

Solution

SCIENCE

Class 10 - Science

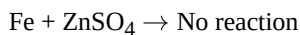
Section A

1.

(c) No reaction

Explanation:

No reaction takes place because Fe is less reactive than Zn



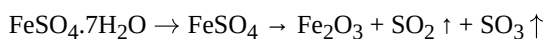
2.

(d) $\text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3 + \text{H}_2\text{O}$

Explanation:

FeSO_4 on heating gives $\text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3 + \text{H}_2\text{O}$.

At 300 °C, hydrated ferrous sulphate becomes anhydrous and colourless. This salt when strongly heated breaks up to form a ferric oxide with the evolution of SO_2 and SO_3 .

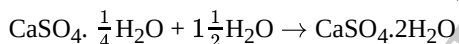


3.

(c) Combining with water

Explanation:

When water is added to the Plaster of Paris, it sets into a hard mass due to its hydration to form crystals of gypsum.



4.

(c) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

Explanation:

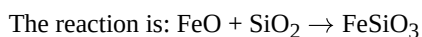
A homologous series is a group of organic compounds having same functional group thus, they show similar chemical properties. Successive members of a homologous series differ by $-\text{CH}_2$ group and hence differ in mass by 14 u.

5.

(d) FeSiO_3

Explanation:

The sulphide ore of copper-containing iron is mixed with silica before heating in a reverberatory furnace. Iron oxide forms a slag of iron silicate (FeSiO_3).



6.

(d) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

Explanation:

Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

7.

(b) $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$

Explanation:

When ester is treated with an alkali, the reaction gives ethanol and sodium ethanoate. This reaction is called saponification reaction.

8. (c) That covered with a transparent paper strip.
Explanation:
That covered with a transparent paper strip.
9. (a) A and C
Explanation:
Mendel selected seven pairs of contrasting characters. Plant Height, Pod Shape, Pod Color, Seed Shape, Seed Color and Flower Position. So flower shape and pod position not included here.
10. (c) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
Explanation:
Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
11. (a) the Y chromosome in zygote
Explanation:
The maleness of a child is determined by the Y-chromosome in zygote inherited from the father. If X-chromosome is inherited from the father, the zygote will develop into a girl.
12. (a) Dilute glycerine
Explanation:
Dilute glycerine
13. (d) High resistance, Low melting point
Explanation:
A fuse wire has high resistance and low melting point so that it will melt if a current of large magnitude passes through the wire.
14. (c) 10 Joule
Explanation:
Work done = $V \times C = 10 \times 1 = 10$ joule
15. (d) 1%
Explanation:
The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about one percent. The green plants (producers) use this solar energy for the process of photosynthesis, convert it into food energy and make the energy available to the rest of the ecosystem.
16. (a) All of these
Explanation:
A habitat is an ecological or environmental area that is inhabited by a particular species of organism. The term refers to the special environment in which an organism lives and breeds and where it can find food, shelter, and protection.
17. (a) Both A and R are true and R is the correct explanation of A.
Explanation:
Both A and R are true and R is the correct explanation of A.
18. (a) Both A and R are true and R is the correct explanation of A.
Explanation:

Asexual reproduction involves a single individual, which gives rise to the new individual that is genetically identical to parents. It is because, when organisms reproduce asexually, only mitotic divisions are involved and the chromosome number remains the same.

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

Explanation:

Here while carrying out an experiment if a compass needle is placed near a wire carrying current then due to the effect of magnetism which is produced due to electric current produced in the wire the needle gets deflected. Which shows that the magnetism and electricity are interlinked. So, both assertion and reason are true and reason is the correct explanation of assertion.

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

Explanation:

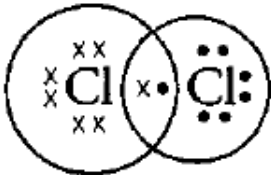
Biomagnification is the increase in concentration of toxins up the food chain. Chemicals and toxins accumulate more and more as we move up the food chain because they do not get broken down in the body. Anything that gets into biological tissue, that is not normally there, has the potential to accumulate and magnify as it moves up the food chain. Thus both assertion and reason are true and reason is the correct explanation of the assertion.

