

CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-3

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. Which one of these has a higher concentration of H^+ ions ? [1]
 1 M HCl or 1 M CH_3COOH

Ans :

1 M HCl has a higher concentration of $H^+(aq.)$ ions as it ionises completely.

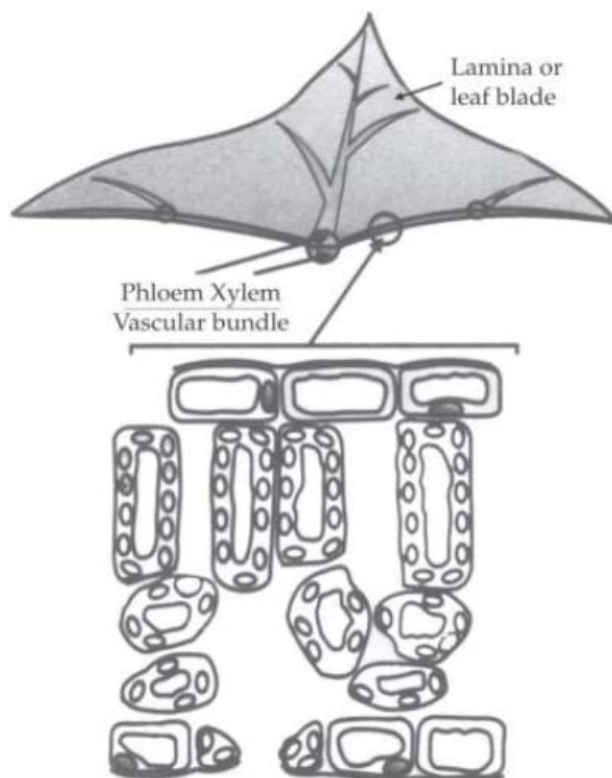
2. What effect does an increase in concentration of H^+ (aq.) in a solution have on the pH of the solution? [1]

Ans :

The increase in concentration of $H^+(aq.)$ ions, lowers the pH of the solution.

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

The leaf is the main photosynthetic organ in a plant. It controls gas exchange in plants, controls the amount of water loss in plants. Upper epidermis cells contain no chloroplasts – which is not true for the guard cells. They form layers on the upper and lower surface of the leaf. Their function is to prevent water from getting out and stopping unwanted substances/organisms getting in. The palisade mesophyll layer is where most of the photosynthesis occurs in the leaf. The palisade cells contain a lot of chloroplasts to help them perform this photosynthesis. Lower epidermis is the bottom layer of the leaf, and is one cell thick. They may not contain a cuticle within the lower epidermis, there are some holes found in leaves called stoma. These holes allow gases to diffuse in and out of the leaves. The stoma are formed by two highly specialized epidermis cells, called guard cells. Guard cells are the only epidermis cells that contain chloroplasts.



- 3.1 Mention two function of lower epidermis. [1]

Ans : (i) To allow transpiration (ii) Allow gas exchange

- 3.2 Where are chloroplasts present in the leaf?

Ans : Guard cells and palisade cells

- 3.3 What are the functions of xylem and phloem in leaf?

Ans :

Xylem : transports water and minerals to leaf cells.

Phloem : translocates dissolved food prepared by photosynthesis by palisade cells.

3.4 List one structural and one functional difference between upper and lower epidermis.

Ans :

Structural difference : Upper epidermis has cuticle and does not have stomata or have fewer stomata. Lower may not have cuticle and have more stomata.

Functional difference : Upper epidermis is more for protection while lower is for gas exchange/transpiration.

4. Question number 4.1–4.4 are based on the two tables given below study these table related to atomic number and electronic configuration and answer that follows

Table – A

Element	Atomic number	Electronic Configuration
H	1	1
He	2	2
Li	3	2,1
Be	4	2,2
B	5	2,3

Table – B

Student	Element	Electronic configuration
Student A	C	2, 4
	N	2, 5
	O	2, 6
Student B	F	2, 7
	Ne	2, 7
	Na	2, 8, 1

4.1 In the table B which student write the incorrect electronic configuration and write the its name? [1]

Ans : Student B, Ne

4.2 How many cells are used to write the electronic configuration of element? [1]

Ans : four (K, L, M, N)

4.3 The atomic number of sodium is [1]

- (a) 11
- (b) 13
- (c) 14
- (d) 9

Ans : (a) 11

4.4 If the atomic number of element is 12 than write down it's electronic configuration. [1]

- (a) 2, 2, 8
- (b) 2, 4, 6
- (c) 2, 8, 2
- (d) 2, 6, 4

Ans : (c) 2, 8, 2

5. In a milliammeter, there are 20 divisions between 400 mA mark and 500 mA mark. The least count of the milliammeter is [1]

- (a) 0.5 mA
- (b) 5 mA
- (c) 10 mA
- (d) 50 mA

Ans : (b) 5 mA

or

What is the current through a 5.0 ohm resistor if the voltage across it is 10 V ?

