Answers to RST/Set-3

1. (b) MgO is basic in nature. Bases turn wet red litmus paper blue.

2. (b) CH_3—$CO_2OH \xrightarrow{\text{hot conc. } H_2SO_4} CH_2$=$CH_2 + H_2O$

   Etnanol   Ethene

3. (c) Burning of coal is an example of combinatin reaction.

   $$C(s) + O_2(g) \longrightarrow CO_2(g)$$

4. (c) Impure Cu as anode, pure Cu as cathode.

5. (d) Insufficient production of insulin in the body increases the blood sugar level and leads to diabetes.

6. (a) Change in DNA can allow survival of few members of this population.

7. (c) (iii) and (iv)

8. (c) Both law of dominance and law of segregation can be explained.

9. (a) *Amoeba* divides by binary fission. Here, division of nucleus is followed by division of cytoplasm leading to formation of two daughter cells.

10. (c) A – (ii), B – (iv), C – (iii), D – (i)

11. (b) $E = P \times t$

    $$= \frac{50}{1000} \times 10 = 0.5 \text{ kWh}$$

    Cost = ₹ 7 × 0.5 kWh = ₹ 3.5

12. (d) Parallel to the magnetic field

13. (d) The rate flow of electric charge is called electric current.

14. (d) $R = \rho . \dfrac{2l}{A} = R_1 + R_2$

    $$\rho . \frac{2l}{A} = \rho_1 \frac{l}{A} + \rho_2 \frac{l}{A} = (\rho_1 + \rho_2)\frac{l}{A}$$

    $$\rho = \frac{\rho_1 + \rho_2}{2}$$

15. (a) a low-resistance conducting path.

16. (d) For every 10 units of energy absorbed by producers, only one unit of energy is absorbed by primary consumers.

17. (d) A is false but R is true.

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

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19. (*a*) Both A and R are true, and R is the correct explanation of A.
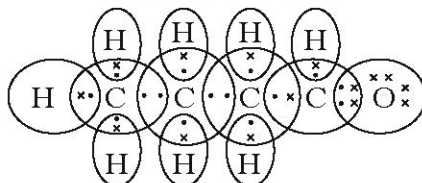
20. (*c*) A is true but R is false.

21. (*a*) The functional group present is aldehyde (—CHO).

The name of carbon compound is propanal.

(*b*) Higher homologue of propanal is butanal.

Electron dot structure of butanal, (C_3H_7CHO).

22. (*a*) The process is photosynthesis. It is a process by which green plants take in carbon dioxide and water and convert these into carbohydrates in the presence of chlorophyll and sunlight.

(*b*) The steps involved in the process of photosynthesis are:

• Absorption of light energy by chlorophyll.

• Conversion of light energy into chemical energy and splitting of water molecules into hydrogen and oxygen.

23. (*a*) Spinal cord, the part of central nervous system (CNS) is involved.

(*b*) The process depicted in image is reflex ation. Reflex action is quick, sudden and immediate response of the body to a stimulus.

(*c*) The neurons involved in reflex action are sensory neuron, relay neuron and motor neuron.

OR

(*a*)   (*i*) 3 – Dendrites

(*ii*) 4 – Axon

(*iii*) 5 – Nerve endings.

(*b*) We may be able to identify the food taste but will not able to smell if nose is blocked. During cold, the mucus in the nasal cavities becomes thick. As a result the air and odour molecules are unable to reach the olfactory cells. The brain does not receive the signals to identify the odour and everything we eat tastes the same.
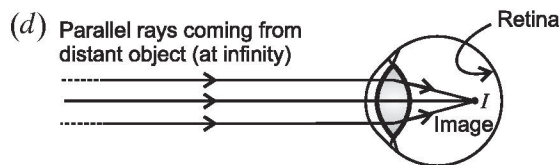
24. (*a*) Myopia

(*b*) This defect may arise due to

(*i*) excessive curvature of the eye lens.

