Sample Paper 14

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. Match the terms of Column (I) with those of Column (II).

Column (I)		Column (II)	
(A)	Olfactory receptors	(i)	Tongue
(B)	Thermo receptors (temperature receptors)	(ii)	Eye
(C)	Gustatoreceptors	(iii)	Nose
(D)	Photoreceptors	(iv)	Skin

(a) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)
(b) (A)-(ii), (B)-(iii), (C)-(iv), (D)-(i)
(c) (A)-(ii), (B)-(iv), (C)-(iii), (D)-(ii)
(d) (A)-(iii), (B)-(i), (C)-(ii), (D)-(iv) 1

2. Packed food items made up of oils and fats are generally flushed with inert gas as shown in the image :

This is done :
(I) To protect them from corrosion.
(II) They protect their flavours.
(III) To protect them from being rancid.
(IV) To protect their taste.
Which of the statements are correct?
(a) (II), (III), (IV) (b) (III) and (IV)
(c) Only (III) (d) All of these 1

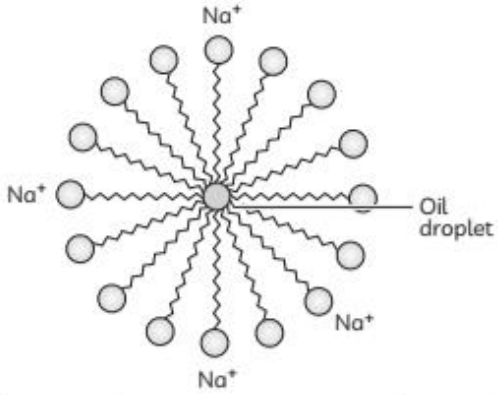
3. The following reactions occurs : Select the correct statements.

(a) It is a displacement reaction.
(b) The white precipitate obtained is $BaCO_3$.
(c) The correct equation representing the chemical reaction is:
$BaCl_{2(aq)} + CuSO_{4(aq)} \longrightarrow BaSO_{4(s)} + CuCl_{2(aq)}$
(d) It is a displacement and precipitation reaction. 1

4. A concave mirror with a 36 cm radius of curvature creates an upright image three times the size of the object. What position does the image occupy?
(a) Behind the mirror
(b) In front of the mirror
(c) Focus of the mirror
(d) Anywhere on the mirror 1

5. Yogita was observing her mother washing the clothes, she added the detergent and washed the clothes.

Yogita asked her teacher how detergent removes all the stains so easily, her teacher replied that soap solution results in micelle formation that helps in removal of dirt. The micelle formation is shown in the given figure:



Choose the correct reason from the following, which helps in dirt removal:

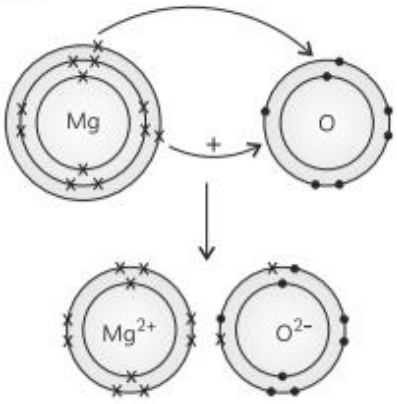
(a) Ionic ends attract each other to remove dirt.
(b) Mixture of soap molecules and dirt is heavy and gets removed.
(c) Accumulation of the dirt at the centre of micelle and gets washed away with it.
(d) Water molecules collect at the centre of the micelle. 1

6. Secretion of certain hormones which are referred to as sex hormones, are responsible for physical changes in the body of both boys and girls starting at the age of 10-12 years (puberty). Some common changes include hair growth under armpits, in genital area, oily skin, development of pimples, etc.

These changes are due to secretion of which hormones?

(a) Oestrogen from ovary and testosterone from adrenal gland
(b) Oestrogen from ovary and testosterone from testes
(c) Oestrogen from thyroid gland and testosterone from adrenal gland
(d) Oestrogen from adrenal gland and testosterone from testes 1

7. What is correct about the following equation?



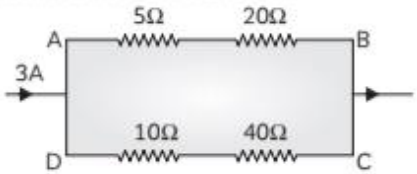
Ionic Bond

(a) Oxygen should be replaced by water
(b) Oxygen should be in molecular (O_2) form
(c) Product would be $Mg(OH)_2$
(d) Product would be MgO_2 1

8. An object is positioned 30 cm away from a concave lens with a 15 cm focal length. Which of the following characteristics of the image created by lens is correct?

(a) Image is virtual
(b) Image is erect
(c) Image is diminished
(d) All of these 1

9. Given figure shows that the current flowing is 3A. There are four resistors.



Find the current flowing through 40 Ω resistor.

(a) 3A (b) 1A
(c) 2A (d) 4A 1

10. A shining metal 'X' on heating in air becomes black in colour. Name the black coloured compound formed and identify 'X'.

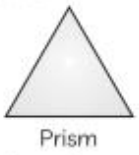
	Compound	X
(a)	Cupric oxide	Copper
(b)	Magnesium oxide	Magnesium
(c)	Copper (III) oxide	Copper
(d)	Copper (II) oxide	Magnesium

1

11. In Dilshad's home, the MCB keeps on tripping again and again. Since it is a domestic circuit, what could be the reason of this phenomenon?

