COIMBATORE SAHODAYA COMPLEX

SCIENCE (086) 2024-25

SET B(Answer Key)

Section A(20x1= 20M)

1. (d)
2. (b)
3. (b)
4. (c)
5. (c)
6. (c)
7. (c)
8. (a)
9. (b)
10. (b)
11. (d)
12. (c)
13. (a)
14. (a)
15. (a)
16. (c)
17. A is true but R is false.
18. Both A and R are true and R is the correct explanation of A.
19. Both A and R are true and R is the correct explanation of A.
20. A is true but R is false.

Section B (6x2=12M)

21.

- No reaction occurred in test tubes where the metal is less reactive than the substance with which it is in contact.

- Order of Reactivity: The metals are arranged based on their ability to displace other metals from solutions, from most to least reactive.

22. The feedback mechanism regulates hormone release. For example, insulin regulates blood sugar; when levels are high, insulin secretion increases, lowering sugar levels and causing insulin secretion to decrease.
23. Protein-digesting enzymes include pepsin and trypsin. Bile emulsifies fats, aiding digestion.
    - OR: Translocation moves nutrients in plants. Thicker walls in ventricles allow stronger blood flow to the body.
24. Diagram: A ray diagram shows a concave mirror focusing an image at its focal point when the object is at that point.

25.

Power Calculation: $P = V \times I = 5\,\text{V} \times 0.1\,\text{A} = 0.5\,\text{W}$

Resistance Calculation: $R = \frac{V}{I} = \frac{5}{0.1} = 50\,\Omega$

---

26. Aquariums require cleaning due to lack of a natural ecosystem, unlike ponds/lakes where decomposers naturally maintain the balance.

Section C (7x3=21M)

27. Reagents used by Sugandha to prepare HCl gas:

To prepare hydrochloric acid (HCl) gas, Sugandha can use sodium chloride (NaCl) and concentrated sulfuric acid (H_2SO_4).

$NaCl\ (solid) + H_2SO_4 (conc.) \rightarrow NaHSO_4 (solid) + HCl\ (gas)$

(ii) Colour changes observed with the dry and wet blue litmus papers:

- Dry blue litmus paper: When dry blue litmus paper is exposed to HCl gas, no immediate colour change occurs because HCl gas is not dissolved in water to release H^+ ions.

- Wet blue litmus paper: When wet blue litmus paper comes in contact with HCl gas, it turns red. This is because the HCl gas dissolves in water and releases H^+ ions, which makes the solution acidic, turning the blue litmus paper red.

(iii) Formation of ions when HCl gas combines with water:
When HCl gas dissolves in water, it ionizes to form hydronium ions (H_3O^+) and chloride ions (Cl^-). The reaction is:

$HCl\ (gas) + H_2O\ (l) \rightarrow H_3O + (aq) + Cl - (aq)$

28. Carbon cannot form C^{4+} cations or C^{4-} anions because it has a relatively small atomic size and high ionization energy, making it difficult to either lose or gain four electrons. Instead, carbon forms covalent bonds by sharing electrons, which allows it to achieve a stable electron configuration.

(i) Covalent compounds are bad conductors of electricity because they do not have free-moving charged particles like ions or electrons, which are required to conduct electricity.

(ii) Covalent compounds tend to have low melting and boiling points because the intermolecular forces (such as van der Waals forces or hydrogen bonding) are generally weaker than the ionic bonds in ionic compounds, requiring less energy to break.

.

29. Features of Human Lungs as an Efficient Respiratory Surface:

The human lungs are well-adapted for efficient gas exchange due to several key features:

1. Large Surface Area: The lungs have millions of tiny air sacs called alveoli. This increases the surface area for gas exchange, allowing more oxygen to be absorbed and more carbon dioxide to be expelled.
2. Thin Membrane: The walls of the alveoli are extremely thin (one cell thick), which allows gases (oxygen and carbon dioxide) to easily diffuse across the membrane.
3. Moist Surface: The inner surface of the alveoli is moist, which facilitates the dissolution of gases, allowing easier diffusion of oxygen and carbon dioxide.
4. Rich Blood Supply: The alveoli are surrounded by a dense network of capillaries, ensuring that the blood can efficiently pick up oxygen and release carbon dioxide.

