Class X Session 2026-27
Subject - Science
Sample Question Paper - 1

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A

1. One-cell thick blood vessels are known as: **[1]**

   a) Veins b) Arteries

   c) Alveoli d) Capillaries

2. A cross between two tall pea plants resulted in offsprings having a few dwarf plants. The gene-combination of the parental plants must be **[1]**

   a) Tt and Tt b) Tt and tt

   c) TT and tt d) TT and Tt

3. In an ecosystem, the amount of energy of sunlight captured by green plants to convert it into food energy is : **[1]**

   a) 90% b) 1%

   c) 99% d) 10%

4. Match the following with correct response. **[1]**

Column A	Column B
(i) The largest part of the brain	(a) Cranial meninges
(ii) The protective covering of the brain	(b) Spinal cord
(iii) Forebrain	(c) Olfactory lobe
(iv) Cerebellum	(d) Cerebrum

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

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

5. Green plants occupy the first trophic level in every food chain because they **[1]**

   a) can synthesize food by b) exist over a large area.

photosynthesis.

c) have very less concentration of harmful chemicals.

d) have to feed large number of herbivores.

6. Most of the digestion and absorption of the food takes place in the **[1]**

a) small intestine

b) stomach

c) large intestine

d) liver

7. The plant hormone present in greater concentration in the areas of rapidly dividing cells is: **[1]**

a) Gibberellins

b) Abscisic acid

c) Cytokinins

d) Auxin

8. **Assertion (A):** Amoeba always produces two daughter amoebae while Plasmodium divides into many daughter cells. **[1]**
Reason (R): Amoeba undergoes binary fission while Plasmodium undergoes multiple fission.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

9. **Assertion (A):** Use of jute bags for shopping reduces pollution. **[1]**
Reason (R)**:** Jute is biodegradable and its bag may be reused as and when needed.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

10. a. List any two contraceptive methods practised only by women. Mention how these methods work. **[2]**
b. Write the two roles performed by testes in human males.

11. i. Write two harmful effects of using plastic bags on the environment. Suggest alternatives to the usage of plastic bags. **[2]**
ii. List any two practices that can be followed to dispose off the waste produced in our homes.

OR

a. Define ecosystem.
b. Autotrophs are at the first level of food chain. Give reason.
c. In a food chain of frogs, grass, insects and snakes assign trophic level to frogs. To which category of consumers do they belong to?

12. Draw a diagram of neuron and name and label the part **[2]**
a. where information is acquired,
b. through which information travels as an electric impulse, and

c. where the electric impulse must be converted into a chemical signal for onward transmission.

13. a. Name the two types of gametes produced by men. **[3]**

b. Does a male child inherit X chromosome from his father? Justify.

c. How many types of gametes are produced by a human female?

14. a. Draw a diagram of human excretory system and label on it the following parts: **[3]**

i. Kidney

ii. Ureter

iii. Urinary bladder

iv. Urethra

b. Write one main function each of the labelled parts.

15. **Read the following text carefully and answer the questions that follow:** **[4]**

A student crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds. He found that only one type of seeds were produced in the F_1 generation. When these F_1 generation pea plants were self-pollinated with each other , then in addition to the seed type of F_1 generation, some new types of seed combinations were also obtained in the F_2 generation.

i. Which traits in the above mentioned cross are dominant traits? (1)

ii. What are the new possible combinations of seeds likely to be observed in F_2 generation? (1)

iii. Give reason why the traits which were not visible in the seeds of F_1 generation reappeared in the seeds of F_2 generation. Write the ratio of different types of seeds obtained in F_2 generation in this case. (2)

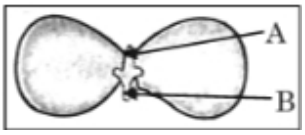
OR

What is meant by the terms (I) dominant, and (II) recessive traits? Explain. (2)

16. a. Name a unisexual and a bisexual flower. **[5]**

b. Define cross pollination. State how it is carried out.

c. Observe the diagram given below and name the parts marked as **A** and **B**.



Mention the function of each of these parts.

OR

i. Distinguish between hormonal co-ordination in plants and animals.

ii. Which part of the brain is responsible for -

1. intelligence
2. riding a bicycle
3. vomiting
4. controlling hunger

iii. How is brain and spinal-cord protected against mechanical injuries?

