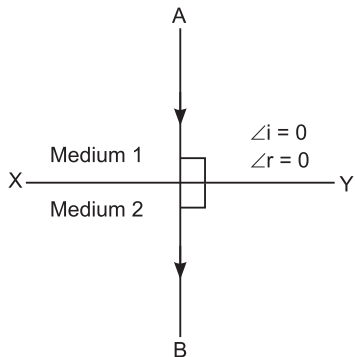
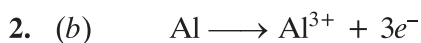


Answers to RST-DS1/Set-1

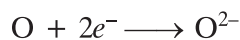
1. (d) (i) When a ray of light is incident normally on a boundary, no refraction occurs as shown in the figure.



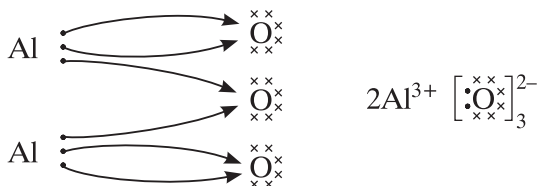
- (iv) When the refractive index of medium 1 is equal to refractive index of medium 2, i.e. $n_1 = n_2$.



2, 8, 3 2, 8



2, 6 2, 8



3. (a) Energy used by TV set = $\frac{250}{1000} \text{ kW} \times 1 \text{ h} = 0.25 \text{ kWh}$

Energy used by mixer grinder = $\frac{600}{1000} \text{ kW} \times \frac{20}{60} \text{ h} = 0.20 \text{ kWh}$

Energy used by hair dryer = $\frac{800}{1000} \text{ kW} \times \frac{10}{60} \text{ h} = 0.13 \text{ kWh}$

Energy used by toaster = $\frac{1200}{1000} \times \frac{12}{60} = 0.24 \text{ kWh}$

4. (c)

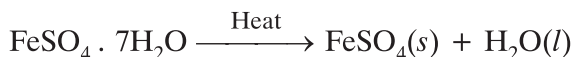
5. (b) From the electronic structures, we know that element A is a metal, B and C are non-metals and element D is a noble gas. Covalent bonds are formed between a non-metal and a non-metal by sharing of electrons.
6. (c) Minimum resistance is obtained when resistors are connected in parallel combination.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad \left[R_1 = R_2 = R_3 = \frac{1}{2} \Omega \right]$$

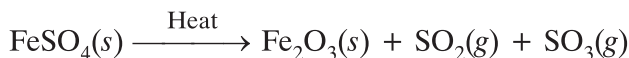
$$\frac{1}{R} = \frac{1}{1/2} + \frac{1}{1/2} + \frac{1}{1/2} = \frac{2+2+2}{1} = \frac{6}{1}$$

$$\Rightarrow R = \frac{1}{6} \Omega$$

7. (b)
8. (c)
9. (c) Single displacement or displacement reaction as Br of NaBr has been displaced by chlorine.
10. (a)
11. (b)
12. (c)
13. (d) The reaction of calcium with water is less violent and the heat evolved is not sufficient for the hydrogen to catch fire. Bubbles of hydrogen gas formed stick to the surface of the calcium metal and metal starts floating.
14. (a) If the length of the wire increases, the electrons have to travel a longer distance and as a result of this, its resistance increases as $R \propto l$. Therefore, on doubling the length of the wire, the resistance also doubles.
15. (d)
16. (d) On heating green coloured ferrous sulphate crystals ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), water is lost and the colour change to dull white.



On further heating a characteristic smell of burning sulphur is given out along with reddish brown residue of ferric oxide.



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

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

20. (d) A is False but R is true.

Leather and cloth bags are biodegradable substances.

21. (a) Organism – *Plasmodium*

Type of reproduction – Multiple fission (Asexual reproduction)

(b) The other name given to this organism is malarial parasite.

Plasmodium is a unicellular organism.

