Sample Paper

Time: 2.30 hrs | Max. Marks: 80

General Instructions:

(i) The question paper has 23 questions in all. All questions are compulsory. Marks are indicated against each question.

(ii) Questions from serial number 1-16 are VSA Questions. Each question carries 1 mark.

(iii) Questions from serial number 17-24 are 3 marks questions. Answer of these questions should not exceed 80 words each.

(iv) Questions from serial number 25-31 are 5 marks questions. Answer of these questions should not exceed 100 words each.

(v) Question number 32 is a map question of 5 marks : 2 marks from History & 3 marks from Geography. After completion, attach the map inside your answer book.

SECTION A

1. Why does Calcium float on water?

OR

Name the acid present in the following:

(i) Tomato (ii) Vinegar (iii) Tamarind

2. Which of the following belongs to the homologous series of alkynes?

A. C_6H_6 B. C_2H_6

C. C_2H_4 D. C_3H_4.

Answer: D

3. A car headlight bulb working on a 12 V car battery draws a current of 0.5 A. The resistance of the light bulb is:

A. 0.5 Ω B. 6 Ω

C. 12 Ω D. 24 Ω

4. An object is moved closer to an eye. What changes must take place in the eye in order to keep the image in Sharp focus?

5. A circular conducting coil has 'n' turns. If the magnitude of the magnetic field produced by a single coil is B, then what is the magnetic field of the entire coil?

6. Write true or false for the following statements:

Potential is positive of a positively charged body and is negative of a negatively charged body.

OR

Write true or false for the following statements:

If the resistance of a conductor is doubled, the current is halved.

7. Rays from the sun converge at a point 15 cm in front of a concave mirror. Where an object should be placed, so that its image formed is equal to the size of the object?

8. A convex lens of focal length 20 cm can produce a magnified virtual as well as a real image. Is this a correct statement? If yes, where shall the object be placed in each case for obtaining these images?

9. In which of the following media: glass, water and diamond

(a) Light travels slowest.

(b) Light travels fastest.

(Refractive indices of the substance are: 1.5, 1.33 and 2.42 respectively)

OR

Why it necessary to connect an earth wire to electric appliances having metallic bodies?

10. In a food chain, the third trophic level is always occupied by:

A. carnivores B. herbivores

C. decomposers D. producers

11. Which organ helps in the exchange of gases, nutrients and wastes in the womb for the developing foetus?

OR

Plasmodium, the malarial protozoan divides by which method of asexual reproduction?

12. Which blood vessel brings deoxygenated blood from the heart towards the lungs?

OR

The process of passing out of undigested food as feces from the alimentary canal is known as _____.

13. Write true or false for the following statements:

A child who inherits an X-chromosome from father will be a boy.

14. In the following Questions, the Assertion and Reason have been put forward. Read the statements carefully and choose the correct alternative from the following:

Assertion: The 200 W bulbs glows with more brightness then 100 W bulbs.

Reason: A 100 W bulb has more resistance than a 200 W bulb.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is true but reason is false.

E. Assertion is false but reason is true.

15. In the following Questions, the Assertion and Reason have been put forward. Read the statements carefully and choose the correct alternative from the following:

Assertion: Salts of strong acids and weak bases undergo cationic hydrolysis.

Reason: Strong acids have higher acid dissociation constants.

A. Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.
B. The Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.
C. The assertion is true but the Reason is false.
D. The statement of the Assertion is false but the Reason is true.

16. **Assertion (A) :** *Amoeba* does not require any respiratory organ like Lungs or Gills.

Reason (R) : *Amoeba* is made up of a single cell only.

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 incorrect explanation of A
C. A is true but R is false
D. Both A and R are false

17. Answer the question 17(a)-17(e) based on the paragraph given below and your understanding:

The energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs. As it moves progressively through the various trophic levels it is no longer available to the previous level.

(a) The flow of energy in a food chain is

A. Unidirectional

B. Multidirectional

C. Bidirectional

D. The energy does not flow in a food chain.

(b) The flow of energy in a food web is

A. Unidirectional B. Multidirectional

A. Bidirectional

B. The energy does not flow in a food chain.

(c) How much percentage of energy is transferred from one trophic level to the next?

(d) Where does the rest of the energy, that is not transferred, dissipate?

(e) How much percentage of energy is captured by the plants from the solar radiations to prepare their own food?

18. Answer the question 18(a)-18(e) based on the paragraph given below and your understanding:

Mendeleev realized that the physical and chemical properties of elements were related to their atomic mass in a 'periodic' way, and arranged them so that groups of elements with similar properties fell into vertical columns in his table. He was also able to work out the atomic mass of the missing elements, and so predict their properties. He also left the gaps for the elements to be discovered later. At present 118 elements are known to exist in nature but at the time of Mendeleev, fewer elements were studied.