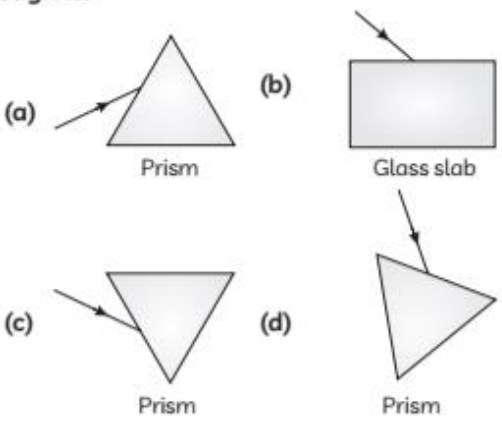
(a) Overloading (b) Short circuit
(c) Faulty design (d) All of these 1

12. When white light passes through the following structure :



(a) Dispersion takes place at first refracting surface and refraction at second refracting surface.
(b) Refraction takes place at find refracting surface and refraction at second refracting surface.
(c) Dispersion takes place at both refracting surfaces.
(d) Refraction takes place at both refracting surfaces. 1

13. In which of the following cases will no dispersion take place when sunlight passes through it?



1

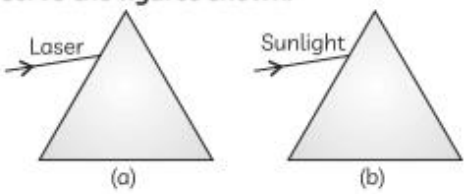
14. Raman and Siya thought of playing a game. Raman blindfolded Siya and asked her to perform a lab test to detect the presence of acid in a given solution. Which acid base indicator will be used by Siya?

(a) Vanilla essence
(b) Phenolpthalein
(c) Litmus
(d) Universal indicator 1

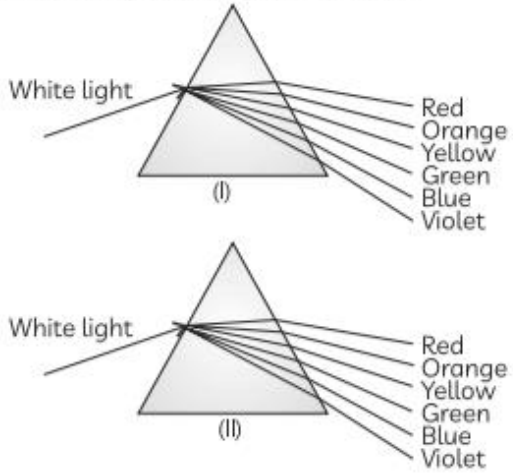
15. Which of the following is the advantage of heating effect of current?

(a) The heating appliances utilize the heating effect of current.
(b) The heating appliances utilize magnetic effect of current.
(c) The solenoid uses the principle of heating effect of the current
(d) All of these 1

16. Observe the figures shown:



Which of the following option represents the complete figure for fig. (a) and (b) ?



Select the correct option :

(a) (I) only
(b) (II) only
(c) Both (I) and (II)
(d) Both figures are wrong 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): A prism held in the air will show that two angles of incidence have the same magnitude of deviation (aside from the minimum deviation).

Reason (R): In a prism suspended in air, a ray strikes the second surface and exits through the first. 1

18. **Assertion (A):** Pungent smelling gas is evolved when sulphur burns in air.

Reason (R): Sulphur trioxide is formed when sulphur reacts with oxygen. 1

19. **Assertion (A):** Tigers have a shorter small intestine whereas deers have a longer small intestine.

Reason (R): The length of the small intestine depend on the type of food the animals eat. 1

20. **Assertion (A):** When a white light beam passes through a hollow prism, it emits a spectrum.

Reason (R): The speed of light inside a glass prism differs from the speed of light outside. 1

SECTION - B

12 MARKS

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

21. Identify P and Q in the given figure.

What could be the possible function of the these parts of human nervous system? 2

22. (A) Out of ketonic and aldehydic groups, which is the terminal functional group?

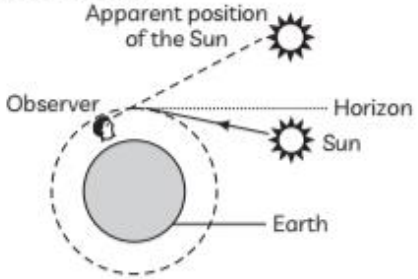
(B) Why is candle flame generally yellow?

OR

(A) An unknown compound has the smell of vinegar. Identify it.

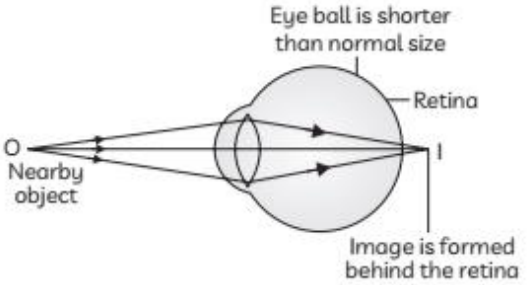
(B) What do we get when ethanoic acid reacts with ethanol in the presence of concentrated sulphuric acid ? 2

23. Observe the image given below and explain what is depicted.



OR

Which defect is shown in the given figure? Write its correction method.