Section B

17. Select the incorrect statement. **[1]**

a. The formula of the compound is calcium sulphate dihydrate.

b. When mixed with water and left for half an hour, this compound sets into a hard mass.

c. If heated at higher temperature, the compound becomes dehydrated and is called dead burnt plaster.

d. Both (a) and (b)

a) Statement (d) is incorrect.

b) Statement (a) is incorrect.

c) Statement (b) is incorrect.

d) Statement (c) is incorrect.

18. Soap doesn't work well with woollen garments because: **[1]**

A. It is basic in nature and woollen garments have acidic dyes.

B. It is acidic in nature and woollen garments have basic dyes.

a) (A)

b) (B)

c) None of these

d) Both (A) and (B)

19. The metals which are found in both free state as well as combined state are: **[1]**

a) Gold and silver

b) Gold and platinum

c) Platinum and silver

d) Copper and silver

20. Match the following with the correct response: **[1]**

Column A	Column B
(i) Welding	(a) Ethyl alcohol
(ii) Fuel in a spirit lamp	(b) Ester
(iii) Lime water turns milky	(c) Carbon dioxide
(iv) Fruity smell	(d) Ethyne and oxygen

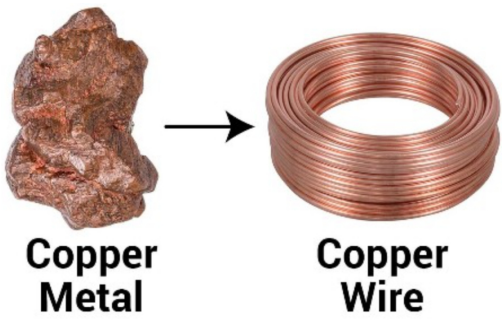
a) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)

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

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

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

21. The property of metal by which it can be drawn into wires is called: **[1]**



a) Ductility

b) Sonorous

c) Conductivity

d) Malleability

22. Which one of the following hydrocarbons is different from the others? **[1]**

a) C_2H_6 b) C_7H_{14}

c) C_4H_{10} d) C_5H_{12}

23. The name of the salt used to remove permanent hardness of water is: **[1]**

a) Calcium sulphate hemihydrate ($CaSO_4.\frac{1}{2}H_2O$) b) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)

c) Sodium hydrogen carbonate ($NaHCO_3$) d) Sodium chloride (NaCl)

24. **Assertion (A):** pH of ammonium nitrate solution is acidic. **[1]**
Reason (R): Solution of a salt of weak base and strong acid is acidic.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

25. A white saree has a yellow stain of curry. When soap is rubbed on this shirt during washing, the yellow stain turns reddish-brown. On rinsing the saree with plenty of water, the reddish-brown stain turns yellow again. **[2]**

a. Name the natural indicator present in curry stain.
b. Explain the changes in colour of this indicator which take place during washing and rinsing the saree.

26. i. Define the term decomposition reaction. Write one chemical equation each for decomposition reaction where energy is supplied in the form of heat, light or electricity. **[3]**
ii. Decomposition of vegetable matter into compost is considered an exothermic reaction. Why?

OR

Give the characteristic tests for the following gases

i. CO_2
ii. SO_2
iii. O_2
iv. H_2

27. Design an activity to show that metals are good conductors of heat and have high melting points. **[3]**

28. **Read the following text carefully and answer the questions that follow:** **[4]**
Redox reactions are those reactions in which oxidation and reduction occur simultaneously. A redox reaction is made up of two half reactions. In the first half reaction, oxidation takes place and in second half reaction, reduction occurs. Oxidation is a process in which a substance loses electrons and in reduction, a substance gains electrons. The substance which gains electrons is reduced and acts as

an oxidising agent. On the other hand, a substance which loses electrons is oxidised and acts as a reducing agent.

i. Illustrate where oxidation and reduction occurs together with an example? (1)

ii. What do you mean by oxidising agent and reducing agent? (1)

iii. For the given reaction, identify the oxidation and reduction parts. (2)

$ZnO + CO \longrightarrow Zn + CO_2$

OR

In the following reaction, which substance is reduced? (2)

$PbS + 4H_2O_2 \longrightarrow PbSO_4 + 4H_2O$

29. A saturated organic compound 'A' with two carbon atoms belongs to the homologous series of alcohols. On oxidation, it forms an organic acid 'B' with molecular mass 60 u. On heating 'A' with excess concentrated sulphuric acid at 443 K, an unsaturated hydrocarbon 'C' is formed. **[5]**

i. Name A, B and C.

ii. Calculate molecular mass of C.

iii. What happens when a pinch of sodium carbonate is added to compound B? Write chemical equation for the reaction.

iv. Draw electron dot structure of compound B.