Read the following and answer any four questions from 18 (a) to 18 (e)

(a) The position of which element is not fixed in Mendeleev's periodic table?

(b) According to Mendeleev, elements are periodic functions of their _____.

(c) How many elements were studied by Mendeleev?

(d) In Mendeleev's Periodic Table, gaps were left for the elements to be discovered later. Which elements found a place in the periodic table later?

(e) What is a homologous series? Explain with an example.

19. Read the following and answer any **four** questions from 19 (a) to 19 (e)

(a) Chemical formula of baking soda is _____.

(b) An acid that contains more than one acidic hydrogen atom is called a _____.

(c) When an acid reacts with a metal, _____ gas is evolved and a corresponding _____ is formed.

(d) When an acid reacts with a metal carbonate or metal hydrogencarbonate, it gives the corresponding salt, _____ gas and _____.

(e) _____ is the fixed number of water molecules chemically attached to each formula unit of salt in its crystalline form.

20. Read the following paragraph and answer the following questions: -

Hypermetropia is a common eye condition where nearby objects appear blurred, but your vision is clearer when looking at things further away. If you feel your eyes are often tired and you have problems focusing on objects close to your eyes, you may have hypermetropia. A person is suffering from hypermetropia (long sightedness). The near point of the person is 1.5 m.

Assume that the near point of the normal eye is 25 cm.

Read the following and answer any **four** questions from 20 (i) to 20 (v)

(a) The type of lens to be used in his spectacles is

A. concave B. convex

C. Plano concave D. cylindrical

(b) The focal length of the lens he should use is

A. 20 cm B. 30 cm

C. 40 cm D. 50 cm

(c) The power of the lens is

A. 2.2 D B. 1.1 D

C. 4.4 D D. 3.3 D

(d) What is the other name of Hypermetropia?

A. Short-sightedness B. Long-sightedness

C. Night blindness D. Presbyopia

(v) A The power of a lens is +2.5 D. What kind of lens is it and what is its focal length?

(A) Concave lens, 100 cm

(B) Concave lens, 40 cm

(C) Convex lens, 40 cm

(D) Convex lens, 50 cm

SECTION B

21. What are respiratory substrates? Give one example.

OR

Name the sites where the bile juice produced and stored?

22. Producers are also referred to as the autotrophs. Why?

23. What will be the change in the value of pH if the concentration of the aqueous solution of HNO_3 is increased to 0.05 M from 0.03 M?

OR

What are the constituents of solder alloy? Which property of solder makes it suitable for welding electrical wires?

24. (a) What is the function of an earth wire in electrical instruments? Why is it necessary to earth the metallic electric appliances?

(b) Explain what is short-circuiting and overloading in an electric supply.

25. (i) Mention the factors on which the direction of force experienced by a current carrying conductor placed in a magnetic field depend.

(ii) A proton beam is moving along the direction of a magnetic field. What force is acting on the proton beam? (1+1)

26. (i) State and explain the laws of refraction of light with the help of a labeled diagram. (1)

(ii) Light in incident on a clear-plastic block at an angle of 45°. The speed of light in the plastic is $c/\sqrt{2}$, where c is the speed of light in vacuum. Find the angle of refraction. (1)

SECTIONC

27. (i) What is meant by blood pressure?

(ii) How systolic pressure differs from diastolic pressure?

(iii) Name the equipment used to measure the blood pressure.

OR

Name the end products formed during:

(i) Oxidation of glucose in the muscles

(ii) Oxidation of glucose in body cells

(iii) Breakdown of glucose anaerobically.

28. With the help of a well labelled diagram, describe the shape of a spermatozoon. What is the advantage of this shape?

29. Why only 10% energy and mass is transferred to the next level in a food chain?

30. Differentiate between metals and non-metals with respect to their chemical properties.

31. Balance the given chemical equation stepwise.

$$SO_2(g) + H_2S(aq) \rightarrow S(s) + H_2O\ (l)$$

32. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

33. (i) An object 2 cm in size is placed 30cm in front of a concave mirror of focal length 15cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? What will be the nature and the size of the image formed? Draw a ray diagram to show the formation of the image in this case.

SECTION D

34. Define translocation with respect to transport in plants. Why is it essential for plants? Where in plants are the following synthesized:

(a) Sugar (b) Hormone?

OR

An animal (guinea pig) having black colour is crossed with guinea pig having the same colour. They produced 100 offsprings, of which 75 were black and 25 were white.

Find out

(i) What is the possible genotype?

(ii) Which trait is dominant and which is recessive? How is this determined?

35. (a) Giving an example listing two points that make a chemical equation more useful (informative). **(2)**

(b) You might have noted that when the copper powder is heated in a china dish, the surface of copper powder becomes coated with a black colour substance. (3)

(i) How has this black coloured substance formed?