(*ii*) elongation of the eye ball   (*any one*)

(*c*) Concave lens is used for the correction of this defect.

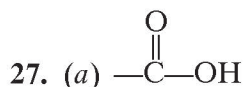(d) Parallel rays coming from distant object (at infinity)

25. **A.** (a) The type of mirror used is concave mirror.

(b) The nature of image formed is real and inverted.

(c) If the object is placed between F and P, the nature of image will be changed to virtual and erect.

(d)
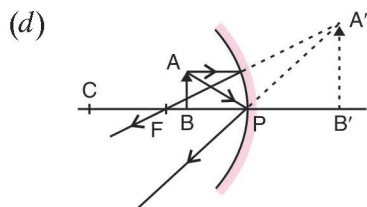
OR

B. (a) Medium with higher refractive index will be optically denser medium with respect to other.

(i) The incident light ray will bend towards the normal.

(ii) The incident light ray will bend away from the normal.

(b) The degree of bending of light will be more in case (ii) as refractive index of medium C is greater than that of medium B.

26. (a) The light changes its position two times at O and O′ as shown in the above figure.

(b) The angle of incidence is more in the refractive surface AB than CD. The light ray changes its direction at points O and O′. Both the points lie on surfaces separating two transparent media, the light ray at point O enters from a rarer medium to a denser medium, that is from air to glass and the light ray bend towards the normal and angle of incidence (∠i) is more than the angle of refraction (∠r). At point O′, the light enters from glass to air, it means from denser to rarer medium, the light bends away from the normal. Here the angle of incidence is lesser than the angle of refraction.

(c) The extent of bending of the ray of light at the opposite parallel faces AB (air-glass interface and CD (glass-air interface) of rectangular glass slab are equal and opposite. Hence, the emergent ray is parallel to the incident ray.

27. (a) $\overset{\displaystyle O}{\overset{\displaystyle \|}{-C-OH}}$

(b) Carboxylic acid.

(c) $CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

Carbon dioxide is formed in this reaction. The gas can be tested by passing it through lime water. Lime water turns milky due to the formation of insoluble calcium carbonate.

$$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$$
Lime water   White precipitate

28. **A.**   (a) $CuO(s) + 2HCl(aq) \longrightarrow CuCl_2(aq) + H_2O$
         Black   Blue-green

When dilute hydrochloric acid is added to copper oxide, the colour of the solution becomes blue-green due to the formation of copper(II) chloride.

(b) The nature of the salt solution is acidic. It is formed by copper oxide, weak base, and hydrochloric acid, strong acid.

OR

B.   (a) Element 'X' is copper

Compound 'Y' is copper oxide

(b) $2Cu(s) + O_2(g) \longrightarrow 2CuO(s)$
      'X'   'Y'

$$CuO(s) + H_2(g) \xrightarrow{\text{heat}} Cu(s) + H_2O(l)$$
   'X'   'Y'

29. (a) To have the roses of same colour and delicious fragrances, stem cutting having nodes and internodes will be used.

(b) Name – Vegetative propagation

Type – Asexual reproduction

(c) **Advantages of vegetative propagation**

- It is cheaper, easier and faster method of reproduction.
- Characteristics of parent plants are preserved.
- It is useful for the seedless plants or plants which have lost the capacity to bear seeds

(*any two*)

Disadvantages of vegetative propagation

- There will be overcrowding of plants
- Plants produced have less vigour
- New characters are not introduced
- Disease of parent plant may get transferred to offspring.   (*any two*)

30. (a) Stimulus for root – Gravity

Stimulus for shoot – Light

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(*b*) Response shown by root – Geotropism

Response shown by shoot – Phototropism

(*c*) The plant hormone that causes the root and shoot to develop in this manner is auxin. The hormone anxin is synthesised at the shoot tip. When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from the light and the shoot appears to bend towards light.

