Solution

SCIENCE

Class 10 - Science

Section A

1.

(c) [C] and [D]

Explanation:

Zn will displace copper from copper sulphate solution. The solution will change colour from blue to colourless.

$$zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$$

Blue Colourless

Zn will displace iron from iron sulphate and solution will change colour from green to colourless, due to formation of zinc sulphate.

$$Zn + FeSO_4 \longrightarrow ZnSO_4 + Fe$$

Pale green Colourless

2.

(c) Combination reaction

Explanation:

Combination reaction

3.

(b) 5.1

Explanation:

Tooth decay begins at the pH of 5.1.

4. **(a)** B, C and D

Explanation:

The water molecule is a covalent compound formed by the sharing of electrons between the hydrogen atoms and the oxygen atom. Metals like Na and Mg are electropositive in nature and form ionic compounds with electronegative non-metals.

5.

(c) On passing the current through the electrolyte, the pure metal from the anode dissolves into the electrolyte.

Explanation:

When current is passed through the electrolyte, the impure metal from the anode is dissolved in the electrolyte and an equal amount of pure metal from the electrolyte is deposited on the cathode.

6.

(c) Copper carbonate

Explanation:

Copper carbonate

7.

(b) (i) and (iv)

Explanation:

Mineral acids are completely ionized but carboxylic acids are partially ionized. Hence, mineral acids are stronger acids than carboxylic acids.

8.

(c) Glycerine

Explanation:

Glycerine is used to temporarily mount the specimen as it prevents the specimen from drying.

9.

(b) Chrysemys picta

Explanation:

In Chrysemys picta, a species of turtle, high incubation temperature above 33^oC results in development of female progeny while a temperature below 28^oC produces only males. It is an example of sex determination under the effect of environmental factors.

10.

(d) (i) and (ii)

Explanation:

In asexual reproduction, the only single parent is involved and progeny develops directly from its parent by cell division, fragmentation, budding, etc. passing the same genes from generation to generation. Thus offspring formed by the asexual reproduction have similarities among themselves.

11.

(d) 1 : 1

Explanation:

A cross between (TT) and (tt) would produce progenies with following genotypes-

In F_2 generation - selfing of F_1 progeny-

Gametes Tt	T	t
T	TT	Tt
t	Tt	tt

Pure tall (TT), Mixed tall (Tt) and Short (tt). The ratio of pure tall and pure short plant is 1 : 1.

12. **(a)** Trypsin digests proteins and lipase emulsified fats

Explanation:

Trypsin breaks down proteins into the polypeptides and Lipase digest emulsified fat molecules into fatty acids and glycerol.

13.

(b) 15 A

Explanation:

The power circuit with a 15 A fuse is used for running the electric heater, electric iron, geyser, refrigerator, etc. as it draws more current.

14.

(c) Neutral

Explanation:

The metallic conductor is electrically neutral. When a potential difference is set up across the metallic conductor, the loosely bound electrons in the metal move with a drift velocity.

15. **(a)** (ii), (iii) and (iv) only

Explanation:

According to the given food web, fish feed on young tadpoles and also on water snails. So, if there is an increase in the population of tadpoles, the population of fish will increase leading to decrease in the population of water snails.
Kingfishers feed on fish and fish feed on water snails. So, if there is decrease in the kingfisher population, there will be increase in fish population leading to decrease in the population of water snails. As the dragonfly nymphs feed on water snails, thus, increase in their population will lead to decrease in the water snail population

16.

(c) Unidirectional

Explanation:

The flow of energy in an ecosystem is always unidirectional. As the energy moves progressively through one trophic level to another, it is no longer available to the previous level. The energy that is captured by the autotrophs (producers) does not revert back to solar radiation. The energy which passes on to the herbivores (primary consumers) from the autotrophs does not come back to the autotrophs.

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.

(c) A is true but R is false.

Explanation:

Vasectomy is a surgical method or birth control in which a small portion of the sperm duct is cut or tied properly.

19.

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

Explanation:

In the case of metallic rod, the charge carries flow through the whole of the cross-section. Therefore, the magnetic field exists both inside as well as outside. However, the magnetic field inside the rod will go on decreasing as we go towards the axis.

20. **(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.

Section B

21. A is ethanoic acid, CH_3COOH

B is sodium ethanoate, CH_3COONa

C is methanol, CH_3OH

D is methylethanoate, CH_3COOCH_3

22. Individual organisms of a species get some variations by the process of reproduction which makes them survive adverse environmental conditions (heat, cold etc.). Thus, variations during reproduction give stability to a species.