- (a) zero
- (b) 0.5 A
- (c) 2.0 A
- (d) 5.0 A

Ans : (c) 2.0 A

6. An object is placed at a distance of 10 cm in front of a plane mirror, then the distance of image from mirror will be [1]

- (a) 5 cm
- (b) 10 cm
- (c) 20 cm
- (d) 0

Ans : (b) 10 cm

7. While performing the experiment to trace the path of ray through glass slab, the teacher instructed her students to ensure that during the experiment, glass slab may not get displaced from its boundary. This instruction was given because if slab gets displaced from its boundary then [1]

- i. the angle of incident ray will change
- ii. the diagram will not look nice
- iii. the refracted ray will not be traceable
- iv. the emergent ray will not be seen

- (a) (i)
- (b) (ii)
- (c) (iii)
- (d) (iv)

Ans : (a) (i)

8. In MAIZE plant the flowers are [1]

- (a) absent
- (b) uni-sexual but on different plants
- (c) bisexual
- (d) uni-sexual but on same plant

Ans : (d) uni-sexual but on same plant

or

During binary fission in Amoeba nucleus divided by

- (a) mitosis
- (b) meiosis
- (c) both mitosis and meiosis
- (d) none of these

Ans : (a) mitosis

9. Some crystals of copper sulphate were dissolved in water. The colour of the solution obtained would be : [1]

- (a) green
- (b) red
- (c) blue
- (d) brown

Ans : (c) blue

10. Which of the following turn pH paper red ? [1]

- (a) Milk of magnesia
- (b) Baking soda
- (c) Oxalic acid solution
- (d) NaCl solution

Ans : (c) Oxalic acid solution

11. In an experimental set up to demonstrate that CO₂ is given out during respiration, the KOH solution should be kept in [1]

- (a) beaker
- (b) bent tube
- (c) without seeds in the flask

(d) in a small test tube in the flask

Ans : (d) in a small test tube in the flask

12. A student takes 5 ml of distilled water in 3 test tubes marked as I, II and III. He dissolves calcium chloride in test tube I, magnesium chloride in test tube II and sodium chloride in test tube III. In which tube/tubes will water behave as hard water : [1]

(a) I (b) 11
(c) III (d) I and II

Ans : (d) I and II

or

Chlorine reacts with saturated hydrocarbons at room temperature in the

- (a) absence of sunlight
(b) presence of sunlight
(c) presence of water
(d) presence of hydrochloric acid

Ans : (b) presence of sunlight

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

- (a) Assertion is true and reason is correct explanation of assertion.
(b) Assertion is true but reason is false.
(c) Assertion is false but reason is true.
(d) Both are true but reason is not correct explanation of assertion.

13. **Assertion:** Plaster of Paris should be stored in moisture proof containers.

Reason : Plaster of Paris on coming in contact of moisture, absorbs water and reacts chemically to form hydrated calcium sulphate, which sets to form a hard mass. [1]

Ans : (a) Assertion is true and reason is correct explanation of assertion.

14. **Assertion** Covalent compounds are generally good conductor of electricity.

Reason: Covalent compounds have cations and anions which can migrate to the opposite poles of an electrolytic cell. [1]

Ans : (d) Assertion is true but reason is false.

Section B

15. What are the limitations of extracting energy from:

- i. wind
ii. waves
iii. tides [3]

Ans :

- i. **Wind :**

- (a) It can be extracted only at limited sites, where the wind blows most of the time in a year.
(b) The minimum speed of wind should be 15

km/h.

- (c) Large area is required to build the wind farm/wind mills, which is an expensive affair.

- (d) Efficiency is low and maintenance cost is high.

- ii. **Waves :**

- (a) The place and time is limited, when the waves are strong.

- (b) Initial setup cost is expensive.

- (c) Efficiency is low.

