Sample Paper 15

Class X 2022-23

Science (086)

Time: 3 Hours **Max. Marks: 80**

General Instructions:

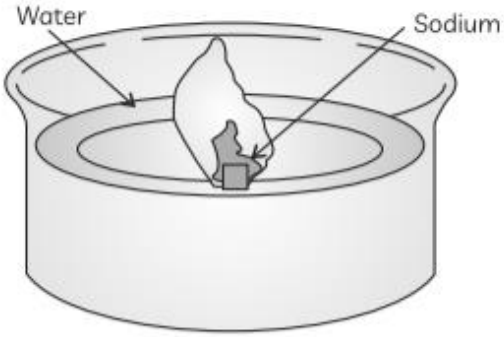
1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 Objective Type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION - A

20 MARKS

(Select and write one most appropriate option out of the four options given for each of the questions 1-20.)

1. **Akash's chemistry teacher advised him not to throw small pieces of sodium into a sink in the laboratory during experiment. His teacher told him that this can be dangerous as a chemical reaction may occur in the sink. The reaction between sodium and water can occur as shown :**



Which of the following statement is true regarding the chemical reaction which can occur here?

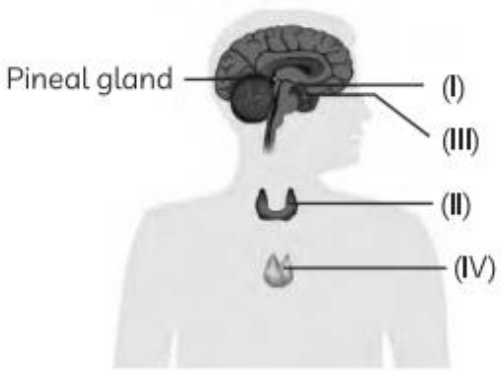
(a) Sodium reacts violently with cold water.

(b) Endothermic reaction occurs between sodium and cold water.

(c) Carbon dioxide is released in the sink.

(d) All of these. 1

2. **Study the diagram of human brain carefully and identify the option that indicates the correct function of that part.**



(a) (I) Pituitary gland – Endocrine and exocrine gland.

(b) (II) Thyroid – Excess release of its hormone causes goitre

(c) (III) Pancreas – Master gland

(d) (IV) Adrenal gland – Regulates metabolism of carbohydrates, fats and protein 1

3. **Why are ionic compounds hard crystalline solids?**

(a) Due to the strong force of attraction between positive ions.

(b) Due to the strong force of attraction between negative ions.

(c) Both (a) and (b)

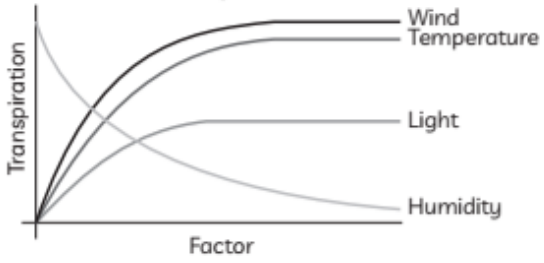
(d) Due to the strong force of attraction between molecules. 1

4. Identify the next homologue of C_2H_4 and C_4H_6.

	C_2H_4	C_4H_6
(a)	C_3H_5	C_5H_{10}
(b)	C_3H_6	C_5H_8
(c)	C_3H_8	C_5H_{10}
(d)	C_3H_3	C_5H_5

1

5. A plot of various abiotic factors affecting the rate of transpiration is as follows :



After analyzing the graph a student writes the following statements.

(I) The rate of transpiration increases with increase in light intensity, wind speed and humidity.

(II) The rate of transpiration decreases linearly with increase in light intensity, temperature and humidity.

(III) The rate of transpiration decreases with increase in humidity.

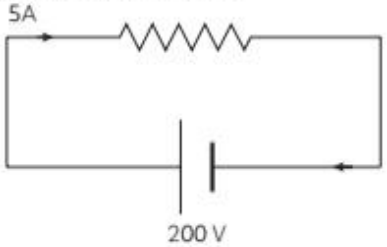
(IV) The rate of transpiration increases with increase in light intensity, temperature and humidity.

Choose from the following which of the following would be the correct statement(s).

(a) Only (I) (b) Only (II)
(c) Only (III) (d) Both (I) and (IV)

1

6. A wire has the same resistance as the one given in the figure. Calculate its resistivity if the length of the wire is 10 m and its area of cross section is 2 m.



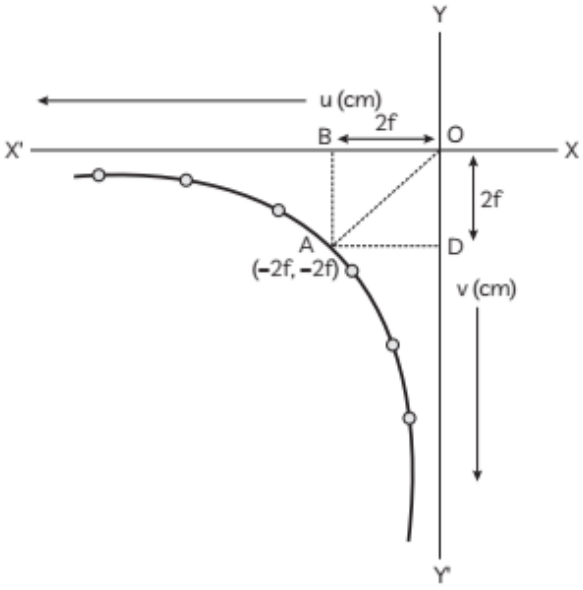
(a) 16 Ohm-metre

(b) 8 Ohm-metre

(c) 16 kilo Ohm-metre

(d) 8 kilo Ohm-metre 1

7. In order to find out the focal length of a concave mirror, a student plotted the following graph between the object distance (u) and the image distance (v):



Graph between u and v

After analysing the graph a student writes the following statements:

(I) The image distance decreases as the object is brought closer to the principal focus from infinity.