22. Different species use different strategies for sex determination and some animals rely completely on environmental cues. In some animals, like a few reptiles the temperature at which fertilised eggs are kept determines whether the animals developing in the eggs will be male or female. For example, in snails, individuals can change their sex indicating that sex is not genetically determined.

23. (a) Mohit was not able to read anything written in the book because of the least distance of distinct vision which is 25 cm.

(b) The defect of vision from which Mohit is suffering is myopia.

The nature of the lens required to correct the defect is concave or diverging lens.

The focal length of the corrective lens is

$$P = \frac{1}{f}$$

$$f = \frac{1}{P} = \frac{1}{-1.0} = -1 \text{ m}$$

Therefore the focal length of the corrective lens is –1 m or –100 cm.

24. (a) Gall bladder stores bile which helps in emulsification of fats. In the absence of stored bile, emulsification of fats is affected and hence fat digestion will be slow.

(b) The final products of fats after their complete digestion are glycerol and fatty acids.

Complete digestion of fats takes place in small intestine.

OR

(a) Fishes take in water through their mouth and force it past the gills where the dissolved oxygen is taken up by blood.

(b) Breathing is a physical process in which oxygen is taken in and carbon dioxide is given out. Breathing involves inspiration (inhalation) and expiration (exhalation).

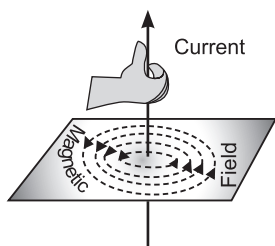
Inspiration: When we breathe in, ribs move up and flatten the diaphragm due to which the chest cavity becomes larger. As result air is sucked into the lungs and fills the expanded alveoli.

Expiration: When we breathe out, ribs move down and diaphragm becomes dome-shaped decreasing the chest cavity. Thus, pushing the air out from lungs.

25. (a) Magnetic field lines are more crowded towards the poles of a magnet because the magnetic field is stronger near the poles.
- (b) The current carrying conductor produces a magnetic field around it. This magnetic field exerts a force on the magnetic needle of compass. As a result, compass needle gets deflected.

OR

The rule which is used to find the direction of magnetic field around a straight conductor carrying current is Right-Hand Thumb Rule. Hold the straight conductor in your right hand such that the thumb points out in the direction of flow of current. Then wrap your fingers around the conductor in the direction of the field lines of the magnetic field.



- (a) On increasing the current through the conductor, the strength of the magnetic field will increase.
- (b) On changing the direction of flow of current through the conductor, the direction of the magnetic field will also change.
26. (a) (i) The name given to the cross is monohybrid cross.
(ii) 50% of the plants is likely to produce wrinkled seeds.

(b) Parents

	Rr	×	Rr
	↙ ↘		↙ ↘
Gametes	(R) (r)		(R) (r)
F ₂ generation		R	r
	R	RR	Rr
	r	Rr	rr

Phenotypic ratio

Round seed : Wrinkled seed

3 : 1

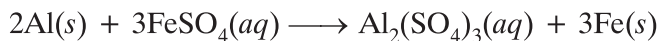
75% of the plants will have round seeds.

Genotypic ratio

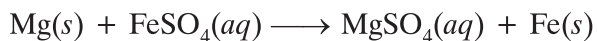
Pure round : Hybrid round : Pure Wrinkled

1 : 2 : 1

27. (a) Metal 'M' is either aluminium or zinc. Gas 'G' is hydrogen.
(b) Test for hydrogen gas – Take a burning match stick near the mouth of the test tube filled with hydrogen gas. The gas will burn with a pop sound.
(c) Metal oxide M_2O_3 is Al_2O_3 .
Reaction of Al_2O_3 with acid and base
 $Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$
 $Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$
28. (a) (i) Unicellular organisms remove waste by simple diffusion from their body surface into the surrounding water.
(ii) The purpose of making urine is to filter out waste products from the blood.
(b) Some substances like glucose, amino acids, salts and a major amount of water are selectively reabsorbed as urine flows along the tubular part of the nephron.
(c) The amount of urine produced is regulated by reabsorption of water and dissolved substances. It depends on how much excess water is there in the body and how much of the waste material has to be removed.