- iii. **Tides :**

- (a) The areas where tidal energy can be harnessed are very limited.

- (b) Efficiency is low.

- (c) These plants are not cost effective.

16. What is ethanol? Draw the structure of ethanol molecule. How does ethanol behave with the following:

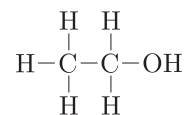
- i. Sodium

- ii. Excess of con. sulphuric acid at 443 K ?

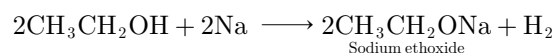
Write chemical equation for each reaction. [3]

Ans :

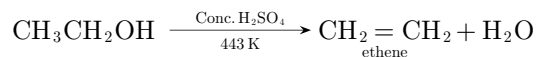
Ethanol is the second member of the homologous series of alcohols.



- i. Ethanol reacts with sodium to liberate hydrogen gas.



- ii. Concentrated hydrochloric acid dehydrates ethanol to ethene.



or

Three elements A, B and C have atomic number 7, 8 and 9 respectively.

- i. What would be their positions in the Modern Periodic Table (Mention group and period both)?
ii. Arrange A, B and C in the decreasing order of their size.
iii. Which one of the three elements is most reactive and why?

Ans :

- i. A, B and C occupy 2nd period of periodic table and 15, 16 and 17 groups respectively.

- ii. $A > B > C$ because atomic size decreases as we move from left to right across a period.

- iii. C has electronic configuration 2, 7. It needs only one electron to complete its outermost shell. So, it is more reactive.

17. Write equations to show the presence of all ions in the aqueous solutions of :

- i. CH_3COOH

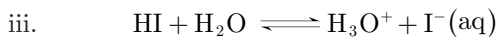
- ii. H_3PO_4

- iii. HI [3]

Ans :

- i. $\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COO}^-(\text{aq}) + \text{H}_3\text{O}^+$

- ii. $\text{H}_3\text{PO}_4 + 3\text{H}_2\text{O} \rightleftharpoons 3\text{H}_3\text{O}^+ + \text{PO}_4^{3-}(\text{aq})$



18. i. Name the plant used by Mendel to carry out his experiments.
 ii. Study the following cross and answer the questions that follow :
- | | | | |
|---------------------------|---------------------------|---|--------------------------|
| Parents | Green and Round seed | × | Yellow and Wrinkled seed |
| F ₁ Generation | All Green and Round seeds | | |

F ₂ Generation	Green and Round (9)	Green and Wrinkled (3)
	Yellow and Round (3)	Yellow and Wrinkle

- (a) List the dominant and recessive characters.
 (b) Are the characters linked or independent? [3]

Ans :

- i. Garden Pea (*Pisum sativum*)
 ii. (a) Dominant characters are green colour and round shape.
 Recessive characters are yellow colour and wrinkled shape.
 (b) These characters are independent.

or

- i. Differentiate between sensory neurons and motor neurons.
 ii. How is brain protected in our body?
 iii. Name the part of the brain responsible for precision of voluntary actions and maintaining body posture and balance of the body.

Ans :

- i. Sensory neurons bring the impulses received by the sense organs to the brain and the spinal cord. The motor neurons carry the message from the brain and the spinal cord to the affected muscles or the glands.
 ii. Brain is protected by the cranial bones and meninges.
 iii. Cerebellum is responsible for precision of voluntary actions, maintaining body posture and balance of the body.

19. The ozone layer is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. The damage of the ozone layer leads to variation in rainfall, ecological disturbances and other effects in global food supply. United Nations Environment programme (UNEP) has signed an agreement to limit this damage in 1986.

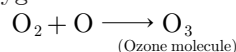
- i. Where is ozone layer found in the atmosphere? [1]
 ii. How is ozone layer formed in the atmosphere? [1]
 iii. How can you contribute in saving the ozone layer? [1]

Ans :

- i. The ozone layer is found in the stratosphere.
 ii. The ultraviolet radiation coming from the sun splits oxygen gas into free oxygen atoms.



These very reactive oxygen atoms react with oxygen molecules to form ozone molecules.



- iii. Use of synthetic chemicals such as chlorofluorocarbons (CFCs) used as refrigerants and in fire extinguishers, methane (CH₄) and oxides of nitrogen (N₂O) should be minimised for saving the ozone layer. By organising an awareness camp we can make people aware about the ill effects of destruction of ozone layer.