(ii) What is that black substance?

(iii) Write the chemical equation of the reaction that takes place.

36. Three resistors are connected as shown in the diagram.

Through resistor of 5 ohms, a current of 1 ampere is flowing

(i) What is the current through the other two resistors? (2)

(ii) What is the potential difference across AB and AC? (1)

(iii) What is the total resistance? (2)

OR

(a) What do you mean by the term accommodation? Explain how the eye can see objects far and near distances. (2.5)

(b) What is the difference in colours of the Sun observed during sunrise/sunset and noon? Give an explanation for each. (2.5)

Hints & Solutions

SECTION A

1. Solution: When calcium reacts with water, it forms hydrogen gas (H_2). The reaction is given below:

$$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$$

The bubbles of hydrogen gas produced in the reaction get stuck to the surface of the metal. Hence, calcium floats on water.

OR

Solution:

(i) Oxalic acid [$C_2H_2O_4$]

(ii) Acetic acid [CH_3COOH]

(iii) Tartaric acid [$C_4H_6O_6$]

2. Solution: C_3H_4. follow the general formula of the alkynes series and hence belongs to the homologous series of alkynes.

3. Answer: C

Solution:

According to the Ohm's law; voltage, current and resistance of a conductor is expressed in the following way

$$V = IR$$

$$R = \frac{V}{I} \Rightarrow \frac{12}{0.5} = 24\ \Omega$$

Hence, option D is the correct answer.

4. Answer: The shape of the eye-lens should must be changed by the ciliary muscles to make it thicker and increase its converging power in order to keep the image sharp and focus.

5. Solution: We know that the magnetic field produced by a current-carrying wire at a given point depends directly on the current passing through it. Therefore, if there is a circular coil having n turns, the field produced is n times as large as that produced by a single turn. This is because the current in each circular turn has the same direction, and the field due to each turn then just adds up.

6. Answer: True

As potential depends on the charge of a body, potential is positive of positively charged body and is negative of a negatively charged body.

OR

Answer: True

This is in accordance with ohm's law. According to the Ohm's law;

$$V = IR$$

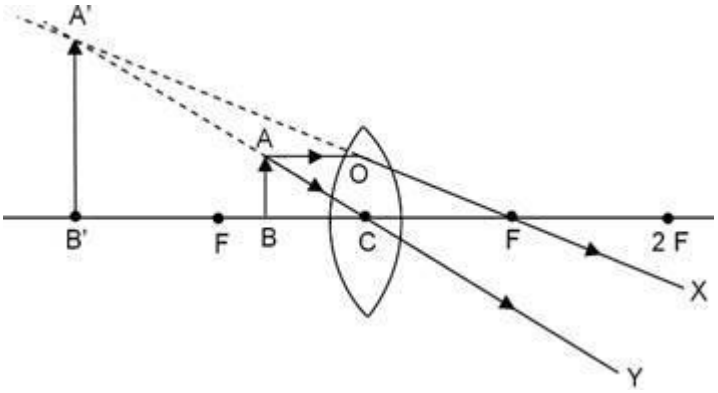
For a constant supply of voltage in a circuit, if the resistance is doubled, then the current will be halved.

7. Answer: The rays from sun coming from infinity are parallel to principal axis after reflection they converge at a point, known as focus.

Therefore, focal length (F) of concave mirror is 15 cm.

8. Answer: Yes, the above statement is correct.

A magnified virtual image can be obtained when the object is placed between optical center and principal focus of the lens means within 20cm. Figure below illustrates it.



Real image of various sizes can be obtained when the object is placed beyond the principal focus.

And we know that same size, real and inverted image is formed by concave mirror when object is placed at center of curvature i.e. 2 × Focal length (F).

So to form same size image object will be placed at 15 × 2 = 30 cm.

9. Answer:

Refractive index of glass: 1.52 to 1.9

Refractive index of water: 1.33

Refractive index of diamond: 2.42

A substance having higher refractive index is optically denser then the substance of lower refractive index and light will travel slowest in the most optically dense substance i.e. having highest refractive index.

OR

Answer:

An electric appliance having metallic body can have current leak and current may flow through its body. It can be fatal if a person touches its current carrying metallic body. So, it must be connected to an earth wire to pass the extra current, flowing through its body, to the earth plate.

10. Answer: A

Solution: The third trophic level is occupied by the secondary consumer. Secondary consumers are carnivores that feed on herbivores or grass eating animals. For example, tigers, wolves, etc.

11. Answer: Placenta

OR

Answer: Multiple Fission

12. Answer: Pulmonary Artery

OR

Answer: Egestion

13. Answer: False. A child who inherits an X chromosome from father will be a girl as the mother will produce only X-chromosome bearing eggs and upon fertilization with the sperm carrying the X-chromosome will lead to the genotype of XX i.e. is a Girl.