31. (*a*) The type of current shown is alternate current (AC)

(*b*) **Advantages of AC**

- It can be transmitted over long distances.
- There is less heat loss in transmission cables.
- Voltage can be changed easily. (*any two*)

(*c*) The frequency of AC is 50 Hz.

(*d*) **Sources of AC**

Hydroelectric power plants, thermal power generator, AC generators, nuclear power plants.

(*any two*)

32. (*a*) Namrata would observe the formation of neutral salt in beaker A. In beaker A, HCl is strong acid and has pH = 1. When NaOH (a strong base) is added, the salt formed is neutral and the pH becomes 7. In beaker B, CH_3COOH is a weak acid with pH = 4. When NaOH (a strong base) is added the salt formed is basic and the pH becomes more than 7.

(*b*) **Beaker A:** $HCl + NaOH \longrightarrow NaCl + H_2O$

Beaker B: $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O + CO_2$

(*c*) The concentration of hydronium ions will decrease. Upon dilution, the volume increases so the number of ions per unit volume decreases.

33. (*a*) Producer – Plant

Primary consumer – Insect, Mice, Rabbit, Rat (*any one*)

(*b*) The arrows in a food chain represent transfer of energy from producers to consumers.

(*c*) Plant → Insect → Frog → Snake → Eagle

The organisms of fifth trophic level (eagle) would have the least energy.

34. A. (*a*) **Activity:**

(*i*) Take three boiling tubes A, B and C.
(*ii*) Pour some water in test tube A. Put iron nails in it and cork it.
(*iii*) Pour boiled distilled water in another test tube B and put iron nails in it. Add 1 ml of oil over it such that oil floats over it and prevents the air from entering.
(*iv*) Take some iron nails in test tube C and put some anhydrous calcium chloride in it and cork it.

(*v*) Leave all the three test tubes for one day and then observe.
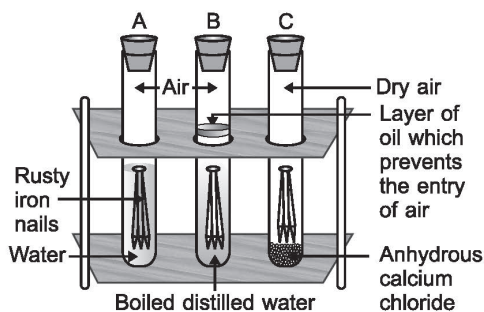
Observation: Iron nails get rusted in test tube A because both air and water are present in it. Iron nails do not get rusted in B because there is water but no air. In C, rusting will not take place because there is neither air nor water.

Conclusion: Iron gets rusted in the presence of air and water.

(*b*) Copper reacts with moist carbon dioxide in the air and slowly loses its shiny surface and forms a green coat. This green coat is basic copper carbonate. Silver articles get tarnished after some time when exposed to air. This is due to the reaction of silver with sulphur in the air to form a black coat. This black coat is known as silver sulphide.

(*c*) The constituents present in the alloys are:

Stainless steel: Iron, nickel and chromium

Bronze: Copper and tin

Solder: Lead and tin.

OR

B. The following observations help us to determine that a chemical reaction has taken place

- Change in state
- Evolution of a gas
- Change in temperature
- Change in colour
- Formation of precipitate

If any one of the above observations is seen in the given reaction, we can say that a chemical reaction has taken place.

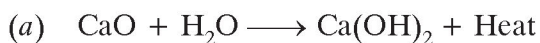In the first chemical equation, heat is given out.

In the second chemical equation, change in state is seen. Two gases – hydrogen and oxygen combine to form water (liquid).

In the third chemical equation change in colour is seen. On heating, red lead oxide is changed to yellow lead monoxide.
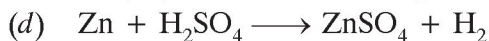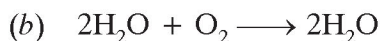
In the fourth chemical equation, bubbles of gas are observed which are of hydrogen gas.

