Solution

SCIENCE

Class 10 - Science

Section A

1. **(a)** Corrosion
   Explanation:
   The copper articles turn green when kept for long due to corrosion in which metal is eaten up gradually by the action of air, moisture or a chemical (such as an acid) on their surface.
2. **(a)** IV only
   Explanation:
   The reaction is highly exothermic.
3. **(b)** Option (a)
   Explanation:
   Option (a) is correct as Lemon juice has the pH value of 3 and it is acidic in nature while other option are incorrect.
4. **(b)** Fluorine
   Explanation:
   Fluorine
5. **(d)** lighter, insoluble
   Explanation:
   1. Since the gas is collected over water so it is insoluble.
   2. The gas evolved is lighter than air.
6. **(b)** The solubility of NH_3 in H_2O
   Explanation:
   The ammonia fountain demonstrates the solubility of ammonia in water.
7. **(d)** Soap
   Explanation:
   Sodium stearate ($C_{17}H_{35}COONa$) is chemically a sodium salt of stearic acid ($C_{17}H_{35}COOH$). Stearic acid (IUPAC name - Octadecanoic acid) is a saturated fatty acid with an 18-carbon chain. **Soaps** are sodium or potassium salts of long-chain fatty acids.
8. **(a)** dialysis
   Explanation:
   Dialysis is a process used for purifying blood by removing waste and excess fluid from the body. When the kidneys don't work properly, dialysis is used to perform the function of the kidneys. Dialysis is a treatment that filters and purifies the blood using a machine.
9. **(c)** Genotype
   Explanation:

The genotype is the part (DNA sequence) of the genetic makeup of a cell, and therefore of an organism or individual, which determines a specific characteristic of that cell/organism/individual.

10.

(d) Bryophyllum

Explanation:

Bryophyllum

11. **(a)** round and green

Explanation:

Since roundness and green colour are shown by capital letters in the genotype so they are dominant traits. We know that only dominant traits are expressed in F_1 generation.

12.

(b) a fungi, Rhizopus

Explanation:

a fungi, Rhizopus breakdown food outside body.

13.

(c) 5 ampere

Explanation:

The lighting circuit with a 5 A fuse is used for running electric bulbs, fans, radio, TV, tube lights, etc.

14.

(d) $R_3 > R_2 > R_1$

Explanation:

$R_3 > R_2 > R_1$

15. **(a)** Decomposers

Explanation:

Organisms can be grouped as producers, consumers, and decomposers according to the manner in which they obtain their substance from the environment. Micro-organisms belong to the group of decomposers. They break-down the dead remains and waste products of organisms.

16.

(c) Plants at place Y can be seen to have burnt yellow looking leaves.

Explanation:

The pH level of rainwater (precipitation) at place Y is around 4 that means rainwater is acidic at place Y. As an impact of acid rain at place Y we can find yellowing of marble statues and plants with burnt leaves. It also indicates that use of fossil fuels (conventional energy sources) is much higher at place Y than at place X.

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

Explanation:

A chemical reaction becomes faster at higher temperatures because at high temperature, the movement of particles are greater.

18.

(c) A is true but R is false.

Explanation:

A is true but R is false.

19.

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

Explanation:

When a current-carrying conductor is placed in a magnetic field, it experiences a force except when it is placed parallel to the magnetic field. The force acting on a current-carrying conductor in a magnetic field is due to interaction between magnetic field produced by the current-carrying conductor and external magnetic field in which the conductor is placed.

20.

(d) A is false but R is true.

Explanation:

A is false but R is true.

Section B

21. The chemical bond formed (between two atoms) through the sharing of electrons is known as a **covalent bond**. The sharing of electrons between the two atoms takes place in such a way that both the atoms acquire stable electronic configurations of their nearest noble gas. The electron pairs shared by the two atoms are known as shared pairs.
    (i) CCl_4: The type of bond in carbon tetra chloride is covalent bond.
    (ii) $CaCl_2$: The type of bond in calcium chloride is ionic bond.
22. Sometimes in organisms like Planaria and Hydra, their parts of the body are accidentally cut such as when its body gets entangled under rocks, in order to escape from under the rocks it cuts its body into tiny bits. These peices can grow into a complete organism. This is known as regeneration.
    Regeneration is carried out by specialised cells. these cells proliferate and make large number of cells. From this mass of cells, different cells undergo changes to become various cell types and tissues. These changes take place in an organised sequence reffered to as development. However, regeneration is not same as reproduction, since most organisms would not normally depend on being cut up to be able to reproduce.
23. 1. Cut the peel to a proper size and avoid folding it.
    2. Always place the peel at the centre of the slide and hold the slide at the edges.
    3. Do not overstrain or under strain the peel.
    4. Always handle the peel with a brush as a needle may damage the cells.
    5. Take care to prevent the peel from drying by using glycerin.
    6. Place the coverslip gently, avoiding any air bubbles.
    7. Remove excess stain and glycerine with a blotting paper.