OR

i. What is a homologous series of carbon compounds? Write general formula for alkynes. Name and draw the electron dot structure of first homologue of this series.

ii. State the meaning of the functional group in an organic compound. Write the formula of the functional group present in alcohols and carboxylic acids.

Section C

30. Find the incorrect statement: **[1]**

A. Convex mirrors are used by the dentist to see the large images of teeth of patients.

B. Convex mirrors are used as rear-view mirrors in cars, motorcycles, scooters, etc

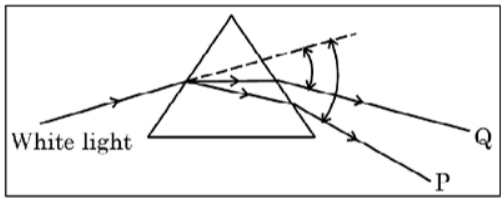
C. Concave mirrors are used for shaving purpose.

D. Concave mirrors are used by doctors to focus light inside the ear or inside the mouth for medical examination.

a) (B) b) (C)

c) (A) d) (D)

31. In the following diagram showing dispersion of white light by a glass prism, the colours **P** and **Q** respectively are- **[1]**



a) Violet and Red b) Orange and Green

c) Red and Blue
d) Red and Violet

32. **Assertion (A):** Magnetic field interacts with a moving charge and not with a stationary charge. **[1]**

Reason (R): A moving charge produces a magnetic field.

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

33. A student cannot see clearly a chart hanging on a wall placed at a distance 3 m from his eye. **[2]**

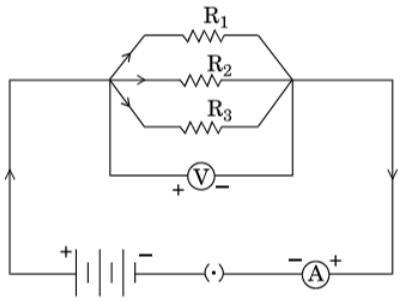
a. Name the defect of vision he is suffering from.
b. Draw a ray diagram to illustrate this defect.
c. List its two possible causes.

34. a. Write the mathematical expression for Joule's law of heating. **[2]**
b. Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

OR

In the circuit given below, the resistors R_1, R_2 and R_3 have the values 10 Ω, 20 Ω and 30 Ω respectively, which have been connected to a battery of 12 V. Calculate

a. the current through each resistor,
b. the total circuit resistance, and
c. the total current in the circuit.



35. Answer the following questions for a case in which a current carrying conductor is placed in a uniform magnetic field: **[3]**

a. List three factors on which the magnitude of the force acting on the conductor depends.
b. When is the magnitude of force on the conductor maximum?
c. Name the rule which helps in determining the direction of force on the conductor and give its one application.

36. How can changes of size of eyeball be one of the reason for **[3]**

i. myopic and
ii. hypermetropic eye?

Compare the size of eyeball with that of a normal eye in each case. How does this changes of size affect the position of image in each case?

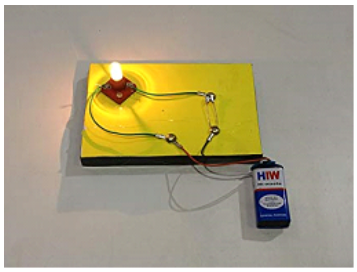
37. a. Draw the pattern of magnetic field lines around a bar magnet. Mark the position of **[3]**

North Pole, South Pole and the places where the magnetic field is strongest.

b. Why do the magnetic field lines not intersect each other?