5. Efficient Transport Mechanism: The circulatory system quickly transports oxygen to the body cells and carbon dioxide away from them, maintaining a continuous exchange of gases between the lungs and the blood stream.(any two points)

(b)Gas Transport: Oxygen binds to hemoglobin, while carbon dioxide dissolves in plasma.

30. (a) Mendel's Observations on F1 and F2 Generations in Pea Plants (Round vs. Wrinkled Seeds): Mendel crossed Round-seeded pea plants (RR) with Wrinkled-seeded pea plants (rr) in his experiment on pea plants. Here's a detailed explanation of his observations in the F1 and F2 generations:

1. F1 Generation:
   - Result: All F1 offspring were Round-seeded (Rr).
   - Reason: The Round seed trait (R) is dominant over the Wrinkled seed trait (r), which is recessive..
2. F2 Generation:
   - Result: In the F2 generation, the plants showed a 3:1 ratio of Round to Wrinkled seeds.
     - 75% of the F2 plants had Round seeds.
     - 25% had Wrinkled seeds. ○ Reason: When the F1 plants (Rr) were self-crossed, the alleles segregated randomly during gamete formation.

     The resulting ratio of Round to Wrinkled seeds in the F2 generation was 3:1, with Round seeds being dominant.

(b) Contrasting Traits: Seed color(yellow and green), flower colour(violet and white) and height(tall and short) are examples.

31. (a) The condition where a person suffers from both myopia (near sightedness) and hypermetropia (farsightedness) is called "mixed astigmatism" or sometimes "a combination of myopia and hypermetropia."

(b) This condition typically occurs due to an irregular shape of the cornea or the lens of the eye. It may also arise as a result of age-related changes in the eye, or if the curvature of the lens or

cornea is not perfectly symmetric, causing light to focus incorrectly both at near and far distances.

(c)Persons suffering from both myopia and hypermetropia generally require bifocal lenses or progressive lenses. These lenses help correct both near and distant vision:

- Bifocal lenses have two distinct regions: one for near vision (for hypermetropia) and one for distance vision (for myopia).
- Progressive lenses gradually change focus from the top (for distance vision) to the bottom (for near vision) without visible lines, offering a smooth transition between the two.

32.

Resistance Calculation: Using $R = \rho\frac{L}{A}$, the new resistance is calculated as $R' = \frac{R\times 3}{4} = 7.5\,\Omega$.

33. A solenoid is a long, straight wire wound in the form of a coil. When an electric current passes through the solenoid, it generates a magnetic field similar to that of a bar magnet. The solenoid has a distinct north pole and south pole, and the magnetic field inside the solenoid is uniform.(i) The magnetic field pattern around a solenoid is as follows:

- Inside the solenoid, the magnetic field lines are parallel and straight, indicating a uniform field.
- Outside the solenoid, the magnetic field lines spread out and form closed loops from the south pole to the north pole.wo Distinguishing Features Between the Magnetic Fields of a Solenoid and a Bar Magnet:

1. Shape of the Magnetic Field Lines:
    - In a solenoid, the magnetic field lines inside are straight and parallel, indicating a uniform magnetic field, whereas outside they form loops. ○ In a bar magnet, the field lines emerge from the north pole and curve around to the south pole outside the magnet, forming closed loops.
2. Magnetic Field Strength:
    - In a solenoid, the magnetic field inside is strong and uniform, whereas the field outside is weaker and irregular.

- In a bar magnet, the magnetic field strength varies; it is strongest at the poles and weaker away from the magnet. (Show diagram) **Section D**

34. A homologous series is a group of carbon compounds that have a similar chemical structure and functional group but differ by a methylene group (−CH2-CH_2−CH2) in their molecular formula. These compounds follow a regular and predictable pattern in their chemical properties, and their physical properties change gradually as the size of the molecules increases. The term "homologous" comes from the Greek word *homo* meaning "same" and *logos* meaning "reason" or "relationship," which refers to the fact that each successive compound in the series differs by a constant unit, the −CH2-CH_2−CH2 group.