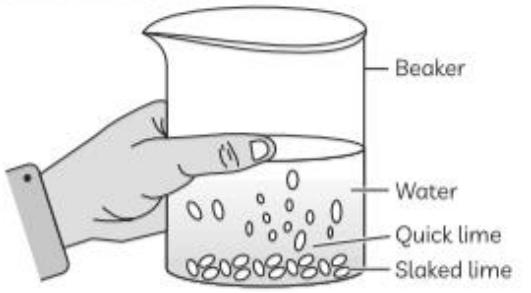
2

24. Study the given date and answer the questions following the data: Parental plants cross fertilised and seeds collected F_1 First generation off springs F_2 of off springs of self-pollination of F_3 Male parents always bare red flowers, Female parent always had white flowers 330 seeds sown and red flowers and 11 seeds gave plants with white flowers.

(A) What is the term for this type of cross?

(B) Express the gene type of the (i) parents (ii) F_1 progeny and (iii) F_2 progeny. 2

25. A housewife requested that her home be painted white. In 30 litres of water, she dissolved 10 kg of quick lime that she had purchased from the market.



Even though the water wasn't being heated, she noticed that it began to boil. explain why she made the observation. Name the product produced and write the corresponding equation. 2

26. In an electric heater, which draws a current of 4A from the source, the potential difference between its terminals is 60 V. If the potential difference is increased to 120 V, then what would be the current that the heater will draw from the source? 2

SECTION - C

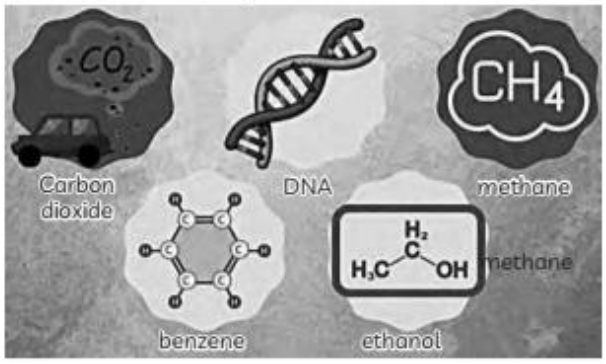
21 MARKS

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

27. Outline a project which aims to find the dominant coat colour in dogs. 3

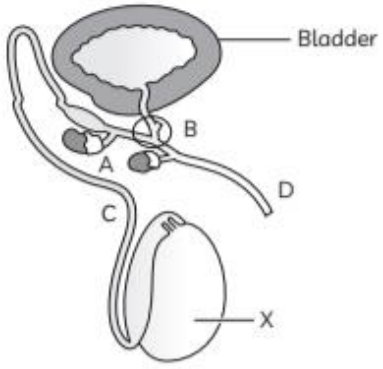
28. The flowers are either self-pollinated or cross pollinated. How can a scientist prevent self-pollination? Show it with the help of a diagram. 3

29. The following picture shows certain examples of compounds containing carbon such as carbon dioxide, methane, DNA. List any three common physical properties of these carbon compounds.



3

30. In the diagram of the human male reproductive system:



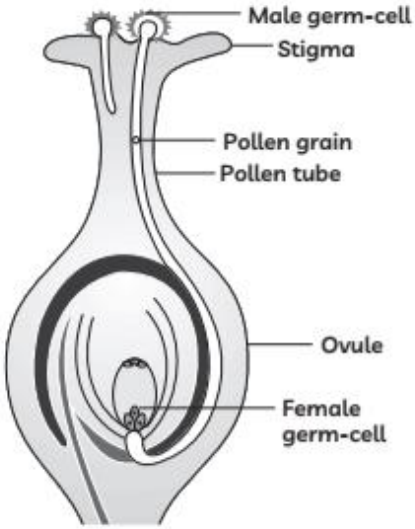
(A) Label A and B.

(B) Name the hormone produced by X. What is the role of this hormone in human male?

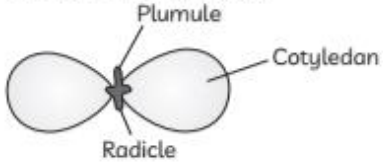
(C) Mention the name of substances that are transported by tubes C and D.

OR

(A) Find the parts that are incorrectly labelled on the given diagram.



(B) What is the purpose of the diagram's labelled components?



3

31. While driving car, Sneha saw a lot of cars behind her in the rear-view mirror when she stopped on the red signal. What kind of mirror do you think was used in the car to see the traffic behind and why? Why is it preferred to a plane mirror, explain?

OR

Rahul was moving from infinity towards the pole of the mirror. What position and type of image does it create? 3

32. (A) Why shouldn't alkalies like sodium hydroxide and potassium hydroxide be exposed to the air?

(B) An aqueous solution goes from having a pH of 3 to 2 over time. How will the nature of the solution change?

(C) What happens to washing soda crystals when they are exposed to air. 3

33. (A) How can we magnetize a steel bar using a solenoid?

(B) Why can't a 5 A fuse be used in wire carrying 15 A current?