23. During vigorous exercise rate of breathing increases by about 20-25 times per minute from 15 to 18 times per minute of normal breathing. It is because the demand for oxygen increases.

OR

Body temperature of some animals depends on the temperature of the environment such animals are called cold blooded animals. Such animals have two or three-chambered heart and can tolerate little mixing of oxygenated blood and deoxygenated blood,

24. i. The mirror is concave.

ii. Given, m = -1, v = -50cm

$\therefore$ Magnification, m = -v/u

$\Rightarrow$ -1 = - (-50)/u

$\Rightarrow$ u = -50cm

So, the distance of image from the object is zero.

iii. Here, the image formed is at the centre of curvature and the focus is half the distance of the centre of curvature, therefore,

2 f = - 50cm $\Rightarrow$ f = -50/2 $\Rightarrow$ f = -25cm

iv. Object distance = image distance = -50cm (minus sign indicates object and image both are in front of mirror)

25. The ozone layer is formed when oxygen molecules (O2) in the Earth's stratosphere are split by ultraviolet (UV) radiation from the sun, creating single oxygen atoms (O). These atoms then combine with other oxygen molecules to form ozone (O3).

- It protects all life forms from the harmful effects of ultra violet radiations.
- Because of the release of chemicals like (CFC's) used in refrigerators and fire extinguishers.

OR

Many insecticides such as aldicarb, aldrin, chlorodane and dieldrin with many others have been banned in India due to their harmful effects on life. These pesticides are non-biodegradable and get accumulated in the body of organisms and the concentration of these chemicals increases with each trophic level, thus, killing a large number of organisms and putting various health risks to others.

26. At noon, the sun is overhead and the light coming from the sun travels a relatively shorter distance through the atmosphere to reach the earth. In this case the blue light is not scattered much. As the light coming from the overhead sun contains almost all its component of colours in the right proportion, the sun appears white to us at noon.

Section C

27. (a) With the help of the wires,try to convert the samples in the form of thin wires. Metals will be readily formed into thin wires being ductile whereas non metals being brittle will break. Now if we construct a cell using these wires the circuit which consists of metallic wires conducts electricity and the bulb will glow whereas non-metallic wires will not allow electricity to pass through them. Also,if beaten by a hammer, the metallic samples will produce a loud ringing sound indicating the metals are sonorous.
(b) From these tests we can say :
(i) Metals are ductile whereas non-metals are not.
(ii) Metals are good conductors of electricity while non metals are not.
(iii) Metals are sonorous while non-metals are not.

28. a. i. No action.
ii. it turns moist litmus paper red and then bleaches it.

b. $S + O_2 = SO_2$

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
$2Mg + O_2 \longrightarrow 2MgO$

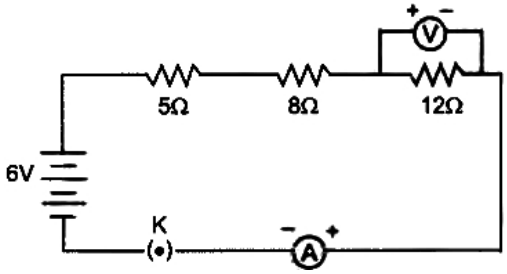
29. i. **Unicellular organisms:** excrete out wastes accumulated in body through the process of diffusion eg: amoeba
ii. **Human beings:** excrete out nitrogenous wastes generated by various metabolic activities through urination.
iii. **Plants:** remove excess water through transpiration, the process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapor and is released to the atmosphere.

30. Contrasting trains were used by mendel and were classified as dominant or recessive. Mendel used 7 traits of pea plant for his experiments. Out of which 3 are.

Character	Given Trait	Contrasting Trait
(i) Position of flower	Terminal	Axial (dominant)
(ii) Colour of flower	White	Violet (dominant)
(iii) Shape of pod	Constricted	Full (dominant)

31. (i) Focal length = 1/power = 1/5D = 1/5m = 20cm
It is convex lens of focal length 20cm.
So, the Magnified image will be formed in all cases, 20cm is focus, 18 cm is on focal length, 22 cm and 30 cm is between focus and focus and center of curvature. In all cases, magnified image is formed.
(ii) In case of 22 cm and 30 cm image formed is real and hence can be obtained on screen.