Chemical Formula of Two Consecutive Members of a Homologous Series:

Let's take the alkane series (saturated hydrocarbons) as an example:

1. Methane (CH_4): The first member of the alkane series.
2. Ethane (C_2H_6): The second member of the alkane series.

These are two consecutive members in the homologous series of alkanes, where the difference between them is one −CH2-CH_2−CH2 group.

Part of These Compounds That Determines Their:

(i) Physical Properties*:*

The length of the carbon chain (or the number of carbon atoms in the molecule) primarily determines the physical properties (such as boiling point, melting point, and solubility). As the number of carbon atoms increases, the molecular size increases, leading to:

- An increase in boiling and melting points. A decrease in volatility. A change in solubility.

For example: Methane (CH_4) is a gas at room temperature. Ethane (C_2H_6) is also a gas, but its boiling point is higher than methane because it has a larger molecular size.

(ii) Chemical Properties:

The functional group or bonding type (such as single bonds in alkanes, double bonds in alkenes, or triple bonds in alkynes) determines the chemical properties. In the case of alkanes like methane and ethane, the single bonds (C–C and C–H) are responsible for their chemical reactivity, which is typically low compared to other hydrocarbons (like alkenes or alkynes).

- Methane (CH_4) and Ethane (C_2H_6) both undergo similar chemical reactions, such as combustion (reacting with oxygen) and substitution reactions with halogens, because they are both alkanes.

Examples: Methane (CH_4) and Ethane (C_2H_6).

OR

Covalent compounds are the compounds formed by sharing of electrons between atoms of compounds.

ionic compounds are formed due to transfer of electrons whereas the covalent compounds are formed due to sharing of electrons

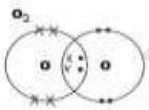
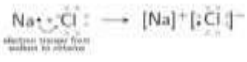
ionic compounds are extremely polar whereas the the covalent compounds are non-polar or less polar.

ionic bonds are between metals and non metals whereas the covalent bonds are between non metals.

ionic compounds have high melting and boiling points whereas the covalent compounds have low melting and boiling points

The compounds which are formed by the mutual sharing of electron are called covalent compounds...

In various ways covalent compounds are different from ionic compounds

Covalent Bonding	Ionic Bonding
A covalent compound is formed by the mutual sharing of electrons to complete the octet of the shell. For example, O_2 is formed by the covalent bonding.	In the ionic bonding, the transfer of electron takes place. In this bonding, one electron donor and one electron acceptor are required. For example NaCl. Here sodium(Na) is electron donor and Cl is an electron acceptor.
	
i) They have low melting.	They have high melting.
ii) They do not conduct electricity	They conduct electricity
iii) They have definite shape	They do not have a definite shape.

35. Female Reproductive System: Diagram includes parts like the ovaries, fallopian tubes, and uterus.Placenta Function: Nutrient and gas exchange between mother and fetus.

- No Fertilization: Menstruation occurs if the egg is not fertilized.

OR

Importance of Vegetative Propagation:

Rapid and Efficient Reproduction:

Vegetative propagation allows plants to reproduce quickly Clonal

Offspring:

The offspring produced through vegetative propagation are genetically identical to the parent plant, ensuring the preservation of desirable traits such as disease resistance, fruit quality, or flower color..

No Need for Pollination:

Vegetative propagation does not require pollinators or specific environmental conditions for fertilization, making it a reliable method of reproduction in areas where pollination may be problematic.

Propagation of Seedless Plants:

It is the only way to propagate certain seedless plants, such as banana, rose, and ginger, which do not produce viable seeds or produce them in very low quantities.

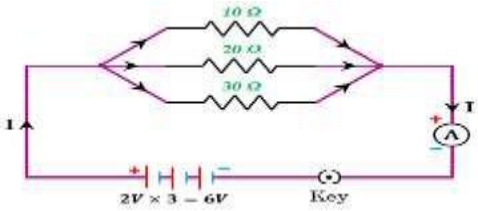
Survival of Plants:

In some cases, vegetative propagation helps plants survive under adverse conditions. For instance, some plants can regenerate from small pieces of roots or stems even if the parent plant is damaged or destroyed.