(C) A fuse is always connected to a live wire and not to a neutral wire. Why? 3

SECTION - D

15 MARKS

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

34. (A) A doctor recommended to a patient to take insulin injections and follow a sugar-free diet. Specify the illness that he has. Why was he given these two pieces of advice?

(B) Describe the reason for the plant's shoots bending toward the light.

OR

(A) Differentiate between voluntary and involuntary actions of our body.

(B) Reflex arcs in animals have developed for what purpose?

(C) Choose involuntary actions, amongst the following: Reading, Beating of heart, Salivation in the mouth on viewing tasty food, Talking. 5

35. Roma noticed her mother keeping two dustbins in her kitchen, one blue and the other green as shown in the picture. She asked her mother about it. Her mother explained her that the waste we generate is of two types and it should be segregated, so that it can be disposed of easily. Based on this answer the following questions:

(A) Differentiate between the two types of wastes generated.

(B) Discuss the importance of segregation of wastes.

(C) How decomposers help in cleaning the environment? 5

36. (A) An iron knife is kept in blue copper sulphate solution turns the blue solution into light green. Explain.

(B) An athlete won a bronze medal in a race competition. After some days, he found that the medal had lost its lustre due to the formation of a greenish layer on it. Name the metals present in the medal. What is the reason for the appearance of a greenish layer on its surface?

OR

(A) Their relative positions in the 'reactivity series' are revealed by how metals like sodium, magnesium, and iron react with air and water. Is this a true statement? Explain your response using example.

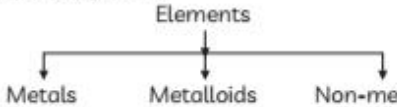
(B) On placing a piece of zinc metal in a solution of mercuric chloride, it acquires a silvery surface but when it is placed in a solution of magnesium sulphate, no change is observed. State the reason for the behaviour of zinc metal. 5

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. *There are 118 elements known at present. It is difficult to study and describe all the properties of all these element separately. That is why elements showing similar properties are grouped together.*



4

(A) (i) Some elements show properties of metals as well as non-metals such elements are known as metalloid. Name three metalloids.

(ii) Study the following reactions of aluminum oxide (Al_2O_3) with acid and base.

$Al_2O_3 + 6HCl \rightarrow 2\,AlCl_3 + 3H_2O$

$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

Interpret from the types of oxides given, which category will you place Al_2O_3.

(B) A yellow colored powder X burns with a blue flame and produces suffocation smelling gas which turns blue litmus red. This yellow powder 'X' is also soluble in carbon disulphide. Identify the nature of 'X'. Write the chemical reaction of 'X' with air.

OR

(B) Aluminium metal acts as a good reducing agent. It reduces Fe_2O_3 and MnO_2 as shown in the given reactions.

(i) $Fe_2O_{3(s)} + 2Al_{(s)} \rightarrow Pl_{(l)} + Al_2O_{3(s)}$ **+ Heat**

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

What do you know about the reactions?

38. *Almost all metals and alloys are unstable in the Earth's atmosphere and will always be susceptible to corrosion. For example, Statue of Liberty looks strong and permanent. Like nearly all metal objects, however, it can become unstable as it reacts with substances in its environment and deteriorates.*

(a)

(b)

4

(A) The process of corrosion is a characterstic of all metals. Which metals do not undergo corrosion?

(B) Which metals do not corrode easily ?

(C) Define corrosion?

OR

(C) Corrosion is enhanced by dents on metallic surface. Why ? What is the chemical formula of rust?

39. *Rohit is having toothache. She told about his problem to his mother. She told that he should brush his teeth twice a day and he started doing it but without any relief. Finally he was taken to a dentist. The doctor diagnosed a cavity in the molars. Dental cavity or dental caries or tooth decay causes gradual softening of enamel and dentin. It starts with bacteria acting on sugars produce acids that softens the enamel. Bacterial cells to gather with food particles stick to the teeth to form dental plaque. Saliva does not reach the tooth surface to neutralist the acid produced by bacteria. Brushing the teeth after eating removes the plague before the bacteria produce acids.*

4

(A) Our stomach is a muscular organ located on the left side of the upper abdomen. It is a J-shaped organ. The stomach expands when food enters into it. How does the exit of waste occurs?

(B) Tooth enamel is made up of calcium hydroxyapatic. Rohit wants to know what type of tooth paste should be used to prevent tooth decay.

(C) We eat various types of food which has to pass through the same digestive tract. Firstly the whole food is taken (ingestion) in the mouth. Then the food is processed to generate small particles. What is the function of Salivary Amylase and HCl?

OR

(C) Nutrition is the method of obtaining nutrients from the environment. This process involves the various steps in heterotrophs. Write the correct order of steps?

SOLUTION

SAMPLE PAPER - 5

SECTION - A

1. *(a) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)*

Explanation: Correct matches are

Olfactory receptors – Nose

Thermoreceptors – Skin

Gustatoreceptors – Tongue

Photoreceptors – Eye

2. *(a) (II), (III), (IV)*

Explanation: Nitrogen gas is an antioxidant, which prevents food from being oxidised. When fats and oils are oxidised, they become rancid and their smell and taste changes.

Caution

Students should know that the rancidity is retarded when food is kept inside the refrigerator since the low temperature does not promote the oxidation reaction.