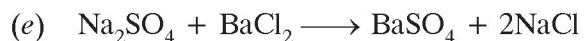In the fifth chemical equation, formation of insoluble substance i.e., precipitate is formed. Barium sulphate ($BaSO_4$) settles down as a white precipitate.

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(a) $CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$

It is already balanced.

(b) $2H_2O + O_2 \longrightarrow 2H_2O$

(c) $2Pb_3O_4 \xrightarrow{\Delta} 6PbO + O_2$

(d) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

Its is already balanced

(e) $Na_2SO_4 + BaCl_2 \longrightarrow BaSO_4 + 2NaCl$

35. A. (a) P – Stigma

Q – Male germ cell

R – Pollen tube

S – Female germ cell

T – Ovary

(b) **Functions of P and R**

Stigma: It is sticky or waxy to collect pollen grains and helps in pollination.

Pollen tube: It delivers the male germ cell to the ovule within the ovary.

(c) Pollen grains are produced in the anthers of a stamen of a flower. Pollen grains contain male gametes necessary for fertilisation. They land on the stigma of a flower through pollination.

(d) **Fate of the flower after fertilisation.**

• The zygote divides a number of times to form embryo within the ovule.

• The ovule develops a tough coat and get-converted into a seed.

• The ovary grows rapidly and ripens to form a fruit.

• The petals, sepals, stamens, style and stigma may shrivel and fall off.

OR

B. (a)
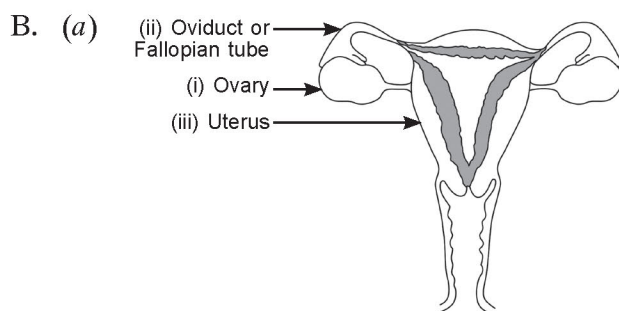
(b) The site of fertilisation in humans is the junction between ampulla and isthmus of the fallopian tube.

Thus, for fertilisation, it is necessary that the ovum be present at this site. As the release of ovum from the ovaries takes place between 11th to 16th day of menstrual cycle, the chances of ovum being present in fallopian tube at that time is high. Hence, fertilisation is possible when ovulation occurs, in the middle of menstrual cycles.

(c) *(i)* Reasons for decline in child sex ratio are:

- People prefer to have a particular child.
- Sex-selective abortion of female foetuses

(ii) The Government of India has baned the pre-natal sex determination in India.

36. A. *(a)* $R_1 = 6\ \Omega,\ R_2 = 12\ \Omega,\ R_3 = 24\ \Omega$

(i) To get highest resistance, connect the resistors in series
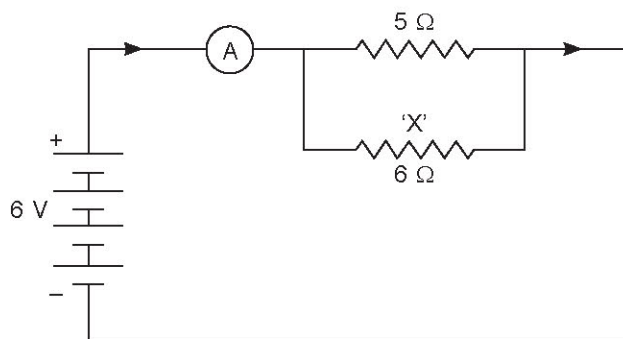
$$R_S = R_1 + R_2 + R_3$$
$$= 6 + 12 + 24 = 42\ \Omega$$

(ii) To get the lowest resistance, connect the resistors in parallel

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{1}{6} + \frac{1}{12} + \frac{1}{24} = \frac{4+2+1}{24} = \frac{7}{24}$$

$$\therefore \qquad R_P = \frac{24}{7} = 3.43\ \Omega$$

(b) Amita can connect the resistor 'X' in parallel to the 5 Ω resistor.