Section B

21. i. The atomic number of chlorine is 17.

Electronic configuration of Cl (17) is $\begin{matrix} K & L & M \\ 2, & 8, & 7 \end{matrix}$

- ii. Electron dot structure of chlorine molecule,



22. a. Mustard will undergo self-pollination in the same process.

b. The two reproductive parts of the bisexual flower are:

- i. Stamen (male part). It consists of anther and filament.
- ii. The female part is carpel or pistil. The pistil has 3 parts stigma, style and ovary.

23. The amount of energy released during anaerobic respiration is much less than the amount of energy released during aerobic respiration. This is because during aerobic respiration, the organic compounds are completely oxidised while during anaerobic respiration, they are incompletely oxidised.

OR

Small intestine has specialized structures known as villi and microvilli which increases the surface area and they are richly supplied by blood vessels. This special structural organisation helps in absorption of food. Due to this, absorption of digested food occurs mainly in the small intestine.

24. Magnification, $m = +2$,

Focal length, $f = -20$ cm (with proper sign)

$$\text{Magnification} = -\frac{v}{u}$$

$$2 = -\frac{v}{u}$$

$$v = -2u$$

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \text{ [Mirror Formula]}$$

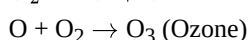
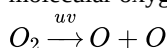
$$\frac{1}{-20} = \left[\frac{1}{-2} + \frac{1}{u} \right] \frac{1}{u}$$

$$\frac{2}{-20} = \frac{1}{u}$$

$$u = -10 \text{ cm}$$

(The object should be placed at a distance of 10 cm in front of concave mirror.)

25.
 - Ozone is a molecule formed by three atoms of oxygen.
 - UV radiations split some molecular oxygen (O_2) into free oxygen atoms ($O + O$). These atoms then combine with molecular oxygen to form ozone.

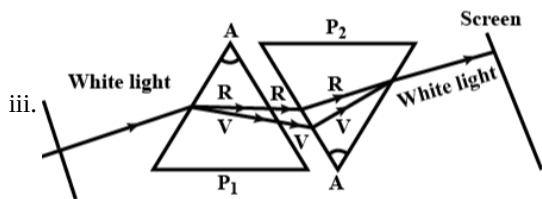


- Ozone layer shields the surface of the earth from damaging UV radiation of the sun. Depletion of ozone layer causes harmful effects on the organism.

OR

Scavengers feed upon discarded and dead waste. Micro organisms are called scavengers of the environment because they decompose dead bodies of plants and animals present in the soil and help in cleaning the environment by removing waste products. They lie at the top of food chain.

26. i. The relation between colour of scattered light and size of the scattering particle is Small size particles scatter shorter wavelength (violet) or large sized particles scatter larger wavelength (Red).
 ii. The basic cause of this observation is due to variation in physical condition of hot air.

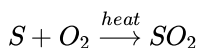


Section C

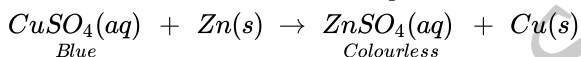
27. The gas is sulphur-dioxide (SO₂)

- It will not react with dry litmus paper.
- The gas will bleach moist litmus paper.

