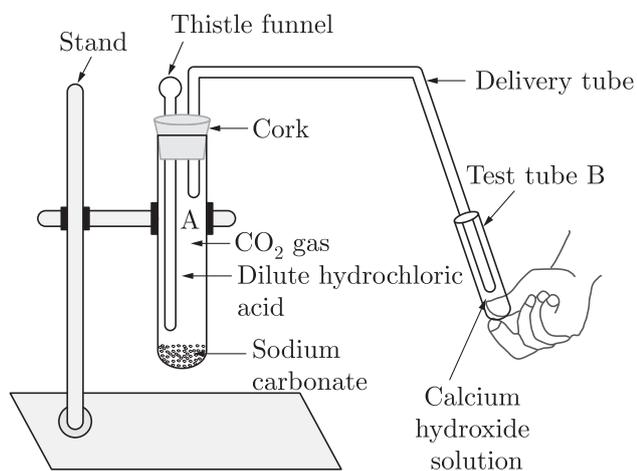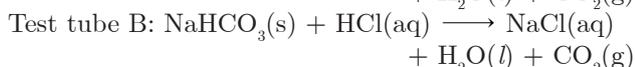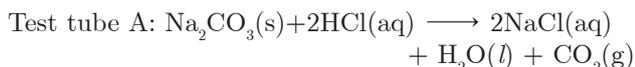
(a) Take two test tubes, label them as A and B.

(b) Take about 0.5 g of sodium carbonate (Na_2CO_3) in test tube A and about 0.5 g of sodium hydrogen-carbonate ($NaHCO_3$) in test tube B.

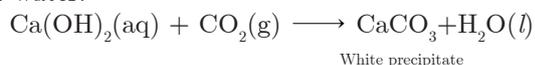(c) Add about 2 mL of dilute HCl to both the test tubes.
We will observe that a gas is produced in both the cases.

(d) Pass the gas produced in each case through lime water (calcium hydroxide solution) as shown in figure and record your observations.

(ii) The reactions occurring in the above activity are written as:

Test tube A: $Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$

Test tube B: $NaHCO_3(s) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l) + CO_2(g)$

On passing the evolved carbon dioxide gas through lime water.

$$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3 + H_2O(l)$$
<div align="center">White precipitate</div>

iii. Limestone, chalk and marble are different forms of calcium carbonate found in nature.

<div align="center">**or**</div>

(a) What is corrosion of metals? Name a metal which does not corrode and the one which corrodes when exposed to the atmosphere.

(b) How will you show that rusting of iron needs oxygen and moisture at the same time?   5

Ans :

(a) The process of slow wearing away of metals due to their conversion into oxides, carbonates, sulphides, sulphates etc., by the action of atmospheric gas and moisture is called corrosion. Metals which are placed at the top in the activity series corrode easily, e.g. potassium, aluminium etc. whereas the metals placed at the bottom of activity series like gold and platinum do not corrode easily.

(b) **Rusting of iron needs both oxygen and moisture:** Take three test tubes and label them as A, B and C. Place clean iron nails in each test tube.
In test tube A : Pour some water so that two-thirds of the nails are dipped in water while rest are above the water exposed to damp air. Cork the test tube and keep it aside for 8-10 days. The water also contains some dissolved air. So in test tube A, both the naked and immersed portions

of nails are exposed to air and water.

In test tube B : Pour enough boiled distilled water so that the nails are completely immersed and add about 1 mL of oil. Cork the test tube and keep it aside for 8 to 10 days. The oil will float over water and will prevent the air from dissolving in water. In test tube B, nails are exposed to water only.
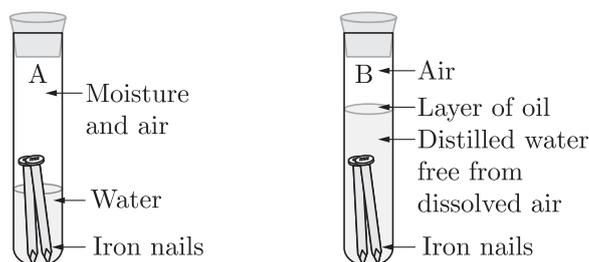
(a) Both water and air are needed for rusting