20. Mention the components of the transport system in highly organised plants. State the functions of these components. [3]

Ans :

Transport system in highly organised plants consists of xylem and phloem.

- i. **Xylem**—Xylem moves water and minerals obtained from the soil. It consists of tracheids, vessels, xylem fibres and xylem parenchyma.
 ii. **Phloem**—Phloem transports products of photosynthesis from the leaves to other plant parts. It consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma.
21. (i) Name all the digestive enzymes present in our digestive system.
 (ii) Explain the process of digestion of carbohydrates, fats and proteins. [3]

Ans :

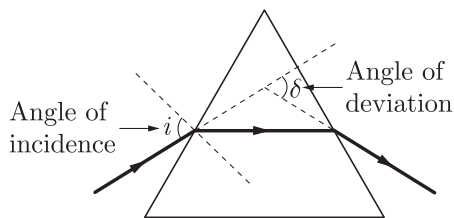
- i. The digestive enzymes present in our digestive system are:
 Salivary amylase, pepsin, trypsin, lipase, pancreatic amylase and lipase.
 ii. **Carbohydrates** : It is acted upon by salivary amylase in mouth, which converts complex insoluble starch into simple sugar form. The food with carbohydrate which is not digested in mouth, then it is digested by amylase from the pancreas to form glucose.
Fats : Bile from liver breaks the big globules of fats into smaller ones and is acted upon by lipase from pancreas, which digest fats into fatty acids.
Proteins : Proteins are first digested by pepsin in stomach to form peptones. This is further digested by trypsin from pancreas to form amino acids.

The enzymes present in small intestine finally convert protein to amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.

22. i. What do you mean by dispersion of light?
 ii. Draw a ray diagram to show the path of a light ray that enters the glass prism obliquely Label on it the angle of incidence and angle of deviation. [3]

Ans :

- i. The phenomenon due to which a white light splits into its component colours, when passed through a prism is called dispersion.
 ii.



23. i. Define the term 'volt'.
 ii. Calculate the potential difference between the two terminals of a battery, if 100 joules of work is required to transfer 20 coulombs of charge from one terminal of the battery to the other.

Ans :

- i. Potential difference between two points in an electric field is said to be 1 volt if the amount of work done in bringing a unit positive charge from one point to another point is 1 J.
 ii. Given:

$$W = 100 \text{ J}, Q = 20 \text{ C}, V = ?$$

We know that,

$$V = \frac{W}{Q} \Rightarrow V = \frac{100}{20} \text{ JC}^{-1}$$

$$V = 5 \text{ JC}^{-1}$$

$$V = 5 \text{ Volt.}$$

24. A convex lens forms a real image 4 times magnified at a distance of 60 cm from the lens. Calculate the focal length and the power of the lens. [3]

Ans :

Given, distance of image, $v = 60 \text{ cm}$,

$$m = -4 \text{ (For real image)}$$

$$m = \frac{v}{u} = -4 \Rightarrow u = \frac{v}{-4} = -\frac{60}{4}$$

$$= -15 \text{ cm}$$

From the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{60} - \frac{1}{-15}$$

$$= \frac{1+4}{60} = \frac{5}{60} = \frac{1}{12}$$

Focal length, $f = 12 \text{ cm} = \frac{12}{100} \text{ m}$

The power of the lens, $P = \frac{1}{f \text{ (in m)}}$
 $= \frac{1}{\frac{12}{100} \text{ m}} = \frac{100}{12} \text{ D}$
 $= 8.33 \text{ D}$

or

- i. Define power of a lens and write its S.I unit.
 ii. A convex lens of power 4 D is placed at a distance of 40 cm from a wall. At what distance from the lens should a candle be placed so that its image is formed on the wall?

Ans :

- i. Power of a lens is reciprocal of its focal length in metre. The SI unit of it is dioptre.
 ii. Focal length of the lens,

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

Here, Power of lens, $P = 4$

Now, $f = \frac{1}{4} = 0.25 \text{ m} = 25 \text{ cm}$

As we know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{25} = \frac{1}{40} - \frac{1}{u}$$

from the lens formula,

$$\frac{1}{u} = \frac{1}{40} - \frac{1}{25} = \frac{5-8}{200} = -\frac{3}{200}$$

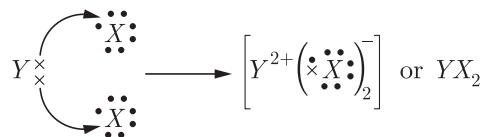
$$u = -\frac{200}{3} = -66.67 \text{ cm}$$