3. *(c) The correct equation representing the chemical reaction is:*

$BaCl_{2(aq)} + CuSO_{4(aq)} \rightarrow BaSO_{4(s)} + CuCl_{2(aq)}$

Explanation:

$BaCl_{2(aq)} + CuSO_{4(aq)} \rightarrow \underset{\text{White ppt.}}{BaSO_{4(s)}} + CuCl_{2(aq)}$

It is a double displacement reaction

4. *(a) Behind the mirror*

Explanation: For an erect image, magnification is positive. Thus, $m = 3$ for an erect image (three times the size of the object).

Given, $m = 3$

$R = 36$ cm

$$f = \frac{R}{2} = -\frac{36}{2}$$

$$= -18$$

[negative sign because it is a concave mirror]

For a concave mirror,

$$m = \frac{-v}{u}$$

$$\Rightarrow \quad 3 = \frac{-v}{u} \qquad [\because m = 3]$$

$$\Rightarrow \quad 3u = -v$$

$$\Rightarrow \quad v = -3u \qquad \text{...(i)}$$

Now, using mirror formula

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

$$\Rightarrow \quad \frac{1}{-3u} + \frac{1}{u} = \frac{1}{f}$$

[putting the value of $v = -3u$]

$$\Rightarrow \quad \frac{-1+3}{3u} = \frac{1}{-18}$$

[putting the value of $f = -18$]

$$\Rightarrow \quad \frac{2}{3u} = \frac{1}{-18}$$

$$\Rightarrow \quad 3u = -36$$

$$\Rightarrow \quad u = -\frac{36}{3}$$

$$\Rightarrow \quad u = -12$$

Now putting the value of u in equation (i), we get

$$v = -3 \times (-12)$$

$$\Rightarrow \quad v = 36 \text{ cm}$$

Thus, the image is formed behind the mirror at a distance of 36 cm.

5. *(c) Accumulation of the dirt at the centre of micelle and gets washed away with it.*

Explanation: The dirt that is present is usually oily in nature that does not dissolve in water. The soap molecule constitutes sodium or potassium salts of long-chain carboxylic acids. The carbon chain dissolves in oil and the ionic end dissolves in water in soaps. Therefore, the soap molecules form structures called micelles. Thus, micelles form an emulsion in water in which one end is towards the oil and the other end (ionic) faces outside. This helps in dissolving the dirt when we wash our clothes.

6. *(b) Oestrogen from ovary and testosterone from testes.*

Explanation: Testes and ovary are the genital organs which secrete sex hormones testosterone and oestrogen respectively. Testosterone helps in regulation of male sex organs and secondary sexual characters like voice, beard, etc. Oestrogen helps in regulation of female sex organs and secondary sexual characters like mammary glands, voice, etc.

Related Theory

Adrenal gland secretes adrenaline hormone that regulates blood pressure, heart rate, etc. Thyroid gland secretes thyroxin hormone that regulates metabolism of carbohydrates, fat and proteins.

7. *(b) Oxygen should be in molecular (O_2) form*

Explanation: In this equation, oxygen should be in molecule form (O_2).

$$2Mg + O_2 \rightarrow 2MgO$$

8. *(d) All of these*

Explanation: At a distance of less than 15 cm from the lens, the image of the given object created by the given concave lens is virtual, erect, diminished in size, and formed on the same side of the lens.

9. *(a) 3A*

Explanation: The current flowing across conductors is constant in a series circuit and voltage is constant in parallel circuit. Therefore, the current flow will be uniform throughout the circuit *i.e.*, 3A. So, current flowing through 40 Ω resistor is 3A.

10. *(a) Compound : Cupric oxide; X : Copper*

Explanation: The black coloured compound is copper (II) oxide or cupric oxide. The metal 'X' is copper.

$$2Cu_{(s)} + O_{2(g)} \xrightarrow{\text{heat}} \underset{\text{(Black)}}{2CuO}$$

11. *(d) All of these*

Explanation: The various reasons for tripping of MCB again and again are:

(1) Overloading

(2) Short circuit

(3) Faulty design

Related Theory

➥ *Short circuit occurs when one wire comes in direct contact with another wire due to faulty wiring or due to higher level of current passage through the MCB.*

12. *(a) dispersion takes place at first refracting surface and refraction at second refracting surface*

Explanation: Dispersion takes place only at first refracting surface. The second refracting surface merely refracts the colours produced after dispersion.

13. *(b)*

Glass slab

Explanation: No splitting of white light into seven colour is observed on passing through a glass slab.

14. *(a) Vanilla essence*

Explanation: Siya will use an olfactory indicator such as vanilla essence, onion or clove oil. The smell of olfactory indicator depends on whether it is mixed with an acidic or basic solution.

Related Theory

➥ *Vanilla essence, onion, clove oil are olfactory indicators. Because these substances give one type of odour in acidic medium and a different odour in basic medium, therefore, it is used by Siya as an acid-base indicator.*

➥ *Olfactory indicators can be used in the laboratory to test whether a solution is a base or an acid, a process called olfactory titration.*

Caution

➥ *Students should know that Vanilla essence, onion, clove oil will not lose its smell on addition of acid whereas it loses its smell on addition of a base.*

15. *(a) The heating appliances utilize the heating effect of current.*

Explanation: Advantages of heating effect of current are:

(1) The heating appliances such as electric iron, room heaters, geysers utilize the heating effect of current.