32. The total resistance of the circuit is given by



R = 5 + 8 + 12 = 25Ω

We know, R = $\frac{V}{I}$

Hence, 25 = $\frac{6}{I}$

I = $\frac{6}{25}$ = 0.24 A

Since, resistances are connected in series, thus electric current remains the same through all resistors.

Here we have, Electric current, I = 0.24 A

Resistance, R = 12Ω

Thus, potential difference (V) through the resistor of 12Ω is given by

V = I × R

= 0.24 × 12 = 2.88 V

∴ Reading of ammeter = 0.24 A

Reading of voltmeter through resistor of 12 Ω = 2.88 V

33. Suppose we replace the parallel resistors R_1 and R_2 by an equivalent resistor of resistance, R′. Similarly we replace the parallel resistors R_3, R_4 and R_5 by an equivalent single resistor of resistance R". Then using eq. $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$, we have

Similarly, $\frac{1}{R"} = \frac{1}{30} + \frac{1}{20} + \frac{1}{60} = \frac{6}{60}$

that is $R'' = 10\Omega$

Thus, the total resistance, R = R′ + R″ = 18Ω

To calculate the current, we use Ohm's law, and get

$I = \frac{V}{R} = \frac{12V}{18\Omega} = 0.67A$

Section D

34. The organic compounds containing the hydroxyl or alcoholic group (–OH) as the functional group are called alcohols. These are obtained by replacing one hydrogen atom of an alkane by –OH group. For example,

$$\underset{\text{Alkane}}{H-\overset{H}{\overset{|}{C}}-OH} \xrightarrow[H \text{ by } OH]{\text{Replace } one} \underset{\text{Alcohol}}{H-\overset{H}{\overset{|}{C}}-OH}$$

They are represented by the general formula C_nH_{2n+1}-OH or ROH, where R stands for alkyl group (C_nH_{2n+1} -)

First three members of the series are:

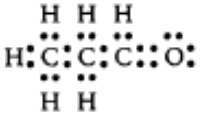
Formula	Common name	IUPAC name
CH_3OH	Methyl alcohol	Methanol
CH_3CH_2OH	Ethyl alcohol	Ethanol
$CH_3CH_2CH_2OH$	Propyl alcohol	Propanol

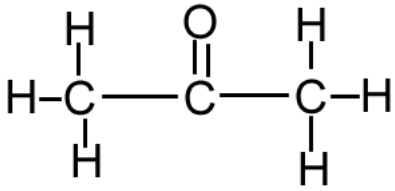
OR

There are four isomers possible for the molecular formula C_3H_6O. These are as follows:

i. $\underset{\text{Propanal}}{CH_3CH_2CHO}$

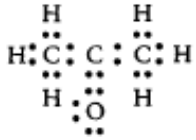
electron dot structure:



ii. 

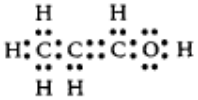
Prop - 2 - one

electron dot structure:



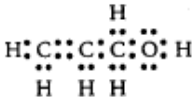
iii. $CH_3 - \underset{\text{Prop - 1 - enol}}{CH = CH - OH}$

electron dot structure:

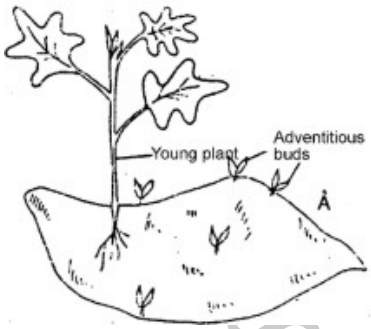


iv. $CH_2 = \underset{\text{Prop - 2 - enol}}{CH - CH_2 - OH}$

electron dot structure:



35. A number of herbaceous and woody perennial plants propagate vegetatively in nature. The common structures that take part in natural vegetative propagation are roots, stems, leaves and buds.
Vegetative propagation by roots. Roots of some plants like radish, carrot, asparagus, tapioca, Dahlia and sweet potato etc. are tuberous and store abundant food material.



These roots when planted in specially prepared beds (soil), develop adventitious buds which grow into leafy shoots called "slips". As the root tubers in sweet potato store large amounts of food, each produces several "slips" the young "slips" are detached from the parent plant and grown separately.