38. **Read the following text carefully and answer the questions that follow:** **[4]**

How do we express electric current? Electric current is defined by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges. In circuits using metallic wires, electrons constitute the flow of charges. However, electrons were not known at the time when the phenomenon of electricity was first observed. So, electric current was considered to be the flow of positive charges and the direction of flow of positive charges was taken to be the direction of electric current. Conventionally, in an electric circuit, the direction of electric current is taken as opposite to the direction of the flow of electrons, which are negative charges.



i. If a net charge Q, flows across any cross-section of a conductor in time **t**, then the current **I**, through the cross-section is given by which formula? (1)

ii. What is the SI unit of electric charge? It is equivalent to how many numbers of electrons? (1)

iii. The electric current is expressed in which unit? Define the unit used to measure electric current. (2)

OR

If the amount of charge passing through the cell in 4 seconds is 12 C then find the current supplied by a cell. (2)

39. The variation of image distance (v) with object distance (u) for a convex lens is given in the following observation table. Analyse it and answer the questions that follow: **[5]**

S. No.	Object distance (u) cm	Image distance (v) cm
1	-150	+30
2	-75	+37.5
3	-50	+50
4	-37.5	+75
5	-30	+150
6	-15	+37.5

i. Without calculation, find the focal length of the convex lens. Justify your answer.

ii. Which observation is not correct? Why? Draw ray diagram to find the position of the image formed for this position of the object.

iii. Find the approximate value of magnification for u = -30 cm.

OR

i. Define principal axis of a lens. Draw a ray diagram to show what happens when a ray of light parallel to the principal axis of a concave lens passes through it.

ii. The focal length of a concave lens is 20 cm. At what distance from the lens should a 5 cm tall object be placed so that its image is formed at a distance of 15 cm from the lens? Also calculate the size of the image formed.

Solution

Section A

1. **(d)** Capillaries
   Explanation:
   Capillaries

2. **(a)** Tt and Tt
   Explanation:
   Tt and Tt

3. **(b)** 1%
   Explanation:
   1%

4. **(d)** (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)
   Explanation:
   - The cerebrum is the largest part of the brain, located superiorly and anteriorly in relation to the brainstem.
   - The primary function of Cranial meninges is to protect the nervous system. It is a three-layer protective tissue that surrounds the neuraxis.
   - Olfactory lobe Either member of a pair of lobes in the forebrain.
   - At the anterior end of the cerebrum; the part of the brain at the back of the skull in vertebrates, which coordinates and regulates muscular activity.

5. **(a)** can synthesize food by photosynthesis.
   Explanation:
   Can synthesize food by photosynthesis

6. **(a)** small intestine
   Explanation:
   The small intestine is the part of the gastrointestinal tract between the stomach and the large intestine where much of the digestion of food takes place. The primary function of the small intestine is the absorption of nutrients and minerals found in food.

7. **(c)** Cytokinins
   Explanation:
   Cytokinins

8. **(a)** Both A and R are true and R is the correct explanation of A.
   Explanation:
   Both A and R are true and R is the correct explanation of A.

9. **(a)** Both A and R are true and R is the correct explanation of A.
   Explanation:
   Both A and R are true and R is the correct explanation of A.

10. a.
    - Oral pills/chemical method: Change hormonal balance so eggs are not released.
    - Loop/Copper T: Prevents pregnancy by checking the entry of sperms through the vagina.

- Surgical method: It does not allow egg to reach the uterus.

b. Two roles of testes:
- Formation of sperms
- Secretion of hormone testosterone

11. i. Harmful effects of plastic bags:
   a. Plastics do not undergo degradation, thus stay in soil for many years. This may affect the soil fertility and degrades the soil quality.
   b. When plastic artifacts enter the drainage and sewerage system, they block the pipes and drains causing water logging.
   c. Littering of plastics in open spaces creates unhygienic conditions, as it acts as breeding ground for insects and mosquitoes.

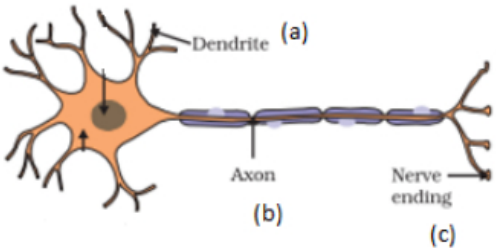
   We can reduce the use of plastic bags and carry jute bags and paper bags to carry items from the market.

   ii. Measures taken for proper disposal of waste produced at our homes are:-
   a. Prepare a compost pit for kitchen wastes.
   b. Safe disposal of plastic bags.
   c. Segregation of biodegradable and non-biodegradable wastes.
   d. Fruit peels can be placed near trees or plants, which on decomposition will enrich the soil with nutrients.
   e. Recycling of paper wastes.