36.:Diagram: A circuit diagram shows resistors in parallel with a total voltage of 6V. Using Ohm's law:

Solution: (c) Total effective resistance of the circuit.

Here, all the resistance is given in parallel.



So, the total resistance is given by-

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

$\frac{1}{R_E} = \frac{1}{10} + \frac{1}{20} + \frac{1}{30}$

$\frac{1}{R_E} = \frac{6+3+2}{60}$

$\frac{1}{R_E} = \frac{11}{60}$

$\frac{1}{R_E} = \frac{11}{60}$

$R_E = \frac{60}{11}$

$R_E = 5.45\Omega$

Thus, the total effective resistance, R_E is **5.45 Ohm**

Solution: (b) Total current in the circuit.

Now, we know that the total current in the circuit is given as-

$I = \frac{V}{R}$

Substituting the value of V and R we get-

$I = \frac{6}{5.45}$

$I = \frac{6 \times 100}{545}$

$I = \frac{600}{545}$

$I = 1.1A$

Thus, the total current, I in the circuit is **1.1 Ampere.**

Solution: (a) Current through each resistor.

Let the current is I_1, I_2 and I_3 in the resistance R_1, R_2 and R_3.

We know that, in parallel combination, the voltage remains the same across each resistor.

Current I, in the circuit is given by the formula-

$I = \frac{V}{R}$

Substituting the given values we get-

$I_1 = \frac{V}{R_1} \Rightarrow \frac{6}{10} \Rightarrow 0.6A$

$I_1 = \frac{V}{R_2} \Rightarrow \frac{6}{20} \Rightarrow 0.3A$

$I_1 = \frac{V}{R_3} \Rightarrow \frac{6}{30} \Rightarrow 0.2A$

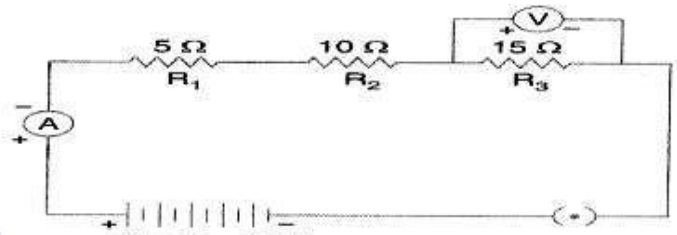
Thus,

(a) Current through each resistor - **0.6A, 0.3A, 0.2A.**

(b) Total current in the circuit - **1.1 Ampere.**

(c) Total effective resistance of the circuit - **5.45 Ohm.**

OR



(i) (2 × 5 = 10V)

10 V battery; Rest,components

Equivalent resistance = $R_1 + R_2 + R_3$

= 5 + 10 + 15

= 30 Ω

Current in the circuit,

I = V/R

I = 10V/30Ω = 1/3 A or 0.33 A

(ii) Potential difference across 5 Ω resistor,

V = IR

= 1/3 A x 5 Ω

= 1.67 V

Section E (4X3-12M)

37.

(i) (b) decomposition reaction (ii)

(c) lead oxide

(iii) (a) CaO (s) + H2O (l) → Ca(OH)2 (aq)

(iv) (b) X-Decomposition, Y-Combination

OR

1. a) thermal decomposition reaction

2. (b) decomposition reaction

3. (c) lead oxide

4. (a) CaO (s) + H2O (l) → Ca(OH)2 (aq)

38.

(b) Pituitary gland

(b) Growth hormone

(c) Testosterone

(b) Increased metabolism

OR

(c) Auxin

(d) Phototropism

(a) Positive geotropism

(d) Ethylene

39.

(c) Convex mirror

(d) Either plane or convex

(Unable to answer without diagram)

(b) 7.5 cm

OR

(a) Red

(d) all of above

(b) Formation of rainbow

(c) All the colours of light do not travel with the same speed