(II) The image distance increases as the object is brought closer to the principal focus from infinity.

Which of the following would be the correct statement(s)?

(a) (I) and (III) (b) (I) and (IV)
(c) (II) and (III) (d) (II) and (IV) 1

8. It is necessary to separate oxygenated and deoxygenated blood in mammals and birds because:

(a) to prevent efficient supply of oxygen

(b) due to their low energy needs

(c) to provide efficient supply of oxygen

(d) to provide efficient supply of carbon dioxide 1

9. How does the refractive index of earth's atmosphere vary with height?

(a) Hotter air is lighter than the cooler air.

(b) Cooler air is lighter than the hotter air.

(c) Refractive index of both airs is equal.

(d) Refractive index of upper atmosphere is more than colder layers of atmosphere.

1

10. Identify one point of difference between Pepsin and Trypsin.

	Pepsin	Trypsin
(a)	Produced by gastric gland	Produced by small intestine
(b)	Produced by gastric gland	Produced by pancreas
(c)	Acts in acidic medium	Acts in neutral medium
(d)	Acts in basic medium	Acts in acidic medium

1

11. Nitesh met with an accident and lost the capacity to walk in a straight line. Which part of the brain is damaged?

(a) Fore brain (b) Mid brain
(c) Cerebellum (d) Medulla 1

12. In the following food chain :
frog → grass → insect → snake.
Assign trophic level to frog.

(a) First (b) Second
(c) Third (d) Fourth 1

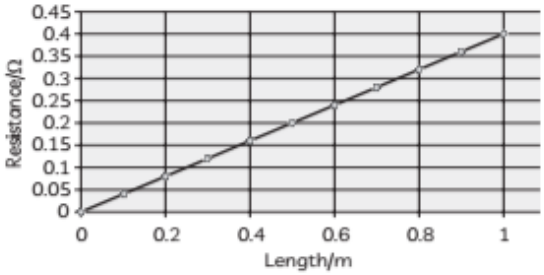
13. Given below are some ways to reduce the problem of waste disposal.

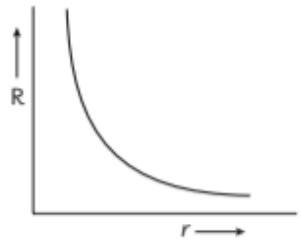
(I) By mixing of waste before disposing off.
(II) By using more biodegradable waste.
(III) By using more non-biodegradable waste.
(IV) By recycling non-biodegradable waste.

Which of the following are correct?

(a) (I) and (II) (b) (II) and (III)
(c) (I), (II) and (III) (d) (II) and (IV) 1

14. A student plotted the graphs as shown to study the variation of resistance R of a wire with its length l and radius *r*:





Select the correct statement (s) after analyzing the graph.

(I) The resistance of a wire is inversely related to the length of the wire, i.e. $R \propto \frac{1}{l}$.

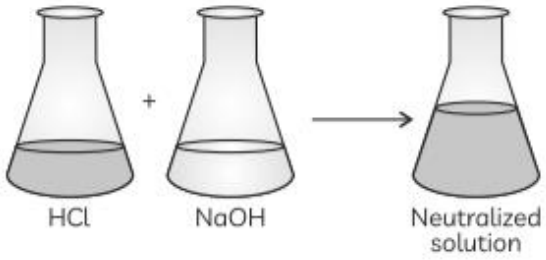
(II) The resistance of a wire is directly related to the length of the wire, i.e., $R \propto l$.

(III) The resistance of a wire is inversely related to the radius of the wire, i.e., $R \propto \frac{1}{r}$.

(IV) The resistance of a wire is inversely related to the square of the radius of the wire, i.e., $R \propto \frac{1}{r^2}$.

(a) Both (I) and (III) (b) Both (II) and (III)
(c) Both (I) and (IV) (d) Both (II) and (IV) 1

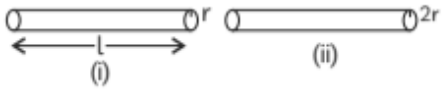
15. Obeserve the reaction shown here.



If 50 ml of a solution of NaOH is found to be completely neutralized by 40 ml of HCl solution. What will be the amount of HCl solution required to neutralize 100 ml of the same solution of NaOH?

(a) 160 ml (b) 80 ml
(c) 125 ml (d) 20 ml

16. Two wires of same materials and same resistance are given as shown :



What is the leugth of wire (ii) :

(a) $\frac{1}{2}$ (b) $2l$

(c) $4l$ (d) $\frac{l}{2}$ 1

Q. no 17 to 20 are Assertion - Reasoning based questions.
These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

17. Assertion (A): Concave mirrors are used as reflectors in torches, vehicle headlights and in search lights.

Reason (R): When an object is placed beyond the centre of curvature of a concave mirror, the image formed is real and inverted. 1

18. Assertion (A): A solenoid tends to expand when a current flows through it.

Reason (R): The cause is an attraction between two metallic straight wires travelling in the same direction. 1

19. Assertion (A): A moving charge interacts with a magnetic field, but a stationary change does not.

Reason (R): moving, charges generate magnetic fields. 1

20. Assertion (A): Inheritance from the previous generation provides subtle changes in body design for the next generation.