OR

a. Ecosystem : It is the interaction between living / biotic and non- living / abiotic components in an area / environment. Within an ecosystem, energy flows through food webs, and nutrients cycle through biogeochemical processes, sustaining life and maintaining ecological balance.
b. Because autotrophs have the ability to trap solar energy and convert it into food by photosynthesis and transfer food energy to the next level in a food chain.
c. Frogs : Third Trophic level ; Secondary consumers

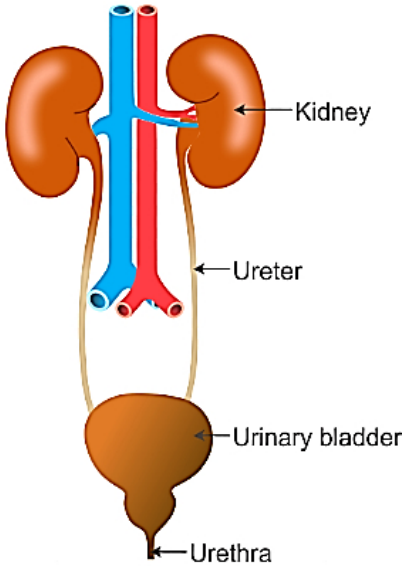
12. Diagram: Structure of a neuron



a. End of the dendritic tip
b. Axon
c. Nerve ending

13. a. Sperm having X chromosome and sperm having Y chromosome
b. No, As male child gets only Y chromosome from his father and X chromosome from mother to have XY chromosome.
c. One type/only ovum/egg

14. a. Diagram of human excretory system



b. Functions:

Kidney → Filtration of blood

Ureter → Transports urine from kidney to bladder

Urinary Bladder → Stores Urine

Urethra → Throws out urine/Excrete Urin

15. i. Round and yellow traits are dominant traits in the above cross.

ii. The F2 progeny of Mendel's dihybrid cross exhibit four different phenotypes: round yellow, round green, wrinkled yellow and wrinkled green.

iii. The traits which were not shown in F1 generation were recessive traits. The recessive traits do not show their presence in front of dominant traits. So when these products were self-crossed in F2 generation they appeared with dominant traits.

The ratio of different types of seeds are 9 : 3 : 3 : 1.

OR

(I) The trait that first appears or is visibly expressed in the organism is called the dominant trait.

(II) The trait that is present at the gene level but is masked and does not show itself in the organism is called the recessive trait.

16. a. Unisexual - Papaya/Watermelon

Bisexual - Hibiscus/Mustard

b. The transfer of pollen grains from anther of one flower to stigma of another flower is called cross - pollination.

Transfer of pollen grains is carried out by some pollinating agents like wind, water and animals.

c. A: Plumule - Future shoot

B: Radicle - Future root

OR

i.

Hormonal coordination in Plants	Hormonal coordination in Animals
1) By simple diffusion	Transported through blood to the target organ.
2) No specialised glands involved.	Hormone released by Endocrine glands.

ii. 1. Cerebrum/forebrain
2. Cerebellum/hindbrain
3. Medulla/hindbrain
4. Hypothalamus/forebrain.

iii. Brain is protected I - Bony box/skull/cranium/fluid filled balloon in skull,
Spinal cord is protected in - Backbone/Vertebral column.

Section B

17.

(c) Statement (b) is incorrect.

Explanation:

Atmosphere of Venus is made up of thick white and yellowish clouds of sulphuric acid.

18. **(a)** (A)

Explanation:

Soap is basic in nature. Acid dyes are used to dye protein fibres such as silk, wool, angora, mohair, feathers, etc. Hence, soap doesn't work well with woolen garments. The soap gets neutralized by the acidic dyes.

19.

(d) Copper and silver

Explanation:

Copper and silver

20.

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

Explanation:

- The oxyacetylene welding process uses a combination of ethyne (C_2H_2) and oxygen gas to provide a high-temperature flame. It is commonly used to permanently join mild steel.
- Alcohol meant for industrial purposes (fuel for spirit lamps) is made unfit for human consumption by adding small amounts (about 5%) of methanol to alcohol. The mixture is known as denatured spirit or denatured alcohol.
- Carbon dioxide turns lime water turns milky due to the formation of insoluble calcium carbonate.
- Esters have a fruity smell and are used in perfumes and cosmetics due to their characteristic odour.

21. **(a)** Ductility

Explanation:

Ductility

22.

(b) C_7H_{14}

Explanation:

C_7H_{14}

23.