14. **Answer:** A

Solution: The resistance of a conductor is related in the following way,

$$R = \frac{V^2}{P} \text{ Þ } R \propto \frac{1}{P}$$

i.e., higher is the wattage of a bulb, lesser is the resistance and so it will glow brighter.

Hence, option A is the correct answer.

Answer: A

15. Explanation: Both the Assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.

16. Answer: A

Solution: Multicellular cells need a proper transport system so that each of their cells can get the requisite gases and nutrients. Diffusion helps in the exchange of gases in the case of a single-celled organism like *Amoeba.*

17. (a) Answer: A

Solution: The flow of energy in a food chain is unidirectional as the energy captured by the autotrophs does not revert back to the solar input, and similar occurs in the upper trophic levels as well.

(b) Answer: A

Solution: The flow of energy in a food web is also unidirectional as the energy captured by the autotrophs does not revert back to the solar input, and similar occurs in the upper trophic levels as well. The flow of energy is not dependent on the complexity of a food web as ultimately the plants are eaten up by a group of consumers and so on. Hence, on a broader scale, the energy still flows unidirectional.

(c) Answer: About 10% of the energy is passed on to the next trophic levels.

(d) Answer: The rest of the energy is consumed in the various life processes of the individual and is released into the environment as heat/respiratory losses.

(e) Answer: About 1% of sunlight or solar radiation is captured by the plants in order to prepare their own food.

18. Solution: (a) Electronic configuration of hydrogen is similar to that of alkali metals. Just like alkali metals, it reacts with halogens, oxygen and sulphur to form compounds of similar formulae. For e.g.: H_2S and Na_2S. On the other hand, hydrogen reacts with metals and non-metals just like halogens. Due to this anomalous behaviour of hydrogen, Mendeleev was unable to fix a position for it.

(b) Solution: According to Mendeleev's Periodic Table, the chemical and physical properties of the elements occur periodically when the elements are arranged in the order of their atomic mass.

(c) Solution: During Mendeleev's work, only 63 elements were known. After studying the properties of every element,

Mendeleev found that the properties of elements were related to atomic mass in a periodic way.

(d) Solution: (d) In 1869, after Newlands Octave Law was rejected, the Mendeleev Periodic table was introduced. In this periodic table, elements were arranged on the basis of their atomic masses. A few gaps were left for the elements to be discovered later. Later, Gallium (Ga) and Germanium (Ge) were found that had the same properties as Eka–aluminium and Eka–silicon, respectively.

(e) Solution: A homologous series is a series of carbon compounds that have different numbers of carbon atoms but contain the same functional group.

For example, methane, ethane, propane, butane, etc. are all part of the alkane homologous series. The general formula of this series is C_nH_{2n+2}.

Methane CH_4

Ethane CH_3CH_3

Propane $CH_3CH_2CH_3$

Butane $CH_3\text{-}CH_2CH_2CH_3$

19. (a) Solution: $NaHCO_3$

(b) Solution: Polyprotic acid

(c) Solution: hydrogen, salt

(d) Solution: carbon dioxide, water

(e) Solution: Water of crystallization

20. (a) Answer: B

Solution : A person suffering from hypermetropia requires a convex lens to correct the defect.
(b) Answer: B

Solution: The near point of the hypermetropic eye is, v = -1.5 m, then the object distance must be, u = -25 cm

Using the lens formula,

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

$$\frac{1}{-150}-\frac{1}{-25}=\frac{1}{f}$$

$$\frac{1}{f}=\frac{-1+6}{150}\Rightarrow\frac{5}{150}$$

$$f=30\ cm$$

Thus, the focal length of the lens should be + 30 cm.

(c) Answer:

Solution: The power of a lens is given by the expression,

$$P=\frac{1}{f}\Rightarrow\frac{100}{30}=+3.3\ D$$

Thus, option D is the correct answer.
(d) Answer: B

Solution: Hypermetropia is also sometimes referred to as long-sightedness.

Hence, option B is the correct answer.
(e) **Answer:** C

Solution: The power of the given lens has positive sign, so it is convex lens. So,

$$+2.5=\frac{1}{f},f=\frac{1}{2.5}m=\frac{1}{2.5}\times 100\ cm\Rightarrow 40\ cm$$

It is a convex lens as the focal length of a convex lens is always positive and it is equal to 40cm

Hence, option C is the correct answer.

SECTION B

21. Answer: Substances which undergo respiration to release energy are known as respiratory substrates. For example, Glucose.

OR

Answer: Bile juice is made in the liver and is stored in the gallbladder.

22. Answer: Organisms which can produce their own food like sugar and starch from inorganic substances using photosynthesis in the presence of chlorophyll are called producers.