    OR

    Dark reaction does not mean that it occurs in the absence of light i.e., at night. Infact these reactions do not depend on light energy and occur simultaneously with light reaction.
24. $nia = \frac{ni}{na} = 1.31 ..... (i)$
    $nra = \frac{nr}{na} = 1.54 ..... (ii)$
    $nri = \frac{nr}{ni} = \frac{\frac{nr}{na}}{\frac{ni}{na}}$
    $nri = \frac{nr}{na} \times \frac{na}{ni} = \frac{1.54}{1.31} = 1.175$
25. Plants are called producers, because they produce thier own food. they do this by using light energy from the sun, carbon dioxide from the air and water from the soil to produce food in the form of glucose (sugar) the process is called photosynthesis.

    OR

    Use of Plastic cups raised the concern towards hygiene thus they were replaced by disposable plastic cups.
    Plastic cups are non-biodegradable and harm the environment friendly. They were thus replaced by Kulhads.
    Making Kulhad made of clay on a large scale resulted in the loss of top fertile soil.
    Now, disposable paper cups are used because - the paper can be recycled, it is biodegradable and is eco-friendly material which does not cause environmental pollution.
26. Blue colour of the sky as seen from earth surface is on the account of scattering of light of shorter wavelength by particles present in the atmosphere of the earth. If the earth had no atmosphere, there would not have been any scattering and sky would have looked dark. When an astronaut is in his spacecraft, he is present above the atmosphere of earth, from where the sky appears dark to him because there is no scattering of light there.

Section C

27. Aluminium is more reactive than zinc hence it displaces zinc from zinc sulphate solution and forms silvery white zinc metal. The reaction is as follows:

$$\underset{Zinc\ sulphate}{3ZnSO_4(aq)} + \underset{Aluminium}{2Al(s)} \rightarrow \underset{Aluminium\ sulphate}{Al_2(SO_4)_3(aq)} + 3Zn(s)$$

28. (1) Metal E is most reactive because it displaces zinc from $ZnSO_4$ solution.
(2) Metal C is the least reactive since it has not displaced any of the metals from their respective salt solutions.
(3) Metal D is more reactive than Ag and less reactive than Fe. It can displace Cu from $CuSO_4$ solution.
(4) Since metal E has displaced Zn from $ZnSO_4$ solution, it is more reactive than Zinc. It is therefore expected to be more reactive than iron as well because iron is placed below zinc in the reactive series. Therefore, metal E displaces Fe from $FeSO_4$ solution. A grey /black coating of iron will be deposited on the metal E.
(5) Decreasing order of reactivity E>B>D>A>C

OR

i. Sulphur is a non-metal because of the following reason:
a. It is a poor conductor of electricity.
b. Sulphur is neither malleable nor ductile.
c. Sulphur forms acidic oxide.
$S + O_2 \longrightarrow SO_2$
$SO_2 + H_2O \longrightarrow H_2SO_4$

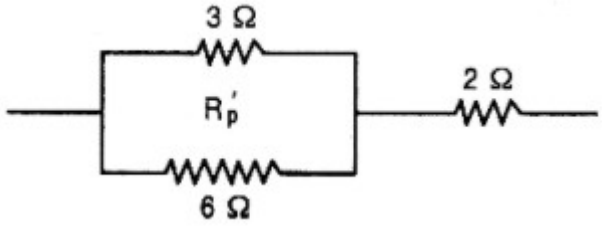
ii. Magnesium is metal because of the following reason.
a. It is a good conductor of electricity.
b. Magnesium is malleable nor ductile.
c. It forms basic oxides
$2Mg + O_2 \longrightarrow 2MgO$

29. The test-tube (A) contains potassium hydroxide. It absorbs the CO_2 released during the respiration of seeds which creates a partial vacuum in conical flask causing the rise in the water level of the bent delivery tube. Rise in level of water shows that CO_2 is released during respiration.

30. The ratio of purple flowers to white flowers in F_2 generation was approximately 3 : 1. This ratio is termed Mendelian ratio or Monohybrid ratio. It explains:
1) F_1 hybrids always exhibited only one of the parental form of a trait and showed dominance / recessive mechanism.
2) Both parental forms of trait segregate and were expressed in F_2 (second filial) generation.
3) The form of trait that appeared in F_1 offspring i.e. the dominant form was present in the F_2 generation about three times as frequently as its alternate form (470 : 162). It is approximately 3 : 1. It is due to mechanism of segregation at the time of gamete formation.