Reason (R): Greater diversity will be generated if asexual reproduction is involved. 1

SECTION - B

12 MARKS

(Q. no. 21 to 26 are very short answer questions.)

21. A white compound on heating decomposes to give brown fumes and a yellow residue is left behind. Write chemical equation of the reaction stating its type. 2

22. Ibrahim applied sodium hydroxide to the lustrous, divalent element M. In the reaction mixture, he saw bubbles beginning to form. When hydrochloric acid was used to treat this element, he recorded the same findings. Tell him how to recognise the gas that was produced. For both reactions, write chemical equations. 2

23. On what factor does the colour of scattered light depend? Explain with an example.

OR

What would happen if danger lights were blue in colour? Justify your answer. 2

24. 'Variations are beneficial to the species but not necessarily for the individual'. Justify.

OR

(A) Identify the organism which causes Kala-azar. How does this organism reproduce?

(B) Draw a diagram showing its reproduction. 2

25. Observe the following cross :

Pure tall pea plant × Pure dwarf pea plant

↓

F_1 Tall plant

What happens to the traits of the dwarf plant ? 2

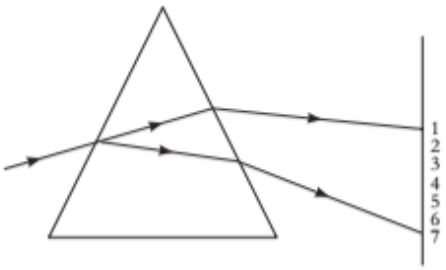
26. Give one example of an organic compound present in biogas. Draw electron dot structure of this compound. 2

SECTION - C

21 MARKS

(Q.no. 27 to 33 are short answer questions.)

27. Rakesh performed the experiment to study the dispersion of light by a glass prism and drew the following figure.



(A) The colour at position marked 3 and 5 are similar to the colour of the sky and the colour of gold metal respectively. Is the above statement made by the student correct or incorrect? Justify.

(B) Which of the above shown positions correspond approximately to the colour of:

(i) a solution of potassium permanganate?

(ii) danger or stop signal lights?

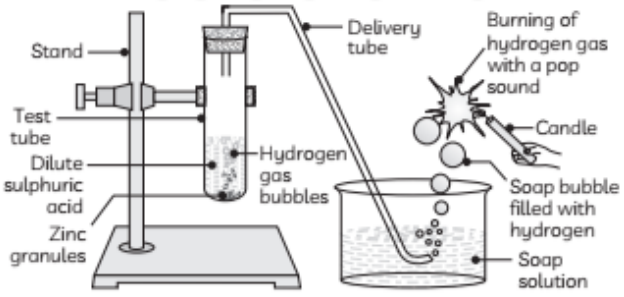
OR

Refractive indices of media A, B, C and D are given:

Media	A	B	C	D
Refractive Index	1.33	1.44	1.52	1.65

In which of these four media is the speed of light (i) Minimum and (ii) Maximum? Give reasons. Find the refractive index of medium A with respect to medium B. 3

28. A student named Rakhi was performing an experiment in chemistry lab. The following diagram shows the reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning.



What would happen if following changes are made:

(A) In place of zinc granules, a big piece of zinc is taken.

(B) In place of zinc granules, copper pieces are taken.

(C) Instead of dilute sulphuric acid, nitric acid is taken. 3

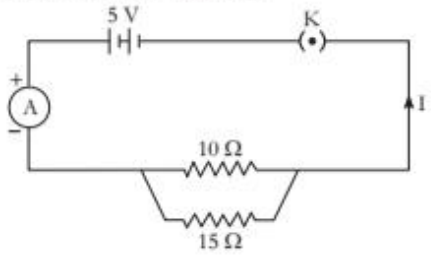
29. Identify the type of chemical reaction in the following statements and define each of them:

(A) Digestion of food in our body

(B) Rusting of iron

(C) Heating of manganese dioxide with aluminium powder 3

30. Study the following circuit and answer the questions that follows:



(A) State the type of combination of two resistors in the circuit.

(B) How much current is flowing through (i) 10 Ohms and (ii) 15 Ohms resistor?

(C) What is the ammeter reading? 3

31. From the dihybrid cross shown below answer the following questions:

RRYY × rryy

A F_1

Self pollination

F_2

9 : 3 : 3 : 1 (Phenotypic ratio)

(A) Write the type of seeds produced in F_1 generation.

(B) Write the type of seeds that were 9 : 3 : 3 : 1 in ratio respectively.

(C) Show the cross obtained after self pollination of F_1 progeny. 3

32. (A) To discard the household waste, we should have two separate dustbins, one for the biodegradable waste and the other for non-biodegradable waste. Justify the given statement and suggest the proper ways of disposal of such wastes.

(B) Classify the given waste into biodegradable and non-biodegradable wastes: used tea leaves, leather bag, plastic bag, jute bag. 3

33. (A) What are the functions of kidneys?

(B) Name the filtration units present in kidneys.