23. Solution: When concentration is 0.03 M

Using, $pH = -\log_{10}[H_3O^+]$

$= -\log_{10}[0.03]$

$= -\log_{10}[3 \times 10^{-2}]$

$= 2 -\log_{10}[3]$

$= 2 - 0.477$

$= 1.52$

When concentration is 0.05 M

Using, $pH = -\log_{10}[H_3O^+]$

$= -\log_{10}[0.05]$

$= -\log_{10}[5 \times 10^{-2}]$

$= 2 -\log_{10}[5]$

$= 2 - 0.699$

$= 1.30$

So the change in pH is = 1.52 – 1.30= 0.22

OR

Solution:

(a) The constituents of solder alloy are tin (60%) and lead (40%).

The properties of solder which make it suitable for welding electrical wires are:

i. The melting point of solder alloy is very low. This makes it easy for solder alloy to melt very easily for welding.

ii. The electricity conductivity of the solder alloy is very high. This makes it possible for solder alloy to pass through it very easily.

24. Answer:

a) The main function of earth wire is to absorb excess electricity passing through the appliance and to prevent overloading of live wire. The metallic appliances are earthed because whenever there is leakage of current, the leaked current passes through the earth wire to earth.

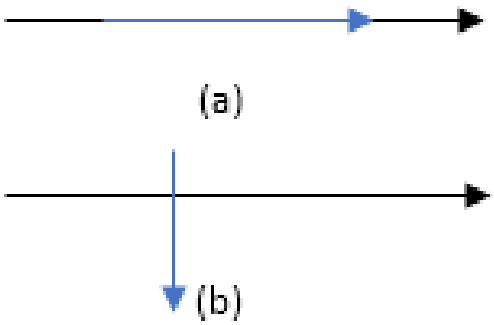
b) Short Circuit – When live wire comes in contact with Neutral wire then the resistance becomes zero and with Ohm's law current becomes infinite.

Overloading – When a large number of home appliances are connected simultaneously to the same socket and they withdraw large amounts of current than mentioned on the switch.

25. Answer: (i) The direction of the force exerted on experienced by a current carrying conductor mainly depends on the two factors;

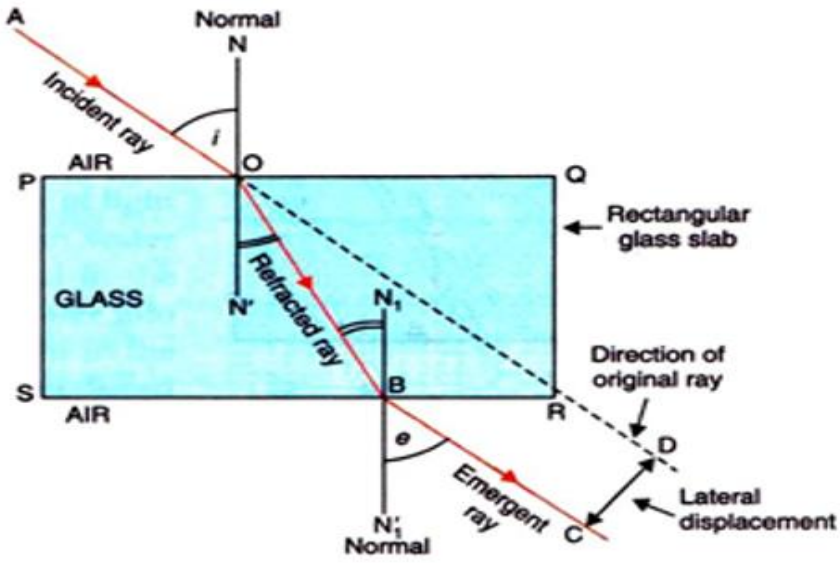
1. **The direction of the current**, the direction of flow of positive charge determine the direction of the force as described by the Flemings left hand rule.
2. The direction of the magnetic field; the force exerted on the conductor depends on the orientation of the magnetic field. This is also defined according to the Flemings left hand rule.

(ii) As the proton beam is moving along the direction of the magnetic field it will experience no force. The strength of the magnetic field depends on the orientation of the conductor in the magnetic field. It experiences maximum force when the direction of flow of current and the magnetic field is perpendicular to each other i.e. the angle between the two is, let's say θ = 90° as shown in the figure (b). If the direction of the current and the magnetic field is parallel i.e. θ = 0° as shown in the figure (a), the conductor will experience no force.



26. Answer:

(i) Laws of refraction:



The first law of refraction states that, the incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane.

Second law of refraction states that, the ratio of the sine of angle of incidence to the sine of angle of refraction is constant for a given pair of media.