(2) The electric fuse uses the principle of heating effect of the current and thus an important application of heating effect of current.

Related Theory

➥ *Electric bulbs and electric lamps produce light by using the heating effect of current.*

16. *(b) (II) only*

Explanation: There is no dispersion in a laser ray because it is monochromatic. Sunlight is a composite light made up of various colours. As a result, it disperses. Low wavelength violet is more off than red, which has a longer wavelength. Dispersion is caused by the various colours' velocities as they move through the prism.

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

Explanation: In a prism suspended in air, a ray strikes the first surface and exits through the second. Another ray will now emerge from the first surface along the previous incident ray if it incidentally hits the second surface (or prism) along the previous emergent ray. The reversibility of light principle is the name given to this phenomenon.

Related Theory

➥ *The two angles of incidence will exist for the same magnitude of deviation when a prism is kept in air. The reversibility of light principle is to blame for this.*

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

Explanation: Sulphur dioxide (SO_2) is formed when Sulphur burns in air.

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

Explanation: Tigers have a shorter small intestine as meat is easior to digest.
Deers have a longer small intestine to allow cellulose from the plants to be digested. We know that deers are herbivorous whereas tigers are carnivorous animals.

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

Explanation: A spectrum is an organised division of coloured light rays from red to violet, similar to the colours of the rainbow. To create a spectrum, white light or visible light must pass through a prism-like object. Light changes in speed as it travels through various objects.

SECTION - B

21. P is cranium

Q is vertebral column.

The function are as follows:

(1) Cranium(P): it is the bony box that protects the brain from mechanical injury.

(2) Vertebral column(Q): it protects the spinal cord and also carries the weight of the upper body.

22. (A) Aldehydic group

O

||

(—C—H) is the terminal functional group.

(B) Candle flame is generally yellow due to the presence of unburnt carbon particles. When light falls on these particles, they scatter yellow colour. This shows that the combustion of hydrocarbons present in wax or candle is not complete.

OR

(A) The compound is ethanoic acid also called acetic acid.

(B) Ethyl ethanoate ($CH_3COOC_2H_5$) is formed by esterification reaction. It has fruity smell.

23. The image shows the position of Sun with respect to horizon. About two minutes before sunrise, the Sun can be seen because, when it is just below the horizon, light from the Sun is refracted downward as it travels through the atmosphere from less dense to more dense air. The Sun appears to be raised above the horizon when it is actually a little below the horizon as a result of this atmospheric refraction.

OR

The defect shown in the given figure is hypermetropia.

Such a person's glasses can be made with a convex lens of a suitable focal length to treat long sight. The diverging light rays from the nearby object are first brought into convergence by the convex lens when it is placed in front of the hypermetropic eye. As a result, at a location close to the hypermetropic eye, the convex lens creates a virtual image of the object nearby. The convex lens's image is then easily focused on the retina by the hypermetropic eye.

24. (A) Monohybrid cross

(B) (i) Parents – (RR) and (*rr*)

(ii) F_1 progeny – Rr

(iii) F_2 progeny – RR, R*r* and *rr*

25. When water is added to quick lime, slaked lime, also known as calcium hydroxide, is created.

$$CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(s)} + \text{heat}$$

(Slaked lime)

The solution began to boil despite not being heated because the reaction is highly exothermic. The slaked lime suspension is allowed to cool for a while, ideally overnight. The liquid obtained after decanting is used for white washing.

26. Given,

The potential difference

(V) = 60V

Current (I) = 4A

According to Ohm's Law,

$$V = IR$$

$$R = \frac{V}{I}$$

$$R = \frac{60}{4}$$

$$R = 15\Omega$$

When potential difference is increased to 120V,

then $$I = \frac{V}{R}$$

$$I = \frac{120}{15}$$

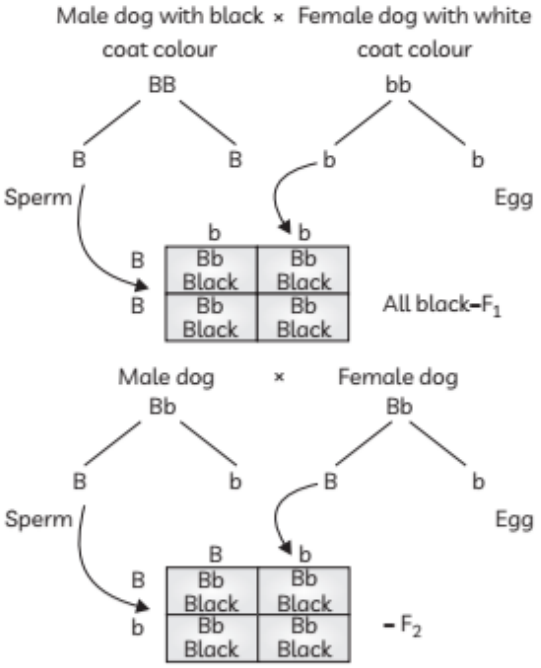
$$I = 8A$$

The current through the heater will become 8A.