OR

i. The brain and the spinal cord constitute the central nervous system (CNS).
ii. The spinal cord is concerned with spinal reflex actions and the conduction of nerve impulses to and from the brain.
iii. The spinal cord is enclosed in a bony cage called vertebral column and is surrounded by membranes called meninges which protects it.
iv. All the nerves of the body together make up the peripheral nervous system. It consists of three types of nerves that are spinal nerves, cranial nerves, and visceral nerves.
v. The autonomic nervous system (ANS) means a self-governing nervous system. Its function is to control and regulate the functions of the internal organs of our body involuntarily.

36. Concave lens-
focal length $(f) = -60\ cm$
Object length $(h) = 9\ cm$
Object distance $(u) = -30\ cm$
Lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

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

$v = \frac{-1}{60} + \left(\frac{-1}{30}\right)$

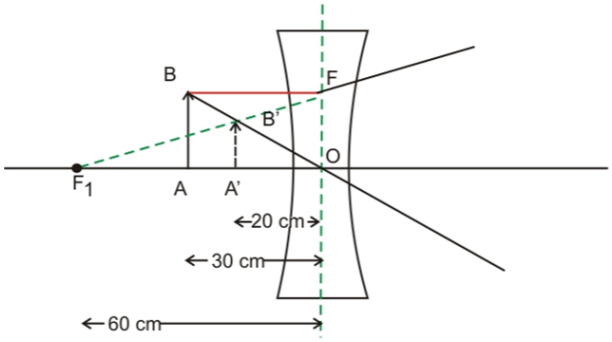
$m = \frac{v}{u} = \frac{-20}{-30} = \frac{2}{3}$

$m = \frac{h'}{h} \Rightarrow h' = m \times h$

$h' = \frac{2}{3} \times 9$

$h' = 6\ cm$

Image is virtual, erect and smaller than object.



OR

Object distance, u = - 15 cm

Focal length, = - 10 cm

Object size, h = 1 cm

Image distance, v= ?

(i) Position of image

From mirror formula, $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

We have, $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

Putting values, we get $\frac{1}{v} = \frac{1}{-10} - \frac{1}{-15}$

$= \frac{-3-(-2)}{3} = -\frac{1}{30}$

The image is formed at a distance 30 cm on the side of the object Negative sign indicates that object and image are on the same side.

(ii)Nature of image: The image is in front of the mirror, its nature is real and inverted.

Size of image: From the expression for magnification,

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

We have h' = $-h \times \frac{v}{u}$

putting values, we get h' = $-1 \times \frac{-30}{-15}$

= -2

The image formed has size 2 cm and negative sign means inverted and real and enlarged.

Section E

37. i. An exothermic reaction is a chemical reaction that releases energy through light or heat.
    ii. Mixing of acid with water is a highly exothermic reaction.
    iii. When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.

    $SO_3 + H_2O \rightarrow H_2SO_4$

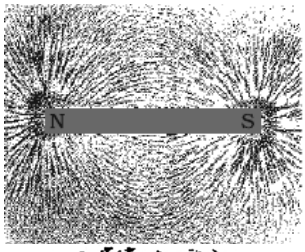
    OR

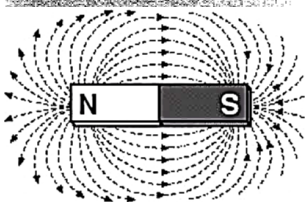
    Since the process of dissolving an acid in water is exothermic, it is always recommended that acid should be added to water. If it is done the other way, then it is possible that because of the large amount of heat generated, the mixture splashes out and causes burns.

38. i. In animals, chemical coordination is achieved through the agency of hormones which function as chemical messengers. Different plant hormones help to coordinate growth, development, and responses to the environment.
    ii. Adrenaline hormone is called an emergency hormone. Adrenaline hormone is released into the blood from the adrenal gland during stimulation of the nervous system.
    iii. The adrenal gland is present on the upper side of each kidney in our body.

    OR

Adrenaline hormone is secreted in small amounts all the time. But in large amounts, it is secreted when a person is frightened. It increases the rate of heartbeat and breathing, raises blood pressure and allows more glucose go into the blood to give us a lot of energy so as to quickly fight or run away from the frightening situation.

39. i. 

ii. 

iii. The direction of a magnetic field at a point is determined by placing a small compass needle. The N - pole of compass indicates the direction of magnetic field at that point.

If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible.

OR

Magnetic field lines can be drawn by moving a small compass from point to point around a magnet. At each point, draw a short line in the direction of the compass needle. Joining the points together reveals the path of the magnetic field lines.