(b) Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$)

Explanation:

Insoluble carbonates are created when washing soda reacts with the salts in water and are easily removed through physical means.

24. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Ammonium nitrate is a salt of ammonium hydroxide (weak base) and nitric acid (strong acid).

25. a. The curry stain contains **turmeric** which is a natural indicator of acids and bases.
    b. When the saree was washed with soap as soap solution is basic in nature the colour of the stain changes to reddish brown. But after when rinsed with water, soap was washed off and in the absence of soap, the color again changed to yellow.

26. i. A single reactant (substance) breaks down to give two or more products.

- $CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2(g)$
- $2AgCl(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Cl_2(\ g)$
- $2H_2O(l) \xrightarrow[\text{Current}]{\text{Electric}} 2H_2(\ g) + O_2(\ g)$

ii. because energy (heat) is released.

OR

The characteristic test for

i. Carbon dioxide (CO_2): This gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.

$$\underset{Limewater}{Ca(OH)_2} + \underset{Carbon\ dioxide}{CO_2} \longrightarrow \underset{Calcium}{CaCO_3} + H_2O$$

ii. Sulphur dioxide (SO_2): This gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO_2 is a strong reducing agent

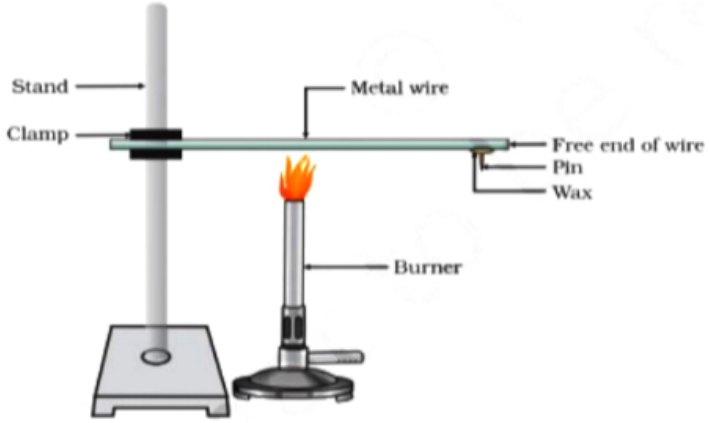
$$2KMnO_4 + 2H_2O + 5SO_2 \longrightarrow K_2SO_4 + \underset{\text{Manganese sulphate}}{2MnSO_4} + 2H_2SO_4$$

iii. Oxygen: The evolution of oxygen (O_2) gas during a reaction can be confirmed by bringing a burning candle near the mouth of the test tube containing the reaction mixture. The intensity of the flame increases because oxygen supports burning.

iv. Hydrogen (H_2): This gas burns with a squeaky pop sound when a burning candle is brought near the mouth of the test tube. Hydrogen gas is highly flammaed.

27. **Activity:**

Take an aluminum or copper wire and clamp it on a stand as shown in the diagram.
Fix a pin to the free end of the wire using wax.
Heat the wire with spirit lamp or burner near the place where it is clamped.
We will observe that the pin falls when the wax melts but wire does not melt.
It indicates that metals are good conductors of heat and have high melting points.



28. i. **The oxidation and reduction occurring together** are called a redox reaction. CuO + H_2 $\longrightarrow$ Cu + H_2O. Example: In this reaction, copper oxide is being reduced to copper whereas hydrogen is being oxidised to water.

ii. Oxidising agents give oxygen to or removes hydrogen from other substances. The reducing agent undergoes loss of electrons. A reducing agent (also called a reductant or reducer) is an element or compound that loses (or "donates") an electron to another chemical species in a redox chemical reaction.

iii. ZnO is being reduced
ZnO is reduced to Zn and CO is oxidised to CO_2

OR

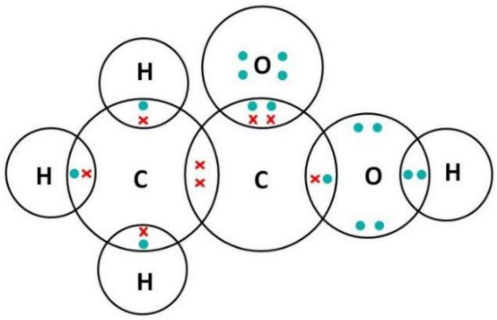
H_2O_2 is reduced to water by removal of oxygen.