Section C

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.
 i. Where in the periodic table are elements X and Y placed?
 ii. Classify X and Y as metal (s), non-metal(s) or metalloid(s).
 iii. What will be the nature of the oxide of element Y? Identify the nature of bonding in the compound formed.
 iv. Draw the electron dot structure of the divalent halide. [5]

Ans :

- i. X belongs to Group 17 and 3rd period.
 Y belongs to Group 2 and 4th period.
 ii. X—Non-metal, Y—Metal
 iii. Basic oxide; Ionic bonding
 iv.



or

State the reason why?

- i. Carbon is not used to reduce the oxides of sodium or aluminium.
 ii. An iron strip is dipped in a blue copper sulphate solution turns the blue solution pale green.
 iii. Metals replace hydrogen from acids whereas non-metals do not.
 iv. Calcium does not occur free in nature.
 v. Zinc is used in the galvanisation of iron and not the copper.

Ans :

- i. Sodium or aluminium have a great affinity for oxygen and therefore cannot be reduced by carbon. Hence, carbon is not used to reduce the oxides of sodium or aluminium.
 ii. When an iron strip is dipped in a blue copper sulphate solution, iron metal. reacts with copper sulphate solution and displaces copper from copper sulphate solution. Hence, the colour of the solution gradually changes to pale green.
 iii. The ionisation energy of metals is higher than hydrogen, so they can replace hydrogen from metals whereas ionisation energy of non-metals is lower than that of hydrogen, hence, they cannot

displace hydrogen from acids.

- iv. Calcium is very reactive and combine with oxygen or water vapour present in air to form compounds. Hence, these metals are not found in the free state in nature.
- v. Zinc is used in the galvanising of iron because zinc being a more active metal than iron will get oxidised first as it is coated over the surface of iron. Thus, iron escapes rusting. Copper is less reactive than iron hence, it will not react with iron and does not form any oxide layer it.

26. Write fully balanced equations for the reactions of : [5]

- i. Sulphur dioxide and water
- ii. Sodium with water
- iii. Iron with oxygen
- iv. Aluminium and potassium hydroxide.
- v. Iron (III) oxide and dilute sulphuric acid.

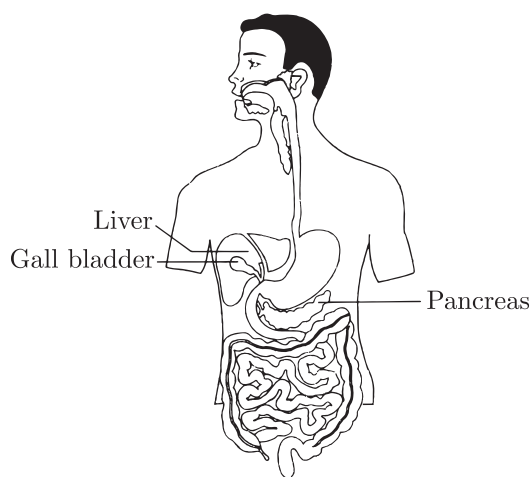
Ans :

- i. $SO_2(g) + H_2O(l) \longrightarrow H_2SO_3$
- ii. $2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(aq) + H_2(g)$
- iii. $4Fe(s) + 3O_2(g) \xrightarrow{\text{heat}} 2Fe_2O_3(s)$
- iv. $2Al(s) + 2KOH(aq) + 2H_2O(l) \longrightarrow 2KAlO_2(aq) + 3H_2(g)$
- v. $Fe_2O_3(s) + 3H_2SO_4(aq) \longrightarrow Fe_2(SO_4)_3 + 3H_2O(l)$

27. i. Draw a diagram depicting the Human Alimentary Canal and label on it, Gall Bladder, Liver and Pancreas.
- ii. State the roles of liver and pancreas.
- iii. Name the organ which performs the following functions in humans :
- (a) Absorption of digested food.
 - (b) Absorption of water
- [5]

Ans :

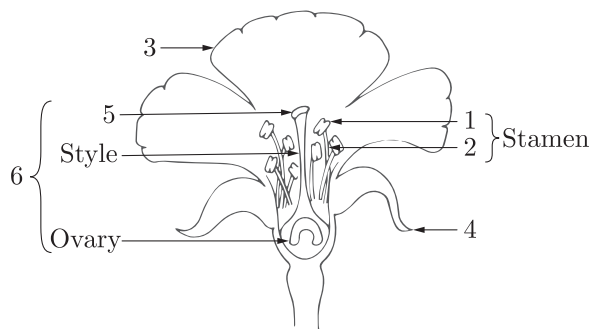
i.