(i) Resultant resistance

$$\frac{1}{R_P} = \frac{1}{5} + \frac{1}{6} = \frac{6+5}{30} = \frac{11}{30}$$

$$\therefore \qquad R_P = \frac{30}{11} = 2.73\ \Omega$$

(ii) $R = \dfrac{30}{11}\ \Omega,\ V = 6\ V$

$$V = IR$$

$$I = \frac{V}{R} = \frac{6 \times 11}{30} = \frac{11}{5} = 2.2\ A$$

OR

B. *(a)* Power of lamp = 100 W, Power of TV set = 250 W, Power of toaster = 1200 W

$$V = 220\ V$$

$$P = VI$$

$$I_1 \text{ of lamp} = \frac{P}{V} = \frac{100}{220}$$

$$I_2 \text{ of TV set} = \frac{250}{220}$$

$$I_3 \text{ of toaster} = \frac{1200}{220}$$

Total current drawn $= I_1 + I_2 + I_3$

$$= \frac{100}{220} + \frac{250}{220} + \frac{1200}{220} = \frac{1550}{220} = 7.04 \text{ A}$$

These appliances are connected in parallel.

They are connected in parallel because

- Overall resistance will decrease due to which current supply is higher.
- If one appliance stops working due to some defect, the other appliances keep working.

(b) Total energy consumed by a lamp $(E_1) = \frac{100}{1000}$ kW $\times$ 8 hours $\times$ 30 days = 24 kWh

Total energy consumed by a TV set $(E_2) = \frac{250}{1000}$ kW $\times$ 2 $\times$ 30 = 3/2 = 1.5 kWh

Total energy consumed by a toaster $(E_3) = \frac{1200}{1000} \times \frac{10}{60}$ hours $\times$ 30 = 2 kWh

Total energy consumed by appliances $= E_1 + E_2 + E_3 = 24 + 1.5 + 2 = 27.5$ kWh

Cost of energy to operate the appliances = 27.5 kWh $\times$ ₹ 6.00 per kWh = ₹ 155.0

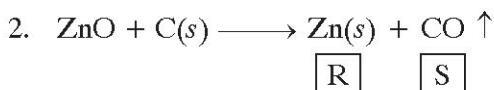**37.** (a) A – Zinc carbonate

B – Hydrochloric acid

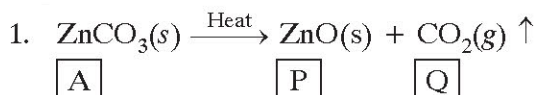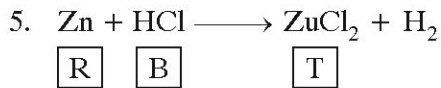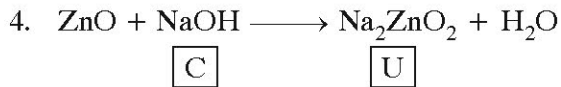C – Sodium hydroxide

P – Zinc oxide

R – Zinc

T – Zinc chloride

Explanation:

1. $ZnCO_3(s) \xrightarrow{\text{Heat}} ZnO(s) + CO_2(g) \uparrow$

   $\boxed{A} \qquad\qquad \boxed{P} \qquad \boxed{Q}$

2. $ZnO + C(s) \longrightarrow Zn(s) + CO \uparrow$

   $\qquad\qquad\qquad \boxed{R} \qquad \boxed{S}$

3. $ZnO + HCl \longrightarrow ZnCl_2 + H_2O$

   $\qquad \boxed{B} \qquad\quad \boxed{T}$

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4. $ZnO + NaOH \longrightarrow Na_2ZnO_2 + H_2O$
     $\boxed{C}$ $\boxed{U}$

5. $Zn + HCl \longrightarrow ZuCl_2 + H_2$
     $\boxed{R}$ $\boxed{B}$ $\boxed{T}$

(b) In equation 1, the process is calcination to obtain metal oxide from metal carbonate on heating in the absence of oxygen.