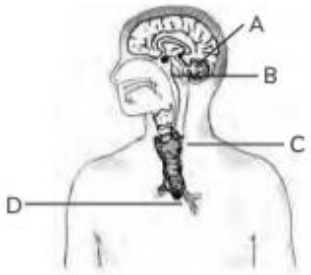
(C) Name two substances which are selectively reabsorbed from nephric filtrate into the blood. 3

SECTION - D

15 MARKS

(Q.no. 34 to 36 are long answer questions.)

34. (A) Lable the endocrine glands given in figure below:



(B) A hot object has been touched by you. Draw a diagram that shows the steps that result in a response, such as a hasty hand pullback.

(C) How are involuntary actions and reflex actions different from each other? 5

35. Draw the pattern of magnetic field lines around a current carrying solenoid and mark the North and South poles.

What can you say about the magnetic field inside the solenoid? How can a solenoid be used to form an electromagnet?

OR

(A) Describe the variables that affect the conductor's experience of force.

(B) When does this force's magnitude reach its peak?

(C) Identify the rule that aids in determining the conductor's motion's direction.

(D) If this force initially operated from right to left, how will the force's direction change if:

(i) the magnetic field's direction is reversed?

(ii) the current's direction is reversed? 5

36. Sahil bought a compound `X` on electrolysis in aqueous solution produces a strong base `Y` along with two gases 'A' and 'B'. 'B' is used in manufacture of bleaching powder. Identify X, Y, A and B. Write chemical equations

OR

Raman took a sodium compound 'X', which is also used in soda-acid fire extinguisher, and heated it gives a sodium compound 'Y' along with water and carbon dioxide. 'Y' on crystallisation forms a compound 'Z'.

(A) Identify 'X', 'Y' and 'Z'. Write chemical equations of the reactions taking place.

(B) How can we obtain Y from Z ? Write equation.

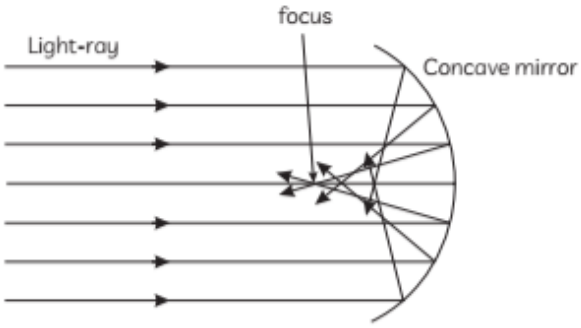
(C) Write any two uses of the compound 'Z'. 5

SECTION - E

12 MARKS

(Q.no. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.)

37. *A spherical mirror is a mirror which has the shape of a piece cut out of a spherical surface. There are two types of spherical mirrors: concave, and convex. As is well-known, these types of mirrors magnify objects placed close to them. It has been observed that as rays from a distant object depart further from the principal axis of a concave mirror they are brought to a focus ever closer to the mirror, as shown in fig. below:*



This lack of perfect focusing of a spherical mirror is called spherical aberration. 5

(A) Where is the principal focus of a parabolic mirror ?

(B) After reflection from a concave mirror, rays of light parallel to the principal axis converge at a point. What do we call that point ?

OR

(B) Define center of curvature and focal length of a mirror.

38. *The nature of non-metals is strongly electronegative. To obtain the nearest noble gas configuration, they frequently add electrons to their valence shell. They become anions as a result, which makes them effective oxidising agents.*

$$\underset{\text{(non-metal atom)}}{X} + ne^- \longrightarrow \underset{\text{(anion)}}{X^{n-}}$$

They react with air or oxygen on heating to form oxides which react with water to form acids. Thus, non-metal oxides are acidic in nature. Non-metals do not react with dilute acids at all. This is because they are electronegative and therefore, cannot displace hydrogen from acids but they form covalent hydrides when heated with hydrogen. 5

(A) Name the acid formed when sulphur trioxide reacts with water.

(B) An element 'X' forms an oxide XO_2, which is a very useful gas used in the process of photosynthesis. Identify the element 'X'.

(C) Non-metals generally act as oxidising agents. Justify. Identify an element which produces basic oxide on reacting with oxygen?

OR

(C) Name three elements which form covalent hydride?

39. *Have you ever wondered how water reaches the top of tall trees, or for that matter how and why substances move from one cell to the other? Plants need to move molecules over very long distances, much more than animals do; they also do not have a circulatory system in place. Water taken up by the roots has to reach all parts of the plant, up to the very tip of the growing stem. The photosynthates or food synthesised by the leaves have also to be moved to all parts including the root tips embedded deep inside the soil. Movement across short distances, say within the cell, across the membranes and from cell to cell within the tissue has also to take place.*

Over small distances substances move by diffusion and by cytoplasmic streaming supplemented by active transport. Transport over longer distances proceeds through the vascular system (the xylem and the phloem) and is called translocation.

The table below gives the results of an experiment carried out to study the factors affecting the rate of transpiration :

Amount of water transpired in 1 Hour (ml)				
	Nor-mal	With Fan	With Heater	With Lamp
Arrowhead	3.6	7.5	6.6	4
Coleus	0.9	6	3.9	3
Devil's Ivy	2.9	4.6	4.1	3
Dieffenbachia	4.1	7.7	6	3.9
English Ivy	1.8	5.1	3.2	2.1
Geranium	1.2	4.7	5.8	2.4
Rubber Plant	4.9	8.4	6.8	4.3
Weeping Fig	3.3	6.1	4.9	2.5
Zebra Plant	4.2	7.6	6.1	3.2

5

(A) What do we call the absorption and upward movement of minerals from roots to leaves.