The balanced chemical equation is

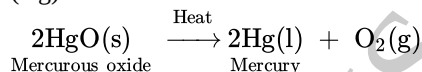


28. Zinc is more reactive than copper. Hence, when a zinc plate is kept in a solution of copper sulphate, it slowly displaces copper from the solution and blue colour of the solution keeps fading away. Because of zinc going into solution as zinc sulphate, a number of holes are seen in the zinc plate. The reaction is



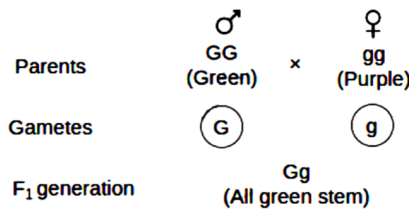
OR

- Metals low in activity series can be reduced to pure metals just by heating their oxides in presence of air, example mercury (Hg):

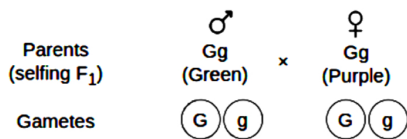


- The given reaction is a displacement reaction.
 - Aluminium is more reactive than manganese used as a reducing agent, as Al is capable of replacing Mn from MnO₂.
29. i. Photosynthesis is a process by which green plants having chlorophyll can synthesize simple sugar (glucose) from water and CO₂ using the energy of sunlight. The light energy is used in a splitting of water molecules into hydrogen and oxygen (i.e. chemical energy).
 ii. **Autotrophs:** The organisms which can synthesize their own food from inorganic substances present in the environment are called autotrophs. An *autotroph* or primary producer, is an organism that produces complex organic compounds, e.g. green plants, autotrophic bacteria etc.
 iii. **Chloroplast:** Chlorophyll is the green pigment capable of trapping light energy required during photosynthesis. This pigment is present in the chloroplast of leaves of all green plants.
 iv. Guard cells are present in the stomata under the leaves rim. Each stomatal pore is surrounded by a pair of guard cells, that control their opening and closing by the inflow and outflow of water.
 v. **Heterotrophs:** The organisms which cannot make their own food from inorganic substances and depend on other organisms for their food are called heterotrophs, e.g. all animals, yeast, most bacteria, etc.
 vi. **Pepsin:** It is a protein-digesting enzyme secreted from gastric glands present in the walls of the stomach, an enzyme in the stomach that begins the digestion of proteins by splitting them into peptones (see peptidase). It is **produced** by the action of hydrochloric acid on pepsinogen, which is **secreted** by the gastric glands.

30. a. All the plants in F_1 progeny will be of green coloured stem.



b. Cross for F_2 progeny is:



F_2 progeny-

♂	G	g
♀		
G	Gg (Green)	Gg (Green)
g	Gg (Green)	gg (Purple)

Phenotypic ratio = Green : Purple = 3 : 1

c. According to the finding above, purple stems are subordinate to green stems. Thus, according to the rule of dominance, only the dominant characteristic was present in F_1 . Purple stem in F_2 indicates that the alleles for purple stem were inherited but were not expressed in F_1 , nevertheless. Only in F_2 under homozygous circumstances did they get expressed.

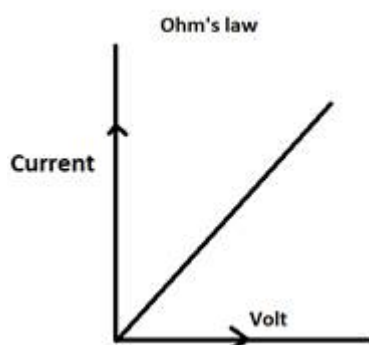
31. Refractive indices of Air, Ice and Benzene are 1.003, 1.31 and 1.5 respectively. Velocity of light in a medium is inversely proportional to refractive index of the medium. Light will travel fastest in air (having least refractive index i.e. 1.0003) and slowest in Benzene (having maximum refractive index i.e. 1.5)

32. The graph obtained by plotting the values of V and I is a linear graph. We will observe that as the voltage V increases the value of current I also increases linearly.