(b) Iron nails do not rust in water free from dissolved air
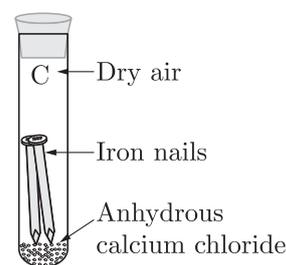
(c) Iron nails do not rust in air free from moisture

In test tube C: Place some anhydrous calcium chloride along with the nails. Cork the test tube and keep it aside for 8 to 10 days. Anhydrous calcium chloride ($CaCl_2$) will absorb moisture from damp air and will make it dry. So in this test tube C, nails are exposed only to dry air.
After 10 days, we find that rusting occurs in test tube A and not in test tube B and C.
So, the necessary conditions for rusting of iron are:

(i) Presence of air

(ii) Presence of water

26. Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most other elements?   [5]

Ans :

(i)
   (a) Carbon has 4 electrons in its outermost shell, and needs to gain or lose 4 electrons to attain noble gas configuration.

   (b) Losing or gaining 4 electrons is not possible due to energy considerations; hence it shares electrons to form covalent bonds.

(ii) Two reasons for large number of carbon compounds:

   (a) **Catenation:** The unique ability of carbon to form bonds with other atoms of carbon giving rise to long chains of different types of compounds.

(b) **Tetravalency:** Since carbon has a valency of 4, it is capable of bonding with four other atoms of carbon or atoms of elements like oxygen, hydrogen, nitrogen, sulphur, chlorine, etc.

(iii) The reason for the formation of strong bonds by carbon is its small size which enables the nucleus to hold on to the shared pairs of electrons strongly.

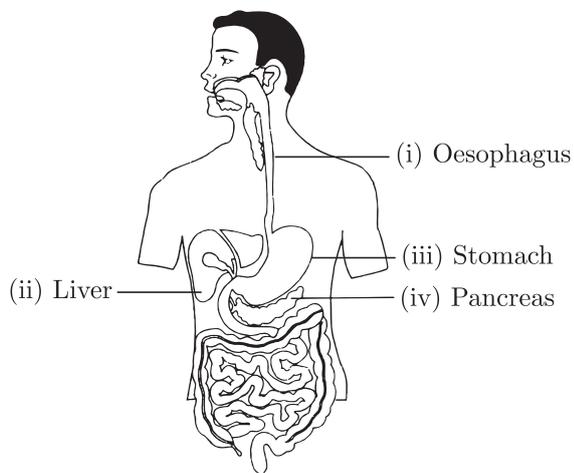27. (a) Draw a sectional view of the human alimentary canal and label the following parts:
   (i) Oesophagus
   (ii) Liver
   (iii) Stomach
   (iv) Pancreas
   (b) What is peristalsis?
   (c) What would happen if mucus is not secreted by the gastric glands? [5]

Ans :

(a) Sectional view of human alimentary canal:

(b) **Peristalsis:** It is a periodic wave of contraction which occurs in the alimentary canal for pushing the food forward from anterior to posterior end.

(c) In case mucus is not secreted in stomach, hydrochloric acid can damage the inner lining of the stomach wall and cause ulcer. Mucus also lubricates and softens the food.

28. (a) Write the functions of the following in human female reproductive system:
   Ovary, Oviduct, Uterus
   (b) What is placenta? State its major role in case of a pregnant human female. [5]

Ans :

(a) **Functions of Ovary :**
   (i) Production of female hormones: oestrogen and progesterone
   (ii) Production of female gamete: egg (germ cell)
   Functions of Oviduct:
   (i) Transfer of female gamete from the ovary
   (ii) Site of fertilization
   Functions of Uterus:
   (i) Implantation of zygote
   (ii) Nourishment of developing embryo

(b) Placenta is a special disc-like tissue embedded in the mother's uterine wall and connected to the foetus /embryo through umbilical cord.
   Placenta provides oxygen, nutrients and hormones to embryo and removes waste from embryo (foetus) of a pregnant human female.

or

State the method of reproduction followed by human beings. Name and explain with a labelled sketch the function of various parts of the human male reproductive system. 5

Ans :

Human beings reproduce by sexual method. For this purpose, two individuals—the male and the female possess a specialised reproduction system.