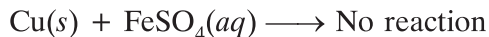
29. In beaker A

Green colour of the iron sulphate solution will fade and becomes colourless and iron particles will settle down. This has happened as Al is more reactive than iron and displaces it from its salt solution.

In beaker B

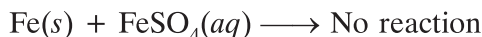
In this beaker also, green colour of iron sulphate solution first fades and ultimately becomes colourless due to the formation of magnesium sulphate and iron particles settle down. This has happened as magnesium is more reactive than iron and displaces iron from its salt solution.

In beaker C



There will be no change in the colour of the solution as copper is less reactive than iron so it will not displace iron from its salt solution.

In beaker D



Rini will not observe any change as iron strip is added into iron sulphate solution.

Increasing order of reactivity of these metals



30. (a) In bright sunlight, the iris contracts the pupil to allow less light to enter the eye and in dim light, the iris expands the pupil to admit more light to see the object clearly. Therefore, it takes sometime to increase the size of pupil in dim light.
- (b) (i) When a narrow beam of white light passes through:
- (1) **Glass slab:** It does not split into its constituent colours. The direction of incident ray and emergent ray of light are parallel to each other.
 - (2) **Glass prism:** It splits into its constituent seven colours. The direction of incident ray and emergent ray of light are not parallel to each other.
- (ii) When a narrow beam of monochromatic light passes through:
- (1) **Glass slab:** It deviates from the actual path but the direction of the incident ray and the emergent ray are parallel to each other.
 - (2) **Glass prism:** It deviates from the actual path but the direction of the incident ray and emergent ray are not parallel to each other.
31. (a) Plants \longrightarrow Goat \longrightarrow Human beings
Plants \longrightarrow Hen \longrightarrow Human beings
- (b) If a farmer applies insecticides to protect his cereal crops, human beings would have the maximum concentration of insecticides. This is due to the phenomenon of biological magnification. The concentration of insecticides/harmful chemicals increases with every trophic level in a food chain. These chemicals are non-biodegradable, they get accumulated in our bodies. As human beings occupy the top most level in any food chain, the maximum concentration of these chemicals will be in our bodies.

- (c) According to 10% law of energy only 10% energy is transferred to the next trophic level because other 90% is used for things like respiration, digestion, running away from predators.

Energy present in rat = 10% of 400 J = 40 J

Energy present in snake = 10% of 40 J = 4 J

Energy present in hawk = 10% of 4 J = 0.4 J

32. (a) At ordinary temperatures, the surface of aluminium metal forms a protective oxide layer (Al_2O_3) which prevents the metal from further corrosion. The protective layer of Al_2O_3 makes it useful in making cooking utensils.
- (b) It is because metals are sonorous, i.e. produce sound when struck with a hard substance.
- (c) Nitric acid (HNO_3) is a strong oxidising agent. It oxidises the hydrogen produced to water and itself gets reduced to nitrogen oxides (N_2O , NO , NO_2).

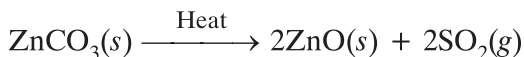
OR

- (a) Metal 'M' is placed in the middle of the activity series and has two ores: MS and MCO_3 . Metal 'M' is zinc and its ores are ZnS and ZnCO_3 .

The sulphide ore is first converted into its oxide by heating strongly in the presence of excess air. This process is called roasting. The metal oxide is then reduced to the corresponding metal by using carbon as reducing agent. Zinc oxide is heated with carbon, it is reduced to metallic zinc.



- (b) Metal carbonate (ZnCO_3) is changed into its oxide by heating strongly in limited supply of air and this process is known as calcination. Zinc oxide is reduced to metallic zinc by heating with carbon.