(ii) According to the question the light hit the surface of the glass slab at an angle of 45°. Thus, the angle of incidence is 45°, ∠i = 45°

Refractive index is defined as the ratio of speed of light in vacuum to the speed of light in a medium.

$$\mu = \frac{Speed\ of\ light\ in\ air}{Speed\ of\ light\ in\ medium} = \frac{c}{\frac{c}{\sqrt{2}}} = \sqrt{2}$$

Now, using the Snell's law,

$$\frac{sin\ sin\ i}{sin\ sin\ r} = \mu$$

$$\frac{sin\ sin\ 45°}{sin\ sin\ r} = \sqrt{2}$$

$$sin\ sin\ r = \frac{\frac{1}{\sqrt{2}}}{\sqrt{2}} = \frac{1}{2}$$

$$r = 0.5$$

$$r = 30°$$

Hence, the angle of refraction is equal to 30°.

SECTIONC

27. Answer: (i) Blood pressure is the pressure exerted by blood against the wall of blood vessels while circulating. Systolic and Diastolic pressure are the two parameters used to represent the blood pressure.

(ii)

SYSTOLIC PRESSURE	DIASTOLIC PRESSURE
The maximum arterial pressure recorded during the contraction of heart is systolic pressure. (Contraction of left ventricle)	The lowest pressure recorded within the arterial blood stream when the heart is expanding is diastolic pressure. (Resting state of left ventricle)

(iii) Sphygmomanometer

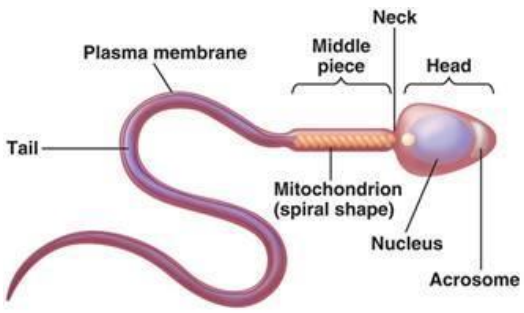
OR

Answer: (i) Oxidation of glucose in the muscles occurs in the absence of oxygen. The end products formed are lactic acid and ATP.

(ii) Oxidation of glucose in body cells occurs in the mitochondria in presence of oxygen. The end products are carbon dioxide, water and ATP.

(iii) Breakdown of glucose anaerobically in yeast produces Ethanol, carbon dioxide and ATP.

28. Answer: The sperm is made up of three regions. The head region is oval-shaped, followed by a tube like Middle piece to which a thin and long tail is attached.
This shape helps the sperm in its motility to swim very fast towards the egg.



Body of Sperm

29. Answer: When green plants are consumed by the herbivores (primary consumers) most of the energy is liberated as heat to the environment, some amount goes into digestion and some energy used for growth and reproduction. Only 10% of the food eaten is turned into its own body and made available for the next level of consumers.

30. Solution: (a) The properties of metals and non-metals are given in the form of a table shown below. The properties mentioned here apply to the metals and non-metals generally. However, all metals and non-metals may not obey the given properties; there might be exceptions.

Metals	**Non-metals**
Contain 1-3 electrons in their valence shell	Contain 4-8 electrons in their valence shell
Lose electrons to achieve stable electronic configuration	Accept electrons to achieve stable electronic configuration
Possess low electronegativity	Possess high electronegativity
Combine with oxygen to form metallic oxides which are generally basic in nature.	Combine with oxygen to form non-metallic oxides which are acidic or neutral in nature.
Metal + Water → Metal oxide + Hydrogen	Non-metal +Water → No reaction
Metal + Acid → Salt + Hydrogen	Non-metal + Water → No reaction

31. Solution: Balanced equation: $SO_2(g) + 2H_2S(aq) \rightarrow 3S(s) + 2H_2O\ (l)$

⇒ Step 1: Write the given unbalanced equation

$SO_2(g) + H_2S(aq) \rightarrow S(s) + H_2O\ (l)$

⇒ Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	2	2
S	2	1
O	2	1

⇒ Step 3: Now, let us consider the oxygen atom. If we multiply 2 in the product (in H_2O), we will get the equal number of atoms as in reactants (SO_2)

No. of atoms of oxygen	Reactants (in SO_2)	Products (in H_2O)
Initially	2	1
To balance	2	1× 2 = 2

⇒ Step 4: Write the resulting equation:

$SO_2 + H_2S \rightarrow S + 2H_2O$

⇒ Step 5: Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	2	4
S	2	1
O	2	2

We find that the equation is not balanced yet. As the number of

sulphur and hydrogen atoms are unequal on the two sides.

First balance the hydrogen number.

⇒ Step 6: Now, let us consider the hydrogen atom. If we multiply 2 in the reactant (in H_2S), we will get the equal number of atoms as in product (H_2O)

No. of atoms of hydrogen	Reactant (in H_2S)	Products (in $2H_2O$)
Initially	2	4
To balance	2 × 2 = 4	4

⇒ Step 7: Write the resulting equation:

$SO_2 + 2H_2S \rightarrow S + 2H_2O$

⇒ Step 8: Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
H	4	4
S	3	1
O	2	2

We find that the equation is not balanced yet. As the number of the sulphur atom is unequal on the two sides.