(B) Root pressure is involved in transpiration. Is this statement true?

(C) Effect of root pressure in transport of water is more important at night. Justify.

OR

(C) What is the function of phloem?

SOLUTION

SAMPLE PAPER - 6

SECTION - A

1. *(a) Sodium reacts violently with cold water.*

Explanation: Metals like sodium and potassium react violently with cold water and the reaction is so exothermic that the hydrogen evolved may even catch fire. Therefore, small pieces of sodium are not thrown into a sink in the laboratory.

2. *(b) (II)-Thyroid – Excess release of its hormone goitre*

Explanation: Pituitary gland is called master gland because it controls the functioning of many other endocrine glands. Thyroxine hormone secreted by the thyroid gland regulates metabolism of carbohydrates, fats and protein. Pancreas is a heterocrine gland means it is exocrine gland as it releases digestive enzyme as well of endocrine gland. As pancreas releases enzyme and hormone so it is termed as endocrine gland.

Related Theory

➥ *Human gonads testes and ovary perform dual functions – laying of gametes (in females, it is ovum and in male it is sperm) and secretion of hormones– testosterone in males and osterogen in females.*

3. *(c) Both (a) and (b)*

Explanation: Ionic compounds are generally crystalline solids and hard due to the strong force of attraction between the positive and negative ions. They are generally brittle.

Related Theory

➥ *Ionic compounds are formed by the transfer of electrons from one atom to another.*

⚠ Caution

➥ *Students should know that ionic compounds consist of ions and not molecules. They have strong forces of attraction between the oppositely charged ions and hence are generally crystalline solids.*

4. *(b) $C_2H_4 : C_3H_6 : C_4H_6 : C_5H_8$*

Explanation: C_2H_4: The next homologue will be C_3H_6. As it is in the form of C_nH_{2n}.

C_4H_6 : Here it will be C_5H_8 as it is in the form of C_nH_{2n-2}.

So a simple logic is to find the relationship between the subscript of carbon and hydrogen and then increase the value of n(subscript of carbon) by 1 to get the homologue series.

5. *(c) Only (III)*

Explanation: The rate of transpiration decreases with increase in humidity. It increases linearly with increase in wind speed, light intensity and temperature upto a certain level and then attains saturation level..

6. *(b) 8 Ohm-metre*

Explanation: Resistance R of a wire of length *l*, area of cross section A and resistivity ρ is given by $R = \rho\frac{l}{A}$.

Therefore, $\rho = RA/l$.

Here, $R = \frac{V}{I} = \frac{200}{5}$ Ohm

$= 40$ Ohm

$\rho = \frac{RA}{l} = 40 \times \frac{2}{10}$

$= 8$ Ohm-m

7. *(c) (II) and (III)*

Explanation: It is observed that as the object is brought closer to the principal focus from infinity, the image distance also increases.

Also, the image distance is equal to the object distance when object distance is 2f, where f is the focal length of the mirror.

8. *(c) to provide efficient supply of oxygen*

Explanation: Mammals and birds have high energy needs for their life processes and hence the separation of oxygenated and deoxygenated blood allows a highly efficient supply of oxygen to the body.

9. *(a) Hotter air is lighter than the cooler air.*

Explanation: The hotter air in the atmosphere is lighter than the cooler air and has a refractive index slightly less than that of the cooler air. The refractive index of the upper hotter atmosphere is therefore less than the cooler layers of atmosphere below it.

10. *(b) Pepsin: Produced by gastric gland; Trypsin: Produced by pancreas*

Explanation: Pepsin is produced in the stomach by gastric glands. It acts in an acidic medium. Trypsin is produced by the pancreas which acts in an alkaline medium.

⚠ Caution

➥ *Students usually make mistake and write option (a) as answer. Trypsin works in small intestine but is produced by pancreas not small intestine.*

11. *(c) Cerebellum*

Explanation: Cerebellum maintains the posture and balance of body. Hypothalamus and pituitary gland of mid brain help in chemical co-ordination whereas fore-brain is associated with the voluntary action of muscles.

12. *(c) Third*

Explanation: The food chain can be represented as : Grass → Insect → Frog → Snake. Frog occupies the third trophic level.

13. *(d) (II) and (IV)*

Explanation: Some ways to reduce the problem of waste disposal are as follows:

(1) By proper segregation of waste before disposing off.
(2) By usage of more biodegradable waste.
(3) By composting of biodegradable waste.
(4) By recycling the non biodegradable waste

14. *(d) Both (II) and (IV)*

Explanation: As the resistance is given by $R = \rho\frac{l}{A}$, where *l* is the length of the wire and A is the area of cross section, $R = \rho\frac{l}{\pi r^2}$.

This shows that $R \propto L$ and $R \propto \frac{1}{r^2}$

15. *(b) 80 ml*

Explanation : 50 ml of NaOH neutralizes 40 ml of HCl solution.

Therefore, 100 ml of NaOH will neutralize

$$= \frac{40}{50} \times 100 = 80\ ml$$

16. *(c) 4l*

Explanation: Let *l'* be the length of the other wire of cross section radius 2*r*. As both the wires are of same material, their resistivity will be equal.