33. Current (I) needed = 9 A

$$V = 18 \text{ V}$$

By applying Ohm's law $V = IR$

$$R = \frac{V}{I} = \frac{18}{9} = 2 \Omega$$

As seen in the circuit the resistors are connected in parallel

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R} = \frac{R_2 + R_1}{R_1 R_2}$$

$$R = \frac{R_1 R_2}{R_2 + R_1}$$

$$2 = \frac{6 \times R_2}{R_2 + 6}$$

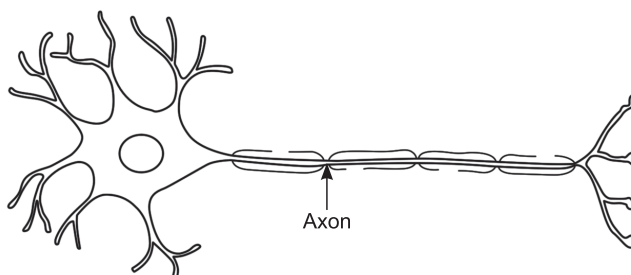
$$R_2 + 6 = 3R_2$$

$$2R_2 = 6$$

$$\Rightarrow R_2 = 3 \Omega$$

Thus, R_2 resistor should be of 3Ω so as to get equivalent current of 9 A. Hence, Reema would be able to get the required result.

34. (a)



A nerve cell (Neuron)

(b) (i) Synapse

(ii) Synapse is a microscopic gap present between two neurons where chemical signal is transmitted from axonal end of one neuron to the dendritic end of another neuron. In this way, the message is passed from one neuron to another across the synapse.

(c) Mode of action in normal breathing is an involuntary action whereas a quick withdrawal of the hand from a hot pan is reflex action.

Normal breathing	Withdrawal of the hand
(i) It is regulated by the brain.	(i) It is regulated by the spinal cord.
(ii) It does not involve skeletal muscles.	(ii) It involves skeletal muscles.

(iii) This action is performed throughout one's life.	(iii) This action is produced in response to an event of an emergency.
(iv) It is not controlled by our will.	(iv) It is the sudden action in response to stimulus.

OR

- (a) • The above experimental set-up demonstrates phototropism and geotropism.
 • The shoot depicts positive phototropism and negative geotropism.
 • The root depicts positive geotropism and negative geotropism.
- (b) Control and coordination takes place in plants with the help of phytohormones or plant hormones. They are secreted by specific parts of plants such as root tip, shoot tip and leaves. They control various activities such as elongation of the stem, flowering etc. They also help in coordinating various responses like phototropism, chemotropism etc.
- (c) Tendrils are sensitive to touch or contact with other objects. When a tendril touches a support, the hormone auxin from the tip of the tendril diffuses towards the side of the tendril that is not in contact with the support. As a result, the side that is not in contact with the support grows faster than the side which is in contact with the support. This leads to the bending of tendril towards the support.
- (d) Cytokinins promotes rapid cell growth. Cytokinins play a vital role in cell division and they are present in greater concentrations in areas of rapid cell division such as in fruits and seeds.

35. (a) Converging lens is convex lens.

Distance of the object from the lens, $u = 60 - 20 = 40$ cm

In case of convex lens, u is taken as -ve

$$\therefore u = -40 \text{ cm}$$

Distance of screen from the lens (v) = $100 - 60 = 40$ cm

By applying lens formula

$$\begin{aligned} \frac{1}{f} &= \frac{1}{v} - \frac{1}{u} \\ &= \frac{1}{40} - \frac{1}{-40} \end{aligned}$$

$$= \frac{1}{40} + \frac{1}{40} = \frac{2}{40} = \frac{1}{20} \text{ cm}$$

$$\Rightarrow f = 20 \text{ cm}$$

(b) When he shifts the object towards the lens at a position of 25 cm

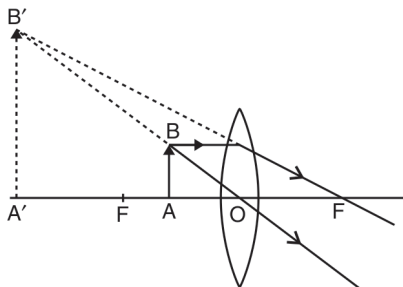
$$u = 60 - 25 = 35 \text{ cm}$$

It means the object lies between F and 2F and the image will be formed beyond 2F.