31. We know that pencil appears to be bent at the interface of air and water because of refraction of light. The degree of refection depends on refractive index of a given liquid. Refraction indices of kerosene, water and other liquids would be different. Hence, degree of bend would be different in case of different liquids.

32. $\frac{1}{R_p} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{3+2+1}{6} = \frac{6}{6} = 1$
Or $R_P = 1\Omega$ when three are in parallel
when 3Ω and 6Ω are in parallel
$\frac{1}{R'_p} = \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2}$
$R'_P = 2\Omega$ is in series with Total 2Ω



∴ Total resistance when 3Ω and $6\Omega$are in parallel are in series with $2\ \Omega$ is = $R'_p + 2 = 2 + 2 = 4\ \Omega = 4\ \Omega$

33. i. Arm AB-Downward, Arm CD-Upward
ii. P and Q-Split ring/Commutator
iii. Arm AB upward, Arm CD downward/Direction of force will get reversed

iv. Fleming's left-hand rule

Section D

34. a. An 'atom' or 'a group of atoms' which makes a carbon compound (or organic compound) reactive and decides its properties (or functions) is called a functional group. The aldehyde group, -CHO, present in ethanol, C_2H_5CHO, is an example of a functional group.

b. Three common functional groups present in organic compounds are:

i. Halo group: - X

ii. Alcohol group: -OH

iii. Aldehyde group: - CHO

c. i. CH_3COOH - Carboxylic acid group

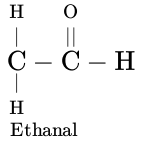
ii. CH_3CH_2CHO - Aldehyde group

iii. C_2H_5OH - Alcohol group

iv. $CH_3COCH_2CH_3$ - Ketone group

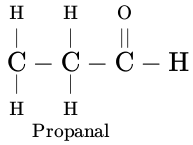
d. Ketone group occurs in the middle, -CO-

e. i.



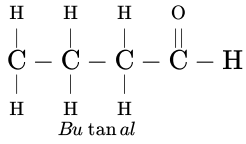
Ethanal

ii.



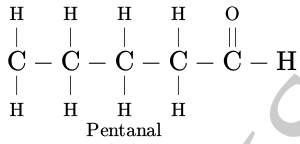
Propanal

iii.



Bu tan *al*

iv.

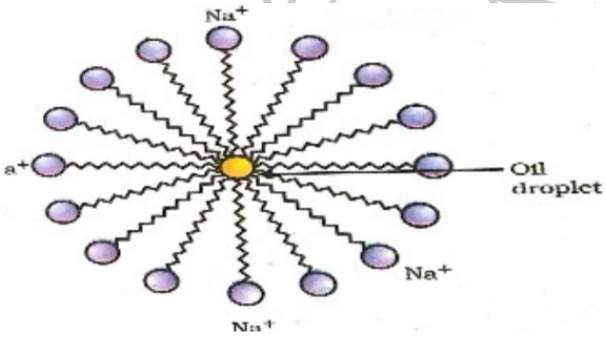


Pentanal

OR

i. Soaps are sodium salts of fatty acids whereas Detergents are sodium salts of sulphonic acids. Soaps do not act in hard water due to formation of scum while detergents do.

ii. In soaps carbon chain dissolves in oil and the ionic end dissolves in water to form micelle



iii. Hard water contains Ca^{2+} / Mg^{2+} ions that react with soap and form precipitates called scum.

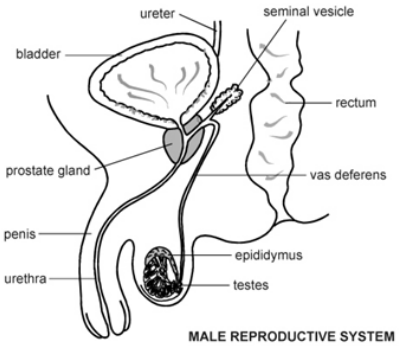
iv. By using detergents in hard water this problem can be resolved.

35. a. A pair of testes- Each testis produces sperms and male sex hormone called testosterone. Testes are present in small pouch called scrotum.

b. Epididymis- It is a long coiled tube. The head is connected with testis and tail is connected with vas deferens

c. Vas deferens- It is a long tube which begins from the tail of epididymis

d. Urethra- It receives the vas deferens from both the testes. It opens outside through penis. It carries both sperms and urine.



MALE REPRODUCTIVE SYSTEM

OR

Central - Brain and Spinal cord: The central nervous system consists of the brain and spinal cord. The brain is the control center of the nervous system and is responsible for processing sensory information, initiating voluntary movements, regulating involuntary functions (such as heartbeat and respiration), and higher cognitive functions (such as thinking, memory, and emotions).

Peripheral - cranial nerves and spinal nerves: The peripheral nervous system consists of all the nerves and ganglia (clusters of nerve cell bodies) outside of the brain and spinal cord. The PNS connects the central nervous system to the rest of the body, including muscles, glands, and sensory organs.