$R = \rho\frac{l}{A}$ for wire with cross section *r* and length *l*

$$R = \rho\frac{l}{\pi r^2} \quad ...(i)$$

For wire with cross section '2*r*' and length '*l*'

$$R = \rho\frac{\rho l_1}{\pi(2r)^2} \quad ...(ii)$$

So, $$\frac{\rho l}{r^2} = \frac{\rho l_1}{(2r)^2}$$

$$l_1 = 4l$$

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

Explanation: Concave mirrors are used as reflectors because when a lighted bulb is placed at the focus of a concave mirror, then the concave mirror produces a powerful beam of parallel light rays. This helps us see things upto a considerable distance in the darkness of night.

18. *(d) A is false R is true*

Explanation: The currents in each of the solenoid's turns are parallel and flow in the same direction when the solenoid is operating. The turns of the solenoid will attract each other because the currents flowing through parallel wires in the same direction cause a force of attraction between them. As a result, the solenoid tends to contract.

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

Explanation: Charges (or electrons) in motion are equivalent to an electric current. These charges interact magnetically. The magnetic needle interacts with the magnetic field created by the current and is deflected.

20. *(c) A is true but R is false.*

Explanation : Inheritance from the previous generation provides both a common body design and subtle changes in it due to inaccuracies during DNA copying. However, greater diversity will be generated if sexual reproduction is involved.

SECTION - B

21. The white compound is lead nitrate and brown fumes are of nitrogen dioxide and yellow residue is lead oxide.

The chemical equation of the reaction taking place is :

$$2Pb(NO_3)_{2(s)} \rightarrow 2Pb_{(s)} + 4NO_{2(g)} + O_{2(g)}$$

The type of reaction is decomposition reaction.

22. The gas that is released is hydrogen gas, to be precise. Bring a burning matchstick close to the gas being evolved to check for the presence of hydrogen gas; if the matchstick burns with a pop sound, the gas is present. It demonstrates how hydrogen gas has evolved.

Reaction with NaOH:

$$M + 2\ NaOH \rightarrow Na_2MO_2 + H_2$$

Reaction with HCl;

$$M + 2\ HCl \rightarrow MCl_2 + H_2$$

23. The colour of the scattered light depends on the size of the scattering particle.

Very fine particles scatter mainly light of shorter wavelengths such as blue light whereas particles of larger size scatter light of longer wavelengths such as red light.

OR

Danger lights are red in colour as red light is least scattered by fog or smoke particles present in atmosphere due to longer wavelength of red.

If danger lights were blue in colour, they would be easily scattered by the smoke, dust and other fine particles present in the atmosphere due to which they would not be seen at a distance.

24. Variations refers to the differences in traits among the individuals of a species.

Variations are beneficial to the species and not necessarily for the individual because

(1) It gives better chance of survival to some organisms in changing environment as they may have favourable variations.

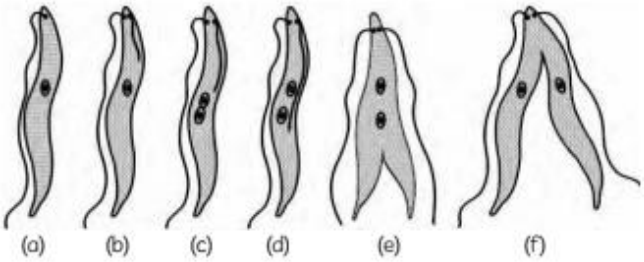
(2) It forms the basis for heredity.

(3) It ultimately leads to formation of new species.

OR

(A) The organism which causes Kala-azar is *Leishmania*. *Leishmania* reproduces asexually by binary fission.

(B) Diagram showing binary fission in *Leishmania* :

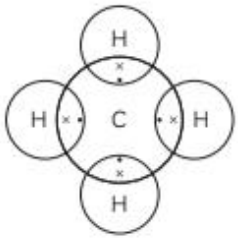


25. Although in F_1 generation only the tall plants appear, both the tallness and dwarfness traits are inherited in the F_1 plants but as the tallness trait is dominant, it is expressed, whereas, dwarfness trait being recessive is not expressed. It is expressed in F_2 generation.

The phenotypic ratio of tallness and dwarfness in F_2 generation is 3 : 1.

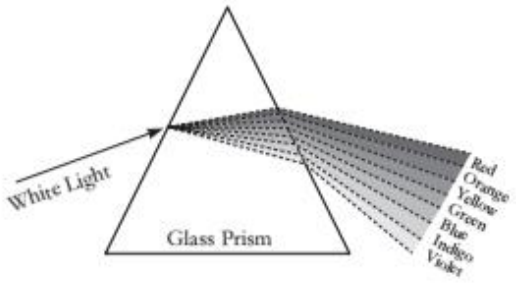
26. Example of organic compound which is present in biogas is methane (CH_4).

Electron dot structure of methane (CH_4):



SECTION - C

27. A beam of white light falling on a glass prism gets split up into seven colours as shown in the diagram :



(A) The colours at position marked 3 and 5 are yellow and blue respectively whereas the student identified them as blue and yellow. Hence, the statement made by the student is incorrect.

Different colours of light bend through different angles with respect to the incident ray, as they pass through the prism. The red light bends the least while the violet the most.

(B) (i) Position 7 is the position of violet colour, which corresponds to the colour of a solution of potassium permanganate.

(ii) Position 1 is the position of red colour, which corresponds to the colour of 'danger' or stop signal lights.