(c) When he further shifts the object towards the lens at a position of 50 cm

$$u = 60 - 50 = 10 \text{ cm}$$

The object lies between its focus and optical centre. Therefore, the image formed is virtual, erect and magnified.



OR

(a) Refractive index of glass with respect to air i.e. ${}^a n_g = \frac{3}{2}$

$$\therefore {}^s n_a = \frac{1}{{}^a n_g} = \frac{1}{3/2} = \frac{2}{3}$$

Therefore, the refractive index of air with respect to glass is $\frac{2}{3}$.

(b) Real depth of tank = 3 m

Apparent depth of tank = x m

$$\text{Refractive index of water} = \frac{\text{Real depth}}{\text{Apparent depth}}$$

$$1.33 = \frac{3}{x}$$

$$\Rightarrow x = \frac{3}{1.33} = 2.26 \text{ m}$$

The tank appears to be 2.26 m deep when seen normally.

- (c) **Absolute refractive index:** The refractive index of medium 2 with respect to vacuum or air is considered to be its absolute refractive index. It is represented by n_2 . It is also equal to the speed of light in vacuum to the speed of light in the medium.

$$\text{i.e. } n_2 = \frac{\text{Speed of light in air or vacuum } (c)}{\text{Speed of light in the medium } (v)} = \frac{c}{v}$$

Speed of light in air, $c = 3 \times 10^8$ m/s

Let the speed of light in medium A and medium B be v_A and v_B respectively.

Speed of light in a medium of refractive index n is given by:

$$v = \frac{c}{n}$$

$$v_A = \frac{3 \times 10^8}{1.36} = 2.20 \times 10^8 \text{ m/s}$$

$$v_B = \frac{3 \times 10^8}{1.63} = 1.84 \times 10^8 \text{ m/s}$$

36. (a) (i) If we warm ethanol directly, the vapours of alcohol may catch fire as ethanol is inflammable.
- (ii) 5% solution of potassium permanganate is prepared by dissolving 5 g of potassium permanganate in 100 mL of water. It can also be prepared by dissolving 5 g of KMnO_4 in water to make a final volume of 100 mL.
- (b) (i) Alkaline potassium permanganate acts as an oxidising agent. The colour of KMnO_4 disappears initially because it oxidises ethanol to ethanoic acid and itself gets reduced to manganese dioxide (MnO_2).
- (ii) On adding excess of alkaline KMnO_4 solution the pink colour persists, indicating that all the ethanol has been converted to ethanoic acid.



OR

- (a) Carbon can neither form C^{4+} cation nor C^{4-} anion. Carbon could lose four electrons forming C^{4+} cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding on to just two electrons. Carbon could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons that is four extra electrons.

- (b) Carbon compounds are bad conductors of electricity as these compounds are made of molecules and the force of attraction between these molecules are not very strong.
- (c) Carbon forms strong bonds within the molecule due to its small size. The small size enables the nucleus to hold on to the shared pairs of electrons strongly.
- (d) Carbon forms a large number of compounds due to its tetravalency and unique property of catenation.
- (e) Butter contains saturated compounds while cooking oil contains unsaturated compounds. When cooking oil is treated with a few drops of alkaline potassium permanganate solution, pink colour disappears. However, with butter the pink colour of potassium permanganate does not disappear.
37. (a) If a fuse wire is connected to neutral wire, the electric appliance will continue to be in touch with the live wire and when the electric appliance is touched, it will give shock. Hence, the fuse is always connected in live wire and not to neutral wire.
- (b) Other than electric fuse, earth wire is commonly used. It ensures that any leakage of current to the metallic body of the appliance keeps its potential to that of the earth and the user may not get a severe shock.
- (c) (i) Fuse wire is placed in series with the device in an electric circuit. It prevents damage to the electric appliances and the circuit due to overloading.
- (ii) If a current larger than the specified value flows through the circuit, the temperature of the fuse wire increases. This melts the fuse wire and breaks the circuit.