- **Protection of the Components of the Central Nervous System:**
- The brain is protected by the skull, a hard and bony structure that surrounds and encases the brain tissue, providing physical protection against external trauma.
- The spinal cord is surrounded by a series of protective membranes called meninges, which provide additional cushioning and support. The three layers of meninges are the dura mater (outer layer), arachnoid mater (middle layer), and pia mater (inner layer).
- **Signals Disrupted in Case of Spinal Cord Injury:**
- A spinal cord injury disrupts the transmission of nerve signals between the brain and the rest of the body, leading to various impairments depending on the location and severity of the injury.
- Motor signals: Damage to the spinal cord can result in paralysis or weakness of muscles below the level of injury, leading to loss of voluntary movement and control.
- Sensory signals: Spinal cord injury can also cause loss of sensation, including touch, temperature, and proprioception (awareness of body position and movement).

36. Height of the object h = + 2.0 cm; Focal length f = + 10 cm; object-distance u = -15 cm; Image-distance v = ? Height of the image h′ = ?

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

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

$\frac{1}{v} = \frac{1}{(-15)} + \frac{1}{10} = -\frac{1}{15} + \frac{1}{10}$

$\frac{1}{v} = \frac{-2+3}{30} = \frac{1}{30}$

or, v = + 30 cm

The positive sign of v shows that the image is formed at a distance of 30 cm on the other side of the optical centre. The image is real and inverted.

Magnification m = $\frac{h'}{h} = \frac{v}{u}$ or, h' = $h\frac{v}{u}$

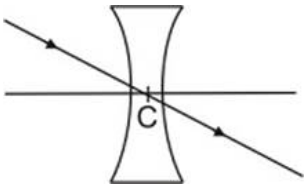
Height of the image, h' = $(2.0)(\frac{+30}{-15})$ = -4.0 cm

or m = $\frac{+30\text{cm}}{-15\text{cm}}$ = -2

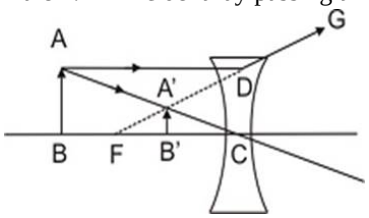
The negative signs of m and h′ show that the image is inverted and real. It is formed below the principal axis. Thus, a real, inverted image, 4 cm tall, is formed at a distance of 30 cm on the other side of the lens. The image is two times enlarged.

OR

Rule 1. Incident rays parallel to the principal axis after refraction through concave lens appear to diverge from principal focus F on the same side of the lens.



Rule 2. An incident ray passing through optical centre of a concave lens goes straight after passing through the concave lens.



Formation of images

a. Object at infinity. In this case, all the rays from infinity will come parallel and appear to diverge from F.

b. Object anywhere except at Infinity. Let the object AB be at point B. A ray of light from A parallel to the principal axis after refraction diverges towards DG. On producing back, it appears to diverge from the principal focus F. Another ray from A through C, goes undeviated.

The two rays appear to meet at A'. Thus a virtual, erect, diminished image of AB is formed at A'B' i.e. between C and F.

Section E

37. i. The pH range of the Human Body is 7 to 7.8.

ii. The strength of acids and bases depends on the number of H^+ ions produced and the number of OH^- ions produced.

iii. Soil Y is acidic. Hence, it should be treated with powdered chalk to reduce its acidity.

OR

When the pH in the mouth falls below 5.5, tooth decay starts. Bacteria present in the mouth produce acid by degradation of sugar and food particles which remain in the mouth after eating.

38. i. Pancreas is a dual gland because it acts as both an endocrine and exocrine gland. As endocrine, it secretes hormones like insulin, glucagon. As an exocrine gland, it releases enzymes like trypsin, lypase, amylase etc.

ii. Testosterone in males and oestrogen in females is the hormone that is secreted during adolescence.

iii. If Insulin is not secreted in the proper amount then it causes diabetes.

OR

Glucagon and Insulin are secreted from alpha and beta cells of islets of the pancreas respectively.

39. i. The reason involved is electromagnetic induction.

When current is passed through coil 1 magnetic field changes in coil 2 due to which an induced current starts flowing in coil 2 and the galvanometer present in coil 2 shows some deflection.

ii. The electromagnetic induction is the phenomenon involved above.

The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.

iii. a. A momentary deflection is shown by the galvanometer.

b. A momentary deflection is shown by the galvanometer but in the opposite direction.

OR

a. When bar magnet is pushed into the coil there is some deflection in the galvanometer.

b. When bar magnet is held stationary there is no change in magnetic field due to which there is no change in the galvanometer.