Human male reproductive system consists of the following parts:
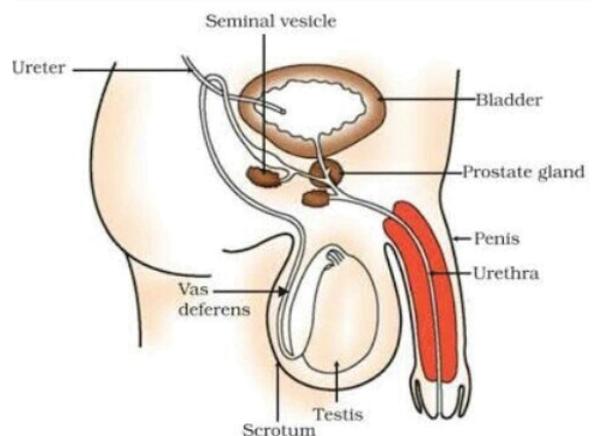
(a) A pair of testes
(b) Vas deferens or Sperm duct
(c) Seminal vesicle and Prostate gland
(d) Urethra
(e) Penis

Functions of parts of the human male reproductive system:

(a) • In the human male, the primary sex organ consists of a pair of testes which are lodged in scrotum or scrotal sac located outside the abdominal cavity.
   • The testes produce sperms or male gametes from the age of puberty.
   • The testes also produce testosterone—the male hormone which is responsible for the formation of sperm and appearance of secondary sexual characteristics.

(b) Vas deferens is also known as sperm duct and its function is to carry sperms from the testes to the urethra.

(c) Seminal vesicle along with prostate gland are situated all along the path of the sperm duct. The secretion of these glands provides the alkaline medium for the survival of sperms and also helps in providing nutrients and motility to sperms.

(d) The urethra in male is the common passage for carrying sperms as well as urine. The urethra opens to the exterior through a pore located at the tip of the penis.

(e) Penis is a muscular structure lined with blood vessels. It is used for depositing millions of sperms in the vagina of the female during sexual intercourse. Penis becomes erect due to the flow of blood into it during mating.

29. (a) State the laws of refraction of light. Explain the term "absolute refractive index of a medium" and write an expression to relate it with the speed of light in vacuum.

(b) The absolute refractive indices of two media A and B are 2.0 and 1.5 respectively. If the speed of light in medium B is 2×10^8 m/s, calculate the speed of light in:

(i) vacuum

(ii) medium A   [5]

Ans :

(a) (i) **Laws of refraction of light:**

(1) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.

(2) The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for the given pair of media.

(ii) When a ray of light travels from vacuum or air into a given medium, the ratio of sin i to sin r is called absolute refractive index of the medium. Absolute refractive index of a medium

$$\frac{\text{Speed of light in vacuum}\,(c)}{\text{Speed of light in the medium}\,(v_m)}$$

(b) Here, $n_A = 2.0$

$$n_B = 1.5$$

$$v_B = 2 \times 10^8 \text{ m/s}$$

$$c = ? \text{ and } v_A = ?$$

(i) $n_B = \dfrac{c}{v_B}$

$$c = n_B v_B = 1.5 \times 2 \times 10^8 \text{ m/s}$$

$$= 3 \times 10^8 \text{ m/s}$$

(ii) $n_A = \dfrac{c}{v_A}$

$$v_A = \frac{c}{n_A}$$

$$= \frac{3 \times 10^8 \text{ m/s}}{2}$$

$$= 1.5 \times 10^8 \text{ m/s}$$

or

"A convex lens can form a magnified erect as well as magnified inverted image of an object placed in front of it." Draw ray diagrams to justify this statement stating the position of the object with respect to the lens in each case.
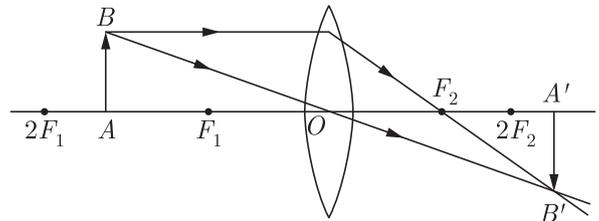
An object of height 4 cm is placed at a distance of 20 cm from a convex lens of focal length 10 cm. Use lens formula to determine the position of the image formed.   [5]