SECTION - C

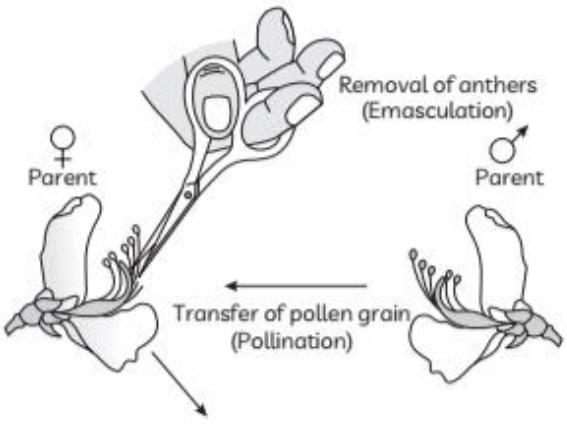
27. Dogs have a variety of coats. Select a pure-bred male and female dog with a black coat (hair) colour or a pure-bred male and female dog with a brown coat (hair) colour to find dominant coat (hair) colour in dogs. Cross a homozygous male BB with a homozygous female BB, then look at the coat colour of the offspring (offspring). If all of the progeny are black, this indicates that in dogs, black will be the dominant coat colour, and if the progeny

has brown coats, brown will be the dominant coat colour.



And, if we make the Punnett square of the F_1 generation, we obtain B*b*, B*b*, B*b*, B*b*, *i.e.*, all progeny is black. As a result, the dominant colour is determined to be black.

28. A plant can be prevented from self-pollination by the process of emasculation. Emasculation is defined as the technique in which the male parts of the flowers (stamens or anthers) are carefully removed before the flower matures, to prevent self-pollination.



29. (1) Carbon atoms are bonded by covalent bonds and therefore they do not form ions. As they do not form free ions, they are poor conductors of electricity.

(2) Carbon compounds have low melting and low boiling points.

(3) Carbon compounds are usually insoluble in water but soluble in the organic solvents like ether, carbon- tetrachloride, etc.

30. (A) A —Seminal vesicle
B — Prostate gland.

(B) X—Testosterone.
Testosterone controls sperm formation, expression of secondary characters and functioning of accessory glands.

(C) C— Sperms.
D —Semen (including sperms) and urine.

OR

(A) Incorrectly labelled parts in the figure are:

(1) Male germ cell

(2) Pollen grain

(3) Pollen tube

(4) Ovule.

(B) Plumule: Formation of shoot.
Cotyledon: Storage of food.
Radicle: Formation of root.

31. In cars and other vehicles, a convex mirror is used as the rear-view mirror because it provides a wider field of vision, enabling the driver to see the majority of the traffic behind him. Convex mirrors always form an erect, virtual, and diminished image of the objects placed in front of it. Convex mirrors always form a virtual, erect, and diminished image of the objects placed in front of it.

(i) A convex mirror's produced image is always virtual and situated behind the mirror.

(ii) The image of the object is upright and situated at the focal point when it is far away from the mirror.

(iii) The image formed by convex mirrors are smaller than the object but gets larger as they approach the mirror.

OR

The formed image begins to shift from the mirror's focus toward infinity as the object is moved from infinity toward the pole of the concave mirror.

The image is created at the focus or in the focal plane when the object is at infinity. As the object is moved, the image first appears between the focus and the centre of the curve, then it appears there, then it appears beyond the centre of the curve, then it appears at infinity, and finally it appears behind the mirror.

32. (A) Because of their hygroscopic nature, which allows them to absorb moisture from the air before dissolving.

(B) The solution will become even more acidic, is the correct response.

(C) They undergo efflorescence. Thus, washing soda ($Na_2CO_3.10H_2O$) transforms into washing powder ($Na_2CO_3.H_2O$).

33. (A) A uniform magnetic field is produced inside the coils of a solenoid, when an electric current is passed through a solenoid. Therefore, when a ferromagnetic material like steel is exposed to the magnetic field, it will be magnetized. So, we can magnetize the steel bar by placing it inside the coils of a solenoid with sufficient current passing through it.

(B) A 5A fuse cannot be used in carrying 15A current, because it will be ineffective in controlling the amount of current flowing as it can protect up to 5A only. If the level of current exceeds 5A, it will lead to a short circuit and can lead to fire. Thus, fuse will protect the electric appliances in line till 5A.

(C) Fuse is connected to a live wire and not to a neutral wire because if it is connected to neutral wire, then even when the fuse burns out due to excessive flow of current, the appliances remain connected to the live wire and current supplied will not be disrupted and if a person touches the appliance, he will get a shock.

SECTION - D

34. (A) Disease is diabetes mellitus. The disease is brought on by insufficient insulin secretion, which prevents glucose from being absorbed by cells and from being converted into glycogen in the liver and muscles. The excess sugar in the blood is partially excreted in the urine. A sugar-free diet will lower the level of blood sugar. Insulin injections will assist in helping cells absorb glucose for their metabolic needs and enable the liver and muscles to turn it into glycogen.

(B) Stems show positive phototropism and bend in the direction of the light. Less auxin is present on the illuminated side and more is present on the darker side, which causes the movement. As a result, the darker side experiences more growth, which makes the stem bend in the direction of the light.