29. i. $A =$ Ethanol/Ethyl alcohol/C_2H_5OH
$B =$ Ethanoic acid/Acetic acid/CH_3COOH
$C =$ Ethene/C_2H_4/$CH_2 = CH_2$

ii. Molecular mass of ethene (C_2H_4)
$12 \times 2 + 1 \times 4 = 24 + 4 = 28u$

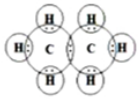
iii. Brisk effervescence is observed.
$CH_3COOH + Na_2CO_3 \rightarrow CH_3COONa + H_2O + CO_2$

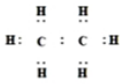
iv. (Ethanoic acid)

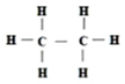


OR

i. A homologous series are compounds with the same general formula that differ only in the carbon chain length. Compounds in a homologous series often have a fixed set of functional groups, resulting in chemical and physical properties that are comparable.
The general formula of alkynes is C_nH_{2n-2}.


Electron dot structure of ethane


Electron dot structure of Ethane molecule


Structural formula of Ethane

ii. Functional group is defined as an atom which makes carbon compounds reactive and also the decides the various properties of the compounds.
The formula for the functional groups present in the following compound are as follows:
Alcohol - OH
Carboxylic acids

$$-\overset{\overset{O}{\|}}{C} - OH$$

Section C

30.

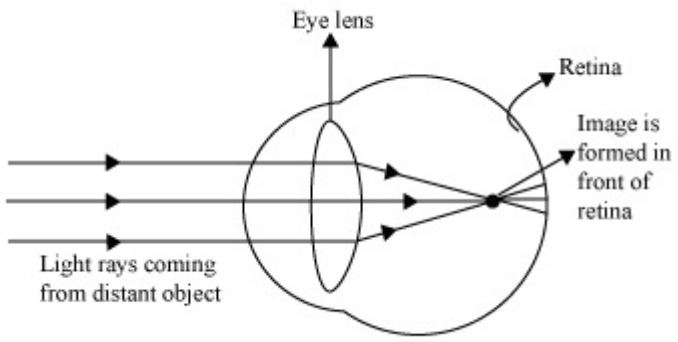
(c) (A)
Explanation:
Concave mirrors are used by the dentist to see the large images of teeth of patients since concave mirrors form enlarged images. Concave mirrors are also used for shaving purpose. Convex mirrors form diminished images. They are used as rear-view mirrors in cars, motorcycles, scooters, etc since they give a wide field of view.

31. **(a)** Violet and Red
Explanation:
The splitting of white light into its constituent colours is known as light dispersion. The spectrum is the band of seven colours produced by splitting white light. All of the constituent colours of white light have the same velocity in vacuum, but their velocity changes when they pass through a transparent 'medium' like a glass prism. Different colours are diverted by different angles on the prism's initial face. Violet's minimum speed is deviated by the

maximum angle, whereas red's maximum speed is distorted by the minimum angle. As a result, the letters 'P' and 'Q' are violet and crimson, respectively.

32. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:
An electric current is equivalent to the charges (or electrons) in motion. Such charges produce magnetic interaction. The magnetic field produced by current interacts with magnetic needle and deflects it.

33. a. Myopia or Short-sightedness is the inability of an eye in viewing long distance objects. The image in this case falls before the retina.
b. A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of its retina as shown in figure.



c. For every myopic eye, there exists a far point beyond which clear image cannot be seen. Short-sightedness is caused due to
i. excessive curvature in cornea.
ii. elongation of eyeball.

34. a. The mathematical expression of the Joules Law of heating is: $H = I^2 Rt$
Here, H is a heating effect, I is the current flowing through the device and t is the time taken.
b. Given:
Amount of charge transferred = 96000 C
Time taken = 2hrs = $2 \times 60 \times 60$ sec = 7200 sec
Potential difference = 40 V
Heat generated = $V \times I \times t$
and we know that; $I = \frac{Q}{t}$
So, $H = VQ$
$= 40 \times 96000$
$= 3.84 \times 10^6$ J