Ans :

For magnified erect image – Object is between the optical centre and principal focus of a convex lens.
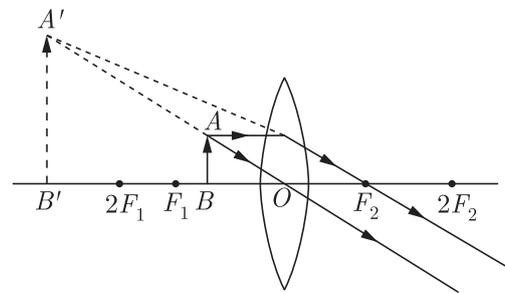
For magnified inverted image – Object is between F and 2F of a convex lens.

Here, $u = -20$ cm

$$f = +10 \text{ cm};$$

$$v = ?$$

Using the lens formula, $\dfrac{1}{f} = \dfrac{1}{v} + \dfrac{1}{u}$; or $\dfrac{1}{v} = \dfrac{1}{f} - \dfrac{1}{u}$

$$\frac{1}{v} = \frac{1}{(+10 \text{ cm})} + \frac{1}{(-20 \text{ cm})}$$

$$\frac{1}{v} = \frac{1}{10 \text{ cm}} - \frac{1}{20 \text{ cm}}$$

$$= \frac{2 - 1}{20 \text{ cm}} = \frac{+1}{20 \text{ cm}}$$

$$v = +20 \text{ cm}$$

Thus, the image is formed on the other side of the lens at a distance of 20 cm from its optical centre.

30. (a) Two identical resistors each of resistance 10Ω are connected in (i) series and (ii) parallel to a 6 V battery. Calculate the ratio of power consumed in the combination of resistors in two cases.

(b) Draw the circuit diagram of the two cases.   [5]

Ans :

(a) **In case (i):** When the resistors are connected in series, the total resistance is $10\Omega + 10\Omega = 20\Omega$. The given voltage is 6 volts,

$$I_1 = \frac{V}{R} = \frac{6 \text{ V}}{20 \, \Omega} = 0.3 \text{ A}$$

In case (ii): When the resistors are connected in parallel, the total resistance is

$$\frac{1}{R} = \frac{1}{10 \, \Omega} + \frac{1}{10 \, \Omega} = \frac{2}{10 \, \Omega} = \frac{1}{5 \, \Omega} \quad R = 5 \, \Omega$$

$$\therefore \qquad I_2 = \frac{V}{R} = \frac{6 \text{ V}}{5 \, \Omega} = 1.2 \text{ A}$$

$$\because \qquad P = V \times I$$

$$\therefore \text{Ratio of powers consumed} = \frac{P_1}{P_2}$$

$$= \frac{V_1 I_1}{V_2 I_2}$$

$$= \frac{6\text{V} \times 0.3 \text{ A}}{6\text{V} \times 1.2 \text{ A}}$$
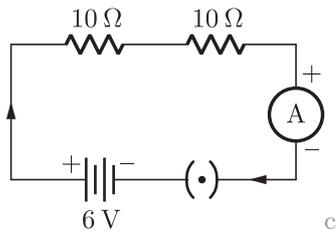
$$= \frac{1}{4}$$

(b) **Circuit diagrams:**
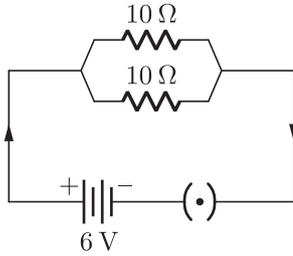

Fig: Case (i) Resistors in series

Fig: Case (ii) Resistors in Parallel

Download unsolved version of this paper from
www.cbse.online