This happens because we know that according to Ohm's Law:

$$V \propto I$$

$$\therefore V = IR$$



33. a. Electric power of an electrical device is defined as its rate of consumption of electrical energy.

$$\text{i.e., } P = \frac{E}{t}$$

The SI unit of electrical power is watt (W)

b. We know,

$$\text{work} = \frac{\text{energy}}{\text{time}}$$

$$\Rightarrow \text{energy} = \text{work} \times \text{time}$$

$$\Rightarrow \text{energy} = 2 \text{ kW} \times 2\text{h} = 4 \text{ kWh}$$

Now,

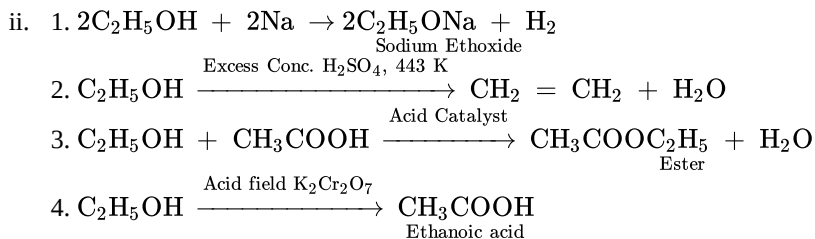
$$1 \text{ kWh} = 3600000 \text{ joules}$$

$$\Rightarrow 4 \text{ kWh} = 11,400,000 \text{ joules}$$

\therefore Energy consumed = 4 kWh or 11,400,000 joules.

Section D

34. i. Ethanol - C₂H₅OH



- iii. 1. Sodium ethoxide
 2. Ethene
 3. Ester
 4. Ethanoic acid

OR

Soaps	Synthetic detergents
1) Soaps are sodium or potassium salts of higher fatty acids e.g. sodium stearate.	1) Synthetic detergents are sodium alkyl sulphates or sodium alkyl benzene sulphonates e.g. sodium n-dodecylsulphate.
2) Soaps are prepared from vegetable oils animal and fats.	2) Synthetic detergents are prepared from the hydrocarbons obtained from petroleum.
3) Soaps have relatively weak cleansing action.	3) They have strong cleansing action.
4) Soaps form curdy white precipitate with calcium and magnesium salts present in hard water and hence, are not used in hard water.	4) Calcium and magnesium salts of detergents are soluble in water and therefore, no curdy white precipitates are obtained in hard water and hence synthetic detergents can be used even in hard water.
5) Soaps cannot be used in acidic medium as they are decomposed into carboxylic acids in acidic medium.	5) They can be used in acidic medium as they are the salts of strong acids and are not decomposed in acidic medium.
6) Soaps do not cause water pollution.	6) Synthetic detergents cause water pollution.
7) Soaps are biodegradable.	7) Some of the synthetic detergents are not biodegradable.

35. The basic requirements for sexual reproduction are the involvement of male and female individuals which will contribute the male and female gametes respectively. The gametes are haploid that are produced through meiosis which on fertilization produce a zygote and the normal diploid number of chromosomes is restored in offsprings.

The importance of sexual reproduction is as follows:

- i. It provides variations in species.
- ii. Two individuals are required one male and another female.
- iii. Specialized organ called sex organ are involved in this type of reproduction.
- iv. It promotes diversity of characters in offsprings.
- v. It results in recombination of genes thus increase chances of genetic variations.
- vi. It plays an important role in origin of new species.

OR

Selye in 1948 defined hormones as "Physiological and organic compounds produced by certain cells (endocrine glands) for the sole purpose of directing the activities of distant parts of the same organism." They are also referred to as "chemical messengers". They have excitatory effects on some organs and inhibitory effects on others.

Functions of hormones:

- 1) Hormones stimulate the tissue activity.
- 2) Hormones regulate growth and reproduction.
- 3) Hormones control metabolism.
- 4) Hormones synthesize, store and utilize substances like glucose.
- 5) Hormones conserve water and minerals.

36. If u is the distance of object and v , the distance of image from optical centre of the lens, then focal length f is related to u and v by $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ which is called lens formula. The formula is equally applicable to convex, concave or any other type of lens. (e.g.

concavo-convex, plano-convex, convexo-concave, plano-concave etc.)