OR

- (c) Power of electric iron $P = 1 \text{ kW} = 1000 \text{ W}$,
 $V = 220 \text{ V}$

$$P = VI$$

$$I = \frac{P}{V} = \frac{1000}{220} = 4.54 \text{ A}$$

Thus current used is 4.54 A

Since the current rating of the circuit is 3 A and the current flowing through the circuit is 4.54 A, the fuse in the circuit melts. Consequently, the circuit breaks and the electric iron is saved from getting damaged. In this case a 5 A fuse must be used.

38. (a) (i) Male gametes : R

Female gamete : T

(ii) Sometimes the parts of the flower which persist in fruits are sepals. Examples of such fruits where sepals persist are guava, tomato, strawberry, etc.

(b) After fertilisation, the zygote divides several times and develops into an embryo within the ovule. The ovule forms a tough coat and is gradually converted into a seed. The ovary grows rapidly and ripens to form a fruit. Generally, the petals, sepals, stamens, style and stigma may shrivel and fall off.

OR

(b) Differences between self-pollination and cross-pollination

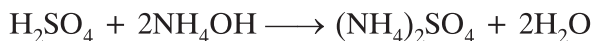
Self-pollination	Cross-pollination
<ul style="list-style-type: none"> It is the transfer of pollen grains from anther to the stigma of the same flower. 	<ul style="list-style-type: none"> It is the transfer of pollen grains from the anther of one flower to the stigma of another flower.
<ul style="list-style-type: none"> It does not require any external agent for the transfer of pollen grains. 	<ul style="list-style-type: none"> It requires external agent for the transfer of pollen grains from one flower to another.
<ul style="list-style-type: none"> Small number of pollen grains are produced by such flowers. 	<ul style="list-style-type: none"> Large number of pollen grains are produced by such flowers.
<ul style="list-style-type: none"> It does not bring variations. 	<ul style="list-style-type: none"> It brings a large number of variations.

39. (a) A – NaCl

B – Na₂CO₃

C – (NH₄)₂SO₄

Out of A, B and C salts, salt C would be acidic in nature as it is formed by a strong acid (H₂SO₄) and a weak base (NH₄OH).



- (b) (i) When Ankita used the universal indicator to find the pH of the salt solution of A she found the pH as 7, i.e. the salt solution is neutral. Salt solution of A (NaCl) is formed by strong acid and strong base.

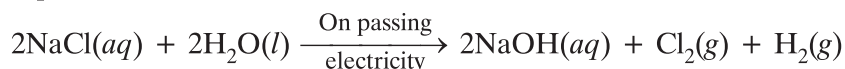
When she added NaOH solution to the aqueous solution of salt A along with phenolphthalein as an indicator, the colour of the solution changes from colourless to pink as the solution becomes basic in nature.

- (ii) Salt C $[(\text{NH}_4)_2\text{SO}_4]$ is acidic in nature as it is formed by strong acid (H_2SO_4) and weak base (NH_4OH). The pH of the acidic solution will be less than 7. The blue litmus solution changes to red but red litmus solution remains unchanged.

OR

- (c) The aqueous solution of salt A (NaCl) is called brine.

When electricity is passed through a concentrated aqueous solution of sodium chloride salt, sodium hydroxide (NaOH) is formed and the reaction can be represented as



Use of sodium hydroxide

- (i) In the paper industry.
- (ii) In the manufacture of dyes, soaps and detergents.
- (iii) As a laboratory agent.
- (iv) For degreasing metals.
- (v) In petroleum refining.
- (vi) In making artificial fibres. *(any one of the uses)*