⇒ Step 9: Now, let us consider the sulphur atom. If we multiply 3 in the product (S), we will get the equal number of atoms as in reactants (SO_2 and H_2S)

No. of atoms of hydrogen	Reactants (in H_2S and $2SO_2$)	Product (in S)
Initially	3	1
To balance	3	1× 3

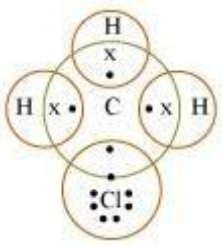
⇒ Step 10: Write the resulting equation:

$SO_2 + 2H_2S \rightarrow 3S + 2H_2O$

⇒ Step 11: Now, compare the atoms of both sides of all the elements. Write down the final balanced equation:

$SO_2 + 2H_2S \rightarrow 3S + 2H_2O$

32. Solution: Carbon can neither lose four of its electrons or gain four electrons as both the processes require an extra amount of energy and would make the system unstable. Therefore, it completes its octet by sharing its four electrons with other carbon atoms or with atoms of other elements. The bonds that are formed by sharing electrons are known as covalent bonds. In covalent bonding, both the atoms share the valence electrons, i.e., the shared electrons belong to the valence shells of both the atoms.



Here, carbon requires 4 electrons to complete its octet, while each hydrogen atom requires one electron to complete its duplet. Also, chlorine requires an electron to complete the octet. Therefore, all of these share the electrons and as a result, carbon forms 3 bonds with hydrogen and one with chlorine.

33. Answer: (i) According to the question;

Object distance (u) = -30cm;

Focal length (f) = -15cm;

Image distance = v;

By mirror formula;

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\Rightarrow \frac{1}{v}+\frac{1}{-30}=\frac{1}{-15}$$

$$\Rightarrow \frac{1}{v}=\frac{1}{30}-\frac{1}{15}$$

$$\Rightarrow \frac{1}{v}=\frac{1-2}{30}$$

$$\frac{1}{v}=-\frac{1}{30}$$

⇒ v = 30cm.

Thus, the screen should be placed 30cm in front of the mirror (Centre of curvature) to obtain the real image.

Height of object h_1= 2cm;

Magnification,

$$\frac{h_2}{h_1}=-\frac{v}{u}$$

Putting values of v and u

Magnification,

$$\frac{h_2}{2} = -\frac{-30}{-30}$$

$$\frac{h_2}{2} = -1;$$

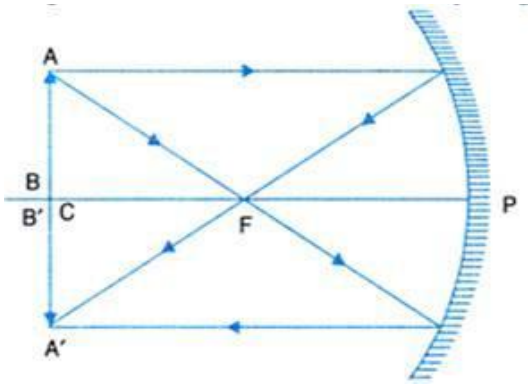
$$h_2 = 2 \times -1 = -2.$$

Height of image is 2 cm.

Negative sign means image is inverted.

Thus real, inverted image of size same as that of object is formed.

Diagram below shows the image formation.



SECTION D

34. Answer: Translocation is the movement of sucrose made by plants from phloem to root cells by means of mass flow. The organic substances like sucrose and other chemicals made by plants are called assimilates which are transported in sieve elements and work together with companion cells to accomplish translocation.

Translocation is important for survival of the plant and it enables sucrose to be stored. It allows the organic molecules to be transported to regions of growth and development, to plant cells for metabolism etc.

(a) Sugar is synthesized in leaves of plants by the process of photosynthesis.

(b) Hormones are synthesized in all parts that are leaves, stem, root, flower, seeds.

OR

Answer: Let BB/ Bb be the dominant color (black) of guinea pig and bb be the recessive trait which codes for white color of guinea pig.

(i) The possible genotype of the parent pigs is Bb i.e. the animals are heterozygous dominant as they produced offspring in the ratio of 3: 1. The 25 of the black pigs have the gene BB whereas the rest 50 of the black pigs have genes Bb and the white pigs have bb.

(ii) The trait coding for black color is dominant while the one coding for white is recessive. Traits are defined to be dominant when they are present in more individuals than the recessive trait-bearing individuals in the wild (i.e. not in human regulated breeding).