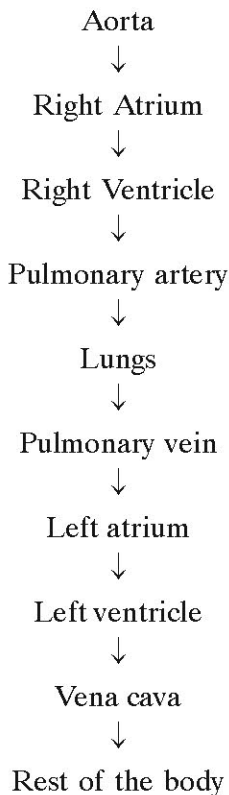In equaton 2, the process is reduction as it is easier to obtain metal from its oxide.

OR

(c) Gas 'S' is carbon monoxide. It has high affinity for haemoglobin.

38. (a) The right side and the left side of the human heart are useful to prevent deoxygenated and oxygenated blood from mixing. This type of separation of oxygenated and deoxygenated blood ensures a highly efficient supply of oxygen to the body. This is useful in case of birds and mammals because it constantly gives energy to maintain their body temperature.

OR

(b)

Aorta
↓
Right Atrium
↓
Right Ventricle
↓
Pulmonary artery
↓
Lungs
↓
Pulmonary vein
↓
Left atrium
↓
Left ventricle
↓
Vena cava
↓
Rest of the body

(c)   (i) The blood vessels that are clearly observed in older people are veins as these are superficially located.


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> > (ii) Veins collect the deoxygenated blood from different organs and bring it back to the heart.

> (d) The smallest vessels which are one-cell thick are called capillaries. Exchange of materials between the blood and the surrounding cell takes place across the thin walls of capillaries.

39. (a) The emergent ray through a prism bends towards the base of prism because in a prism refraction occurs at two inclined surfaces. In a rectangular glass slab, refraction of light occurs at two parallel surfaces. So the emergent ray is in direction of the incident ray but laterally displaced.

(b)

∠A – angle of prism

∠D – angle of deviation

OR

(c)
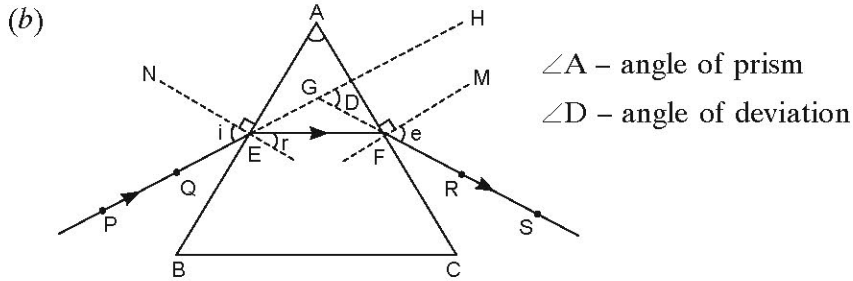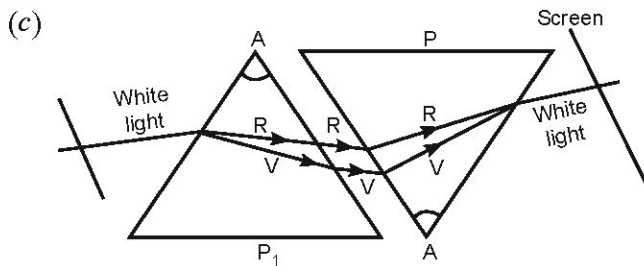
(d) The various colours of spectrum of white light are:

Violet, Indigo, Blue, Green, Yellow, Orange, Red.