Human Alimentary canal

- ii. The liver secretes bile which contains bile pigments and bile salts. Bile emulsifies fats present in the food. The pancreas releases the pancreatic juice into the duodenum. The pancreatic amylase breaks down starch and other carbohydrates into glucose.
- iii. (a) Small intestine
(b) Large intestine

28. i. In the given figure name the parts marked 1 to 6.



ii. Differentiate between self pollination and cross pollination. [5]

Ans :

- i. 1. Anther 2. Filament 3. Petal
4. Sepal 5. Stigma 6. Carpel
- ii.

	Self Pollination	Cross Pollination
1.	Self pollination occurs within a flower or between two flowers of the same plant.	Cross pollination occurs between two flowers borne on different plants of the same species.
2.	Flowers are neither attractive, nor do they produce nectar.	Flowers attract insects by various means like coloured petals, nectar, etc.
3.	Pollen grains are produced in small number.	Pollen grains are produced in large numbers.
4.	Wastage of pollen grains occurs, thus economical.	No wastage of pollen grains occurs, hence uneconomical.

or

- i. Differentiate between fertilisation and germination.
- ii. State in brief the functions of the following parts of the human male reproductive system :
(a) Scrotum
(b) Testes
(c) Vas deferens

Ans :

i.

	Fertilisation	Germination
1.	It is the fusion of male and female gametes.	In it the food reserves present in a seed are broken down and the embryo start to grow.
2.	It occurs in plants and animals of various types.	It occurs only in seed plants.
3.	It actually brings about fusion of gametes.	During it, seeds convert into seedling.

	Fertilisation	Germination
4.	Fertilisation occurs only after pollination when the pollen grain has germinated and sent the male gametes to the ovule.	It begins when a seed starts to absorb water

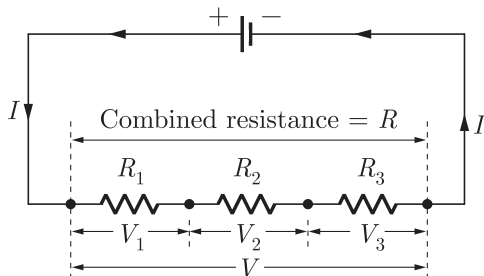
- ii.
- (a) **Scrotum** : It contains and supports the testes. It is situated outside the body cavity and allow sperm to develop at the optimum temperature, which is slightly lower than body temperature.
 - (b) **Testes** : The formation of male germ cells or sperms take place in it. Leydig cells of testes secrete hormone testosterone which brings about changes in appearance seen in boys at the time of puberty.
 - (c) **Vas deferens** : It ascends into the abdomen, passes over the urinary bladder and receives duct from the seminal vesicles behind the urinary bladder to form the ejaculatory duct

29. Derive an expression for equivalent resistance (R), when resistors R_1, R_2, R_3 are connected in series. [5]

Ans :

Consider three resistors of resistances R_1, R_2 and R_3 connected in series, such that I is the current flowing through them. Let R be the equivalent resistance of the circuit. Let V_1, V_2 , and V_3 ; be the potential difference at the ends of resistors R_1, R_2 , and R_3 . If V is the combined potential difference of all the resistors in series, then :

$$V = V_1 + V_2 + V_3 \quad \dots(1)$$



According to the Ohm's law,

$$I = \frac{V}{R} \Rightarrow V = IR \quad \dots(2)$$

Applying, Ohm's law to the individual resistors. Current in the resistor R_1 :

Similarly, $I = \frac{V_1}{R_1}$ or $V_1 = IR_1 \quad \dots(3)$

Current in the resistor R_2 ; $I = \frac{V_2}{R_2}$ or $V_2 = IR_2 \quad \dots(4)$

Current in the resistor R_3 ; $I = \frac{V_3}{R_3}$ or $V_3 = IR_3 \quad \dots(5)$

Substitute the value of V_1, V_2 and V_3 in Eq. (1)

$$V = IR_1 + IR_2 + IR_3$$

From Eq. (2), we get,

$$IR = I(R_1 + R_2 + R_3)$$

$$R = R_1 + R_2 + R_3$$

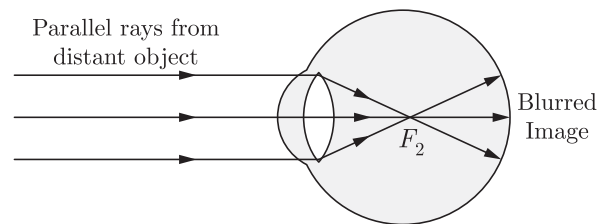
Thus, the total resistance in series combination is equal to the sum total of the individual resistances in series.