OR

The speed of light is minimum in medium D and maximum in A.

This is because the refractive index of a medium is the ratio of speed of light in vacuum to the speed of light in that medium.

So, refractive index of a medium is inversely proportional to the speed of light.

As refractive index of D is the maximum, speed of light in D will be minimum.

Similarly, as refractive index of A is minimum, speed of light will be maximum in A.

Refractive index of medium 2 with respect to medium 1 is given by $n_{21} = \frac{n_1}{n_2}$

Therefore, refractive index of A with respect to B is given by $n_{BA} = 0.92$

28. (A) As the surface area of a big piece of zinc is less as compared to zinc granules.

(B) No reaction will take place as copper is less reactive than zinc and hydrogen gas will not evolve.

(C) Hydrogen gas is not evolved when a metal reacts with nitric acid because HNO_3 is a strong oxidizing agent. It oxidizes the H_2 produces to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO or NO_2)

29. (A) Digestion of food in our body is decomposition reaction. A decomposition reaction is a type of reaction in which a single compound breaks down into two or more elements or a new compound.

Related Theory

➥ *Digestion is considered a decomposition reaction because enzymes in the stomach and small intestine break down larger molecules into smaller molecules.*

(B) Rusting of iron is an oxidation reaction. Oxidation is the process which involves gain of oxygen or loss of hydrogen or which involves loss of electrons during a reaction.

Related Theory

Rusting of iron is considered an oxidation reaction, because iron reacts with oxygen molecules of air in the presence of moisture/water and rust is formed. Rust consists of hydrated iron (III) oxides i.e. $Fe_2O_3.nH_2O$.

(C) Heating of manganese dioxide with aluminium powder is single displacement reaction. A reaction in which more reactive element displaces the less reactive element from its compound is known as single displacement reaction.

$$3MnO_{2(s)} + 4Al_{(s)} \rightarrow 3Mn_{(l)} + 2Al_2O_{3(s)} + Heat$$

In this reaction Al is used as reducing agent as it displaces Mn from MnO_2 and Al metal is also more reactive than Mn metal.

30. (A) Resistors in the circuit are connected in parallel combination.

(B) (i) Let I_1 be the current flowing through $R_1 = 10$ Ohm

Now $I_1R_1 = V$

$$I_1 = \frac{V}{R_1} = \frac{5}{10} = 0.5A$$

(ii) Let I_2 be the current flowing through $R_2 = 15$ Ohm

Now $I_2R_1 = V$

$$I_2 = \frac{V}{R_2} = \frac{5}{15} = 0.33A$$

(C) Ammeter reading will be 0.83 A, which is the sum of currents flowing through R_1 and R_2 as they are connected in parallel.

This can also be done like this:

Since resistors are connected in parallel

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

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

$$= \frac{3+2}{30}$$

$$= \frac{5}{30} \text{ or } \frac{1}{6}\Omega$$

As per Ohm's law $V = IR$

$$I = \frac{V}{R} = \frac{5}{6} = 0.83A$$

31. (A) The type of seeds produced in F_1 generation is RrYy or Round, Yellow seeds.

(B) The type of seeds that were in the ratio 9 : 3 : 3 : 1 in F_2 generation is given below:

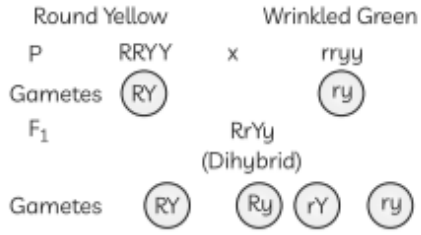
Round Yellow: 9

Round Green: 3

Wrinkled Yellow: 3

Wrinkled Green : 1

(C) The cross obtained after self pollination of F_1 progeny is as follows :



F_2 Round Yellow (selfed)

	RY	Ry	rY	ry
RY	RRYY Round Yellow	RRYy Round Yellow	RrYY Round Yellow	RrYy Round Yellow
Ry	RRYy Round Yellow	RRyy Round Green	RrYy Round Yellow	Rryy Round Green
rY	RrYY Round Yellow	RrYy Round Yellow	rrYY Wrinkled Yellow	rrYy Wrinkled Yellow
ry	RrYy Round Yellow	Rryy Round Green	rrYy Wrinkled Yellow	rryy Wrinkled Green

32. (A) First identify the waste as biodegradable and non-biodegradable waste and use two different dustbins according to being biodegradable or not. We can take blue for non-biodegradable and green for biodegradable. Biodegradable waste can be composted and turned into manure as it is decomposed by micro organisms easily.

Non-biodegradable waste should be collected and disposed off at right place so that it can be recycled.

(B)

Biodegradable waste	Non-biodegradable waste
Used tea leaves	Plastic bag
Leather bag	
Jute bag	

33. (A) The functions of kidneys are :

(1) To remove nitrogenous waste from the blood.

(2) To maintain salt and water balance in the body.

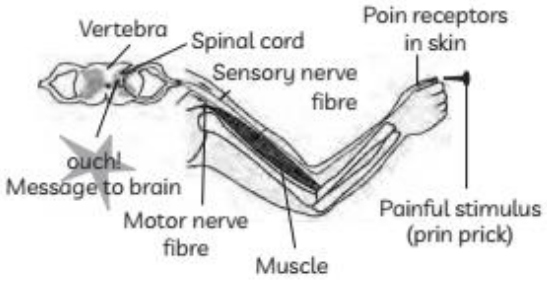
(B) The filtration units present in the kidneys are nephrons.