35. Solution: (a) Chemical equations can be made more informative by the following characteristics:

Physical state: There are three different states which are solid, liquid and gaseous. If the substance exists in a solid-state, it is represented by (s).

If the substance exists in the aqueous state, it is represented by (aq).

If the substance exists in the gaseous state, it is represented by (g).

Evolution of gas : If the gas is liberated in a reaction, it is indicated by an arrow upward and its physical state is shown by (g).

For example:

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)\uparrow$

(b) (i) When the copper powder is heated in the presence of air (oxygen), copper reacts with oxygen to form copper oxide. The copper oxide formed is black in colour. The black colour is formed because the oxidation of copper takes place.

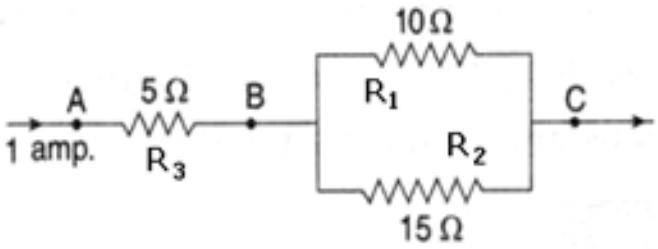
(ii) The black substance formed is copper oxide.

(iii) The chemical equation of the reaction that takes place is given below:

$$2Cu + O_2 \rightarrow 2CuO$$

36. Answer:

(i) According to the figure.



R_1 and R_2 are connected in parallel.

Let I be the current following in the circuit, which is equal to 1A. After passing through the resistance R_3

Current I is divided into two part say I_1 and I_2

$$I_1 = \frac{IR_2}{R_1 + R_2}$$

$$= \frac{1 \times 15}{10 + 15} = 0.6A$$

$$I_2 = \frac{IR_1}{R_1 + R_2}$$

$$= \frac{1 \times 10}{10 + 15} = 0.4A$$

(ii) Potential difference across AB = IR_3 = 1 x 5 = 5V

As R_1 and R_2 are connected in parallel

So the equivalent resistance,

$$\frac{1}{R_{equivalent}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{equivalent}} = \frac{1}{10} + \frac{1}{15}$$

$$R_{equivalent} = \frac{60}{10} = 6\Omega$$

Total resistance in the circuit

R_{total}= 5 + 6 = 11Ω

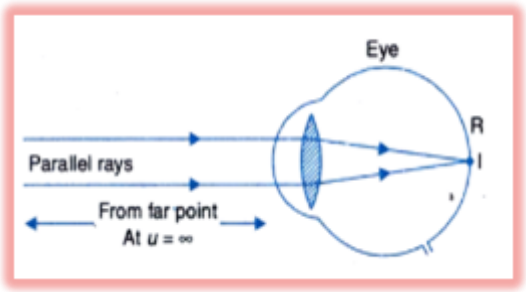
Potential difference across AC = IR = 1 × 11 = 11V

OR

Answer:

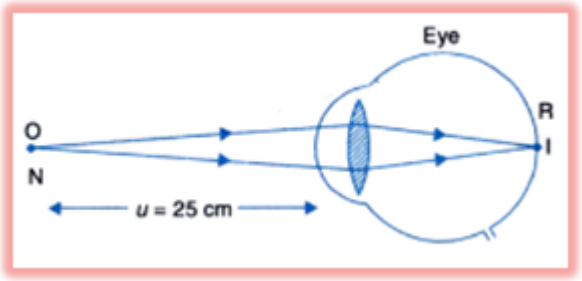
Accommodation is the ability or property of the eye lens to change its curvature or focal length so that images of objects at various distances can be formed on the same retina. Ciliary muscles help in changing the focal length.

Viewing Of Far Off Objects: When the ciliary muscles are completely relaxed, the eye lens is thin and its focal length is maximum (equal to distance between retina and eye lens).The rays which are coming from the distant object are parallel to each other and they are focused at the retina. Formation of the image on the retina is illustrated in the figure below.



Viewing nearby Objects: Ciliary muscles contract when we look at nearby objects. The eye lens bulges out and becomes thick. Focal length is reduced as a result. This focuses light

from the nearby object on the retina as shown in the figure below.



(b) At the time of sunrise or sunset the sun is near the horizon hence the sunlight has to travel the maximum distance to reach us. Due to this large distance, the most of the shorter wavelength blue-colour present in the while light gets scattered out and away from our line of sight, leaving behind mainly red color in the direct sunlight beam that reaches our eye. Hence the sky appears red at the time of sunrise and sunset.

At noon the sun is overhead in the sky. The light coming from the sun has to travel a shorter distance through the atmosphere to reach us. Due to this short journey, only a little blue light gets scattered. Since the light coming is having almost all the components in the right proportion hence the sun in the sky overhead appears white to us at noon.

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