Sign Conventions:

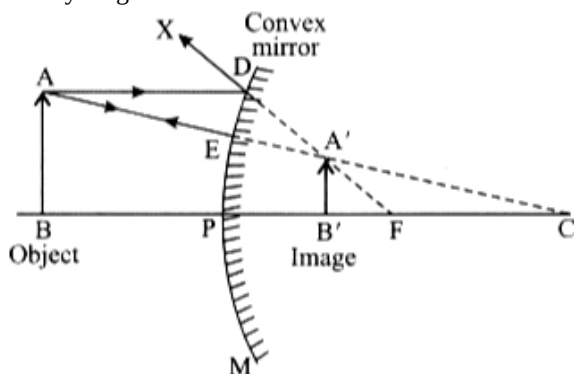
- (1) The object is always placed to the left of the lens.
- (2) All distances parallel to principal axis are measured from optical centre of the lens.
- (3) All distance measured to the right of optical centre (along x-axis) are taken as positive while those measured to the left of optical centre (along x-axis) are taken as negative.
- (4) Distance measured perpendicular to and above the principal axis (along y axis) are taken as positive.
- (5) Distance measure perpendicular to and below the principal axis (y'-axis) are taken as negative.

Assumptions (1) Object is taken on principal axis. (2) The lens is thin.

OR

- a. The type of the mirror is convex mirror.

The ray diagram:



Use of convex mirror: A convex mirror always produces a smaller, virtual and erect image of an object. In convex mirror, the length of the image is shorter than that of the object. Hence, it is used as a side view mirror in vehicles.

- b. **Radius of curvature (R):** The distance between the centre of curvature and pole of a spherical mirror is known as radius of curvature.

Given: Radius of curvature, $R = 24 \text{ cm}$

$$\text{Focal length (f)} = \frac{R}{2} = \frac{24}{2} = +12 \text{ cm}$$

Since the focal length is positive, therefore, the nature of the mirror is convex mirror.

Section E

37. i. Formic acid is the common name for methanoic acid and it is present in a bee stings.

ii. $\text{pH} = -\log_{10} [\text{H}^+] = 8$

$$\log_{10} [\text{H}^+] = -8$$

$$[\text{H}^+] = 10^{-8} \text{ mol/L}$$

- iii. Water < Acetic acid < Hydrochloric acid

OR

$\text{C}_2\text{H}_5\text{OH}$ is not an ionic compound, it is a covalent compound and hence does not give H^+ ions in aqueous solution.

38. i. Diabetes, Diabetes is caused due to less or no secretion of hormone insulin by pancreas.

- ii. Insulin level in the blood is responsible for the given disease.

- iii. Low sugar high fibre diet

OR

$$> 180 \text{ mg/dL.}$$

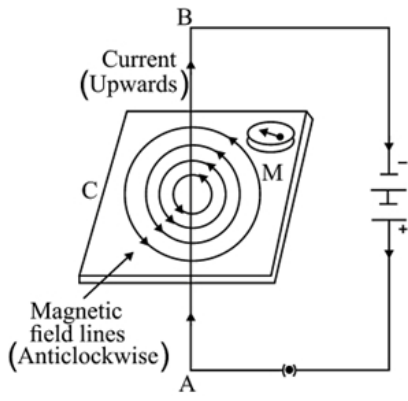
39. i. When current is passed through the rod it produces magnetic field due to which it feels a force and due to it rod displaces from its position.

- ii. Fleming's left hand rule gives the direction of force experienced by current carrying conductor placed in an external magnetic field. According to Fleming's left hand rule if we arrange our thumb, forefinger and middle finger of the left hand perpendicular to each other, then the thumb points towards the direction of the magnetic force, the forefinger points towards the direction of the magnetic field and the middle finger points towards the direction of the current.

- iii. a. According to Fleming's left-hand rule, the rod will get displaced upwards.

- b. Devices that use current-carrying conductors and magnetic fields are electric motors, electric generators, loudspeakers, and microphones.

OR



SATISH SCIENCE
ACADEMY