30. A student finds the writing on the blackboard as blurred and unclear when sitting on the last desk of the class room. He however sees clearly when sitting on the front desk of an approximate distance 2 m from the blackboard.

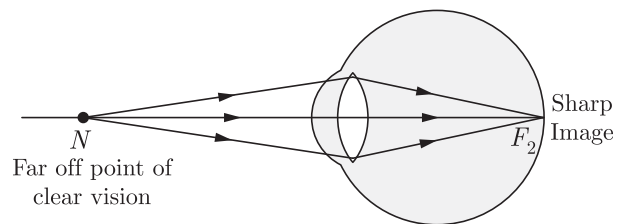
- i. Draw the ray diagram to illustrate the formation of image of the blackboard writing by his eye lens when he sits at the :
 - (a) last desk
 - (b) front desk
- ii. Name the defect of vision the student is suffering from. Also, list two causes of this defect.
- iii. Name the kind of lens that would enable him to see clearly when he is seated at the last desk. Draw the ray diagram to illustrate how this lens helps him to see clearly. [5]

Ans :

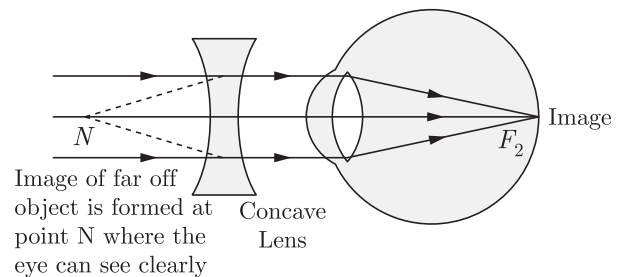
- i. (a)



- (b)



- ii. Defect of vision — myopia (Short-sightedness)
 - Two causes of this defect :
 - (a) Ciliary muscles get weak.
 - (b) Eye ball gets elongated.
- iii. Concave lens is used for the correction of myopic eye (seated at last desk)



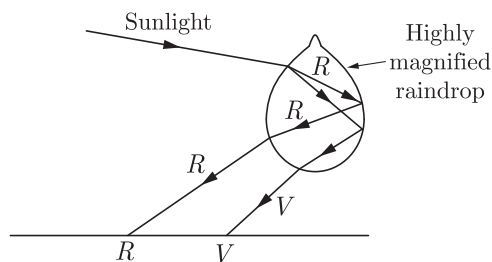
or

- i. What is meant by dispersion of light?
- ii. Describe the formation of rainbow in the sky.
- iii. What is meant by accommodation of eye? Name the part of eye which helps in this phenomenon and state how does it help.

Ans :

- i. **Dispersion of light** : The phenomenon due to which a white light splits into its component colours, when passed through a prism. White light is combination of seven different colours of light having different wavelengths.

More is the wavelength of light, less is the angle of deviation for the same material and same angle of incidence. This is caused of dispersion of white light.



- ii. The rainbow is produced due to the dispersion of sunlight by tiny droplets of water suspended in air, just after rain.

From the figure when the sunlight is incident on the side A of the droplet of water, it gets refracted as well dispersed. The dispersed rays on striking the surface B of tiny droplets, suffer total internal reflection and moves towards surface A, the rays further suffer refraction and emerge out as the band of colours in the form of a circular arc (rainbow) along the horizon. The red colour appears upper arc and violet colour on the innermost arc of the rainbow.

- iii. **Accommodation of eye :** The phenomenon by which the ciliary muscle alter the focal length of the crystalline lens, so as to focus nearer or far-off objects clearly on the retina is called accommodation of the eye.

In order to focus at far-off objects, the ciliary muscles relax to make crystalline lens thin and its focal length increases. In order to focus nearer objects, ciliary muscles contract to make crystalline lens thick and its focal length decreases.

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