OR

Given: $R_1 = 10\ \Omega$; $R_2 = 20\ \Omega$; $R_3 = 30\ \Omega$
According to Ohm's law,
$V = IR$
Given V = 12 V
a. Current through resistor R_1:

$$I_1 = \frac{V}{R_1} = \frac{12}{10} = 1.2 \text{ A}$$

Current through resistor R_2:

$$I_2 = \frac{V}{R_2} = \frac{12}{20} = 0.6 \text{ A}$$

Current through resistor R_3:

$$I_3 = \frac{V}{R_3} = \frac{12}{30} = 0.4 \text{ A}$$

b. Total circuit resistance, R

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$\frac{1}{R} = \frac{1}{10} + \frac{1}{20} + \frac{1}{30}$

$\frac{1}{R} = \frac{11}{60}$

$R = \frac{60}{11} = 5.45\Omega$

c. The total current in the circuit is $I = I_1 + I_2 + I_3$

$= 1.2 + 0.6 + 0.4 = 2.2$ A

35. a. i. Magnitude of current,
ii. Strength of the magnetic field.
iii. Orientation of the conductor in the magnetic field.
iv. Length of the conductor

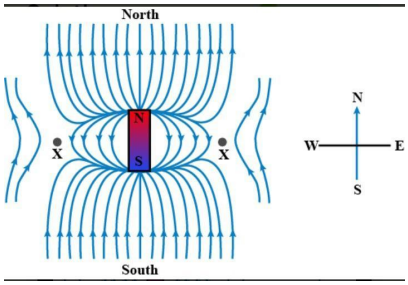
b. When the current carrying conductor is placed at right angles to (or perpendicular) to the direction of the magnetic field.

c. Fleming's Left-hand rule
Electric motors/Microphones/Generator **(Any one)**

36. i. The eye suffering from myopia or short-sightedness, has long eyeball than that of normal eye due to which the retina is at a larger distance from the eye lens thus image formation occurs before retina rather than onto it.

ii. The eye suffering from hypermetropia or long-sightedness has short eyeball than that of normal eye due to which the retina is at smaller distance from the eye lens thus, the formation of the image occurs behind the retina and not on retina.

37. a.



the poles are mentioned in the given figure and the magnetic field will be stronger at the end of the pole.

b. If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible. Hence the field lines do not cross or intersect each other.

38. i. If a net charge Q, flows across any cross-section of a conductor in time 't', then the current 'I', through the cross-section is given by $I = \frac{Q}{T}$

ii. The SI unit of electric charge is the coulomb (C), which is equivalent to the charge contained in nearly 6×10^{18} electrons.

iii. The electric current is expressed by a unit called ampere (A). One ampere is constituted by the flow of one coulomb of charge per second.

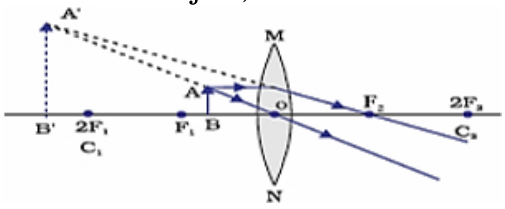
OR

$I = \frac{Q}{t} = \frac{12}{4} = 3A$

39. i. S. No. 3, 2f is 50 cm. $\therefore$ 2f = 50 cm, or f = 25 cm.
Justification: Object distance(u) and image distance (v) are same so it implies that object is placed at 2F.

ii. S. No. 6, is not correct.
Reason: For u = –15 cm, sign of v must be - ve (as the image is formed on the same side of the

lens as the object)

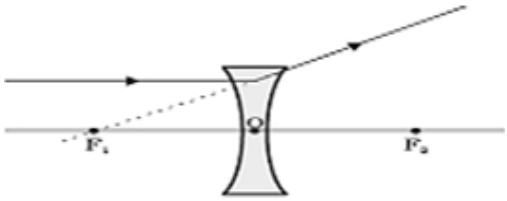


iii. Magnification: $m = \frac{v}{u}$

$= \frac{+150 \text{ cm}}{-30 \text{ cm}} = -5 \text{ cm}$

OR

i. Principal axis: It is an imaginary line passing through the two centres of curvatures of a lens.



ii. f = -20 cm; h = 5 cm; v = -15 cm

$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{(-15)} - \frac{1}{(-20)}$

$= \frac{-1}{60 \text{ cm}}$

or u = – 60 cm object is at a distance of 60 cm from the lens

Size of the image(magnification): $\text{m} = \frac{h'}{h} = \frac{v}{u}$

$h' = \frac{V}{u} \times h = \frac{(-15)}{(-60)} \times 5 = 1.25 \text{ cm}$