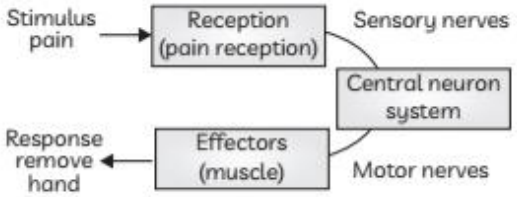
(C) Two substances which are selectively reabsorbed from nephric filtrate into the blood are glucose, amino acids, salts and a major amount of water.

SECTION - D

34. (A) A—Pineal gland
B—Pituitary gland
C—Thyroid gland
D—Thymus

(B)

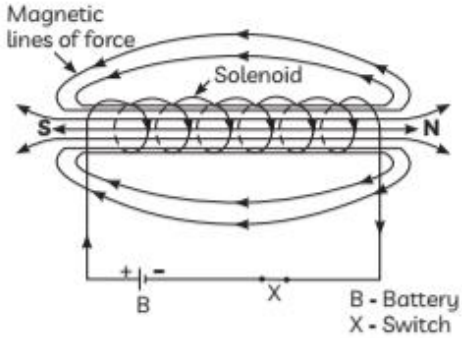




(C)

S. No.	Involuntary Action	Reflex Action
1.	They involve autonomic nervous system.	They involve all parts of voluntary nervous system though they are not under out control.
2.	They involve functioning of the internal body parts.	They are concerned with emergency.

35. The magnetic field lines around a current carrying solenoid is shown in the figure:



The field inside the solenoid is uniform as the field lines are in the form of parallel straight lines inside the solenoid. Magnetic field is the same at all points inside the solenoid.

Solenoid can be used to magnetize a piece of magnetic material such as soft iron, when placed inside the coil due to the strong magnetic field produced inside the solenoid. The magnet so formed is called an electromagnet.

36. When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide. The process is called the chlor-alkali process because of the products formed– chlor for chlorine and alkali for sodium hydroxide.

$$\underset{X}{2NaCl_{(aq)}} + \underset{Y}{H_2O_{(l)}} \longrightarrow \underset{A}{NaOH_{(aq)}} + \underset{B}{Cl_{2(g)}} + H_{2(g)}$$

Chlorine gas is given off at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode.

The compound X is NaCl or sodium chloride,

Y is NaOH or sodium hydroxide, which is a strong base.

Gas A is hydrogen gas and gas B is chlorine gas, which is used in the manufacture of bleaching powder.

Bleaching powder is produced by the action of chlorine on dry slaked lime [$Ca(OH)_2$]. Chemical equation for formation of bleaching powder is :

$$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$$

OR

(A) The sodium compound which is also used in soda-acid fire extinguisher is sodium hydrogencarbonate or $NaHCO_3$. Therefore, X is $NaHCO_3$.

When sodium hydrogencarbonate is heated, it gives sodium carbonate, Na_2CO_3.

The reaction taking place is:

$$2NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$$

Therefore, Y is Na_2CO_3.

Sodium carbonate on crystallization forms washing soda or $Na_2CO_3.10H_2O$ or Z.

$$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3.10H_2O$$

(B) We can obtain Y from Z by heating Y:

$$Na_2CO_3.10H_2O \longrightarrow Na_2CO_3 + 10H_2O$$

(C) Uses of washing soda :

(1) It is used in the manufacture of sodium compounds such as borax.

(2) It is used for removing permanent hardness of water.

SECTION - E

37. (A) A parabolic mirror is a type of concave mirror which does not suffer from any spherical aberrations and the rays of light which are parallel to the principal axis converge at a point called the principal focus, which lies in front of the mirror.

(B) Principal focus: It is the point on the principal axis of the mirror at which the rays of light incident on the mirror in a direction parallel to the principal axis meet after reflection (in case of concave mirror) or appear to diverge after reflection (in case of convex mirror). It is represented by the letter F.

Pole : The centre of a spherical mirror is called its pole (P).

OR

(B) Centre of curvature : It is the centre of the hollow sphere of glass of which the mirror is a part. It lies in front of a concave mirror and behind a convex mirror.

Focal length : It is the distance between the pole and principal focus of the mirror

38. (A) Sulphuric acid

The reaction involved is:

$$SO_3 + H_2O \longrightarrow H_2SO_4 + \text{heat}$$

(B) Element 'X' is carbon. Carbon forms CO_2 on reaction with oxygen. During photosynthesis plants take in CO_2.

(C) Non-metals act as oxidising agents since they can accept electrons. Magnesium, being a metal, produces basic oxide in reaction with oxygen.

$$2Mg + O_2 \longrightarrow 2MgO$$

OR

(C) Carbon, nitrogen and sulphur are non-metals hence, they form covalent hydrides.

39. (A) The transport of soluble products of photosynthesis is called translocation and it occurs in phloem.

(B) Statement is false. Transpiration is a universal process that occurs in all plants. It does not involve root pressure but the water comes out from a plant in the form of water vapour.

(C) The effect of root pressure in transport of water is more important at night as during the day, transpiration pull is the major driving force in the movement of water in xylem.

OR

(C) Phloem transports soluble products of photosynthesis in plants. Translocation of food and other substances takes place in seive tubes. Translocation in phloem is achieved by utilizing energy.