OR

(A) Differences between Voluntary and Involuntary actions:

S. No.	Voluntary Actions	Involuntary Actions
1.	They are under control of the will.	They are performed without consulting the will.
2.	The actions are performed with the help of striated muscles.	The actions are performed with the help of smooth muscles.
3.	They are connected with the functioning of external organs.	They are connected with the functioning of internal organs.

(B) Beating of heart, salivation in the mouth on viewing of tasty food.

(C) Prior to the emergence of intelligence, reflex arcs served as a survival mechanism in animals.

35. (A) The two types of wastes are:

(1) Biodegradable wastes: These are organic wastes that can be broken down into simpler forms by microorganisms like bacteria, fungi. These do not cause pollution. Examples: fruits and vegetable peels, flowers, paper, wood, leftover food, etc.

(2) Non-biodegradable wastes: These are the wastes that cannot be broken down into simpler substances by microorganisms. Such type of wastes is responsible for environmental pollution. Examples: plastics, glass, metals, electronic gadgets.

(B) Importance of waste segregation:

(1) It reduces landfills and thus reduces pollution and transmission of diseases.

(2) Compost of kitchen waste serves as an excellent manure.

(3) Makes waste disposal easy.

(4) Serves as a livelihood for ragpickers as they sell segregated wastes to recycle companies.

(C) Decomposers feed on dead plants and animals and thus act as a cleansing

agent. They are regarded as Earth's clean-up crew. They help in recycling the nutrients and provide space on earth by decomposing the dead, otherwise dead organisms would pile up everywhere.

36. (A) Iron lies above copper in the activity series. This means that iron or iron knife will displace copper from copper sulphate solution. As a result of the reaction, ferrous sulphate will be formed and the solution will be light green in colour.

$$\underset{\text{Iron}}{Fe_{(s)}} + \underset{\substack{\text{Copper sulphate}\\\text{(blue)}}}{CuSO_{4(aq)}} \rightarrow \underset{\substack{\text{Ferrous sulphate}\\\text{(light green)}}}{FeSO_{4(aq)}} + \underset{\text{Copper}}{Cus_{(s)}}$$

(B) The bronze medal is an alloy and the constituting metals are copper and tin.

The loss of lustre by the medal is due to the formation of a coating of green layer. This layer is at basic copper carbonate.

OR

(A) It is true. The relative positions of these metals in the reactivity series can be estimated. For instance,

(i) Even with cold water, sodium reacts violently, and it easily combines with air or oxygen.

(ii) When heated, magnesium reacts with hot water as well as with oxygen or air.

(iii) Iron only reacts with steam, and it reacts slowly with air.

This demonstrates that these metals' respective positions in the activity series are: sodium, magnesium, and iron.

(B) Zinc lies above mercury in the activity series and can easily replace it from mercuric chloride solution. Mercury formed in the reaction gets deposited on the surface of zinc to give it a silvery look.

$$Zn_{(s)} + HgCl_{2(aq)} \rightarrow ZnCl_{2(aq)} + Hg_{(s)}$$

But zinc is placed below magnesium in the activity series. Therefore, no chemical reaction occurs between zinc and magnesium sulphate solution.

SECTION - E

37. (A) (i) Si, Ge, As are metalloids.

The oxides of metal which reacts with both acids and bases to produce salt and water are called amphoteric oxide.

Thus, Al_2O_3 is an amphoteric oxide.

(B) *Nature of 'X' : non-metal, chemical reaction of 'X' with air* $S + O_2 \rightarrow SO_2$.

Sulphur burns in air and forms sulphur dioxide gas. This gas when dissolving in water forms sulphurous acid which turns most blue litmus red.

$$S + O_2 \rightarrow SO_2$$

$$SO_2 + H_2O \rightarrow H_2SO_3$$

OR

(B) The reaction of Iron (III) oxide (Fe_2O_3) is highly exothermic. The amount of heat evolved is so large that the metals are produced in the molten state. This reaction is also known as thermite reaction. In these reaction aluminium is used as a reducing agent as it can displace metals of lower reactivity from this compounds.

38. (A) Corrosion is not shown by and noble metals, such as gold, platinum.

(B) Noble metals like gold and platinum do not corrode easily.

(C) The process of slow conversion of metal into their undesirable compounds (sulphides. carbonates, oxides, *etc.*) by interaction with atmospheric gases and moisture is known as corrosion. It is an oxidation reaction.

OR

(C) Corrosion is enhanced by dents on metallic surface because water is accumulated on dents, scratches and bends etc.

Chemically rust is hydrated ferric oxide or hydrated iron (III) oxide ($Fe_2O_3.2H_2O$)

39. (A) The waste material is removed from the body via the anus. The exit of waste material from anus is regulated by anal sphincter.

(B) Basic toothpaste should be used by Rohit for clearing the teeth. This toothpaste neutralise the excess acid produced by bacteria and prevent toothpaste decay.

(C) Salivary glands not only secrete saliva but also salivary amylase which converts starch into sugar. Hydrochloric acid is present in the stomach which is secreted by gastric glands.

OR

(C) The correct order of steps is:

(i) Ingestion – Intake of food.

(ii) Break down of complex material into simpler materials.

(iii) Absorption – Movement of digested food for absorption.

(iv) Assimilation – Utilization of food.

(v) Egestion – Removal of undigested food material.