

**Class- X Session - 2022-23**

**Subject - Science (086)**

**Sample Question Paper - 6**

**with Solution**

**Max. Marks: 80**

**Time Allowed: 3 hours**

**General Instructions:**

- i. This question paper consists of 39 questions in 5 sections.
- ii. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- iii. **Section A** consists of 20 objective type questions carrying 1 mark each.
- iv. **Section B** consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
- v. **Section C** consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words
- vi. **Section D** consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
- vii. **Section E** consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

**Section A**

1. Match the following with correct response.

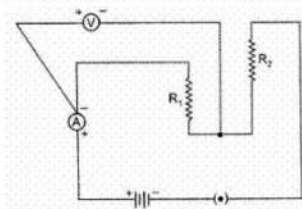
[1]

Column A	Column B
(i) Genes	(a) Units of inheritance
(ii) Factors	(b) Impressions of past organism
(iii) Fossils	(c) Entities which control the expression of traits
(iv) Sex chromosomes	(d) Determine sex of an individual

- a) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)      b) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)
- c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)      d) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)

2. A student set up an electric circuit shown here for finding the equivalent resistance of two resistors in series. In this circuit, the

[1]



- a) resistors, as well as the voltmeter, have been wrongly connected      b) resistors have been connected correctly but the voltmeter has been wrongly connected

- c) resistors, as well as the ammeter, have been wrongly connected
- d) resistors have been connected correctly but the ammeter has been wrongly connected
3. Name a body part where anaerobic respiration takes place. [1]
- a) Mitochondria
- b) Chloroplast
- c) Protoplasm
- d) Cytoplasm
4. An element A is soft and can be cut with a knife. This is very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following. [1]
- a) Na
- b) P
- c) Mg
- d) Ca
5. In our domestic electric supply we use following three colours of wire. [1]
- a) red, black, green
- b) red, blue, green
- c) black, green, yellow
- d) red, black, blue
6. The raw materials that are required for the manufacturing of washing soda by the Solvay process are: [1]
- a)  $\text{NH}_4\text{OH}$ ,  $\text{CaCO}_3$ ,  $\text{NaCl}$
- b)  $\text{NaCl}$ ,  $\text{CaCO}_3$ ,  $\text{NH}_3$
- c)  $\text{NaCl}$ ,  $\text{NH}_4\text{OH}$ ,  $\text{CaO}$
- d)  $\text{NH}_3$ ,  $\text{CaCl}_2$ ,  $\text{CaCO}_3$
7. Which of the following does not belong to the same homologous series? [1]
- a)  $\text{C}_3\text{H}_8$
- b)  $\text{CH}_4$
- c)  $\text{C}_2\text{H}_6$
- d)  $\text{C}_4\text{H}_8$
8. Baking soda is a mixture of: [1]
- a) Sodium hydrogen carbonate and tartaric acid
- b) Sodium carbonate and tartaric acid
- c) Sodium hydrogen carbonate and acetic acid
- d) Sodium carbonate and acetic acid
9. In the list of organisms given below, those that reproduce by the asexual method are [1]
- i. banana
- ii. dog
- iii. yeast
- iv. Amoeba









A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** Man is a herbivore.

[1]

**Reason (R):** Omnivores eat both plant food and meat of animals.

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

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

c) A is true but R is false.

d) A is false but R is true.

### Section B

21. What is GA3?

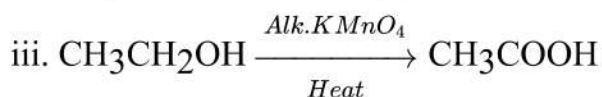
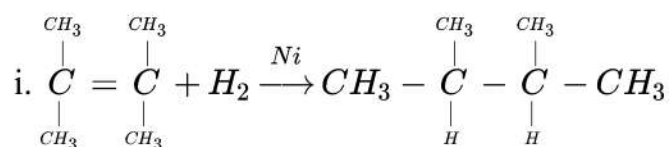
[2]

22. Write the difference between soaps and detergents.

[2]

OR

What is the role of metal or reagents written on arrows in the given chemical reactions?



23. i. Write two harmful effects of using plastic bags on the environment. Suggest alternatives to the usage of plastic bags.

[2]

ii. List any two practices that can be followed to dispose off the waste produced in our homes.

24. We often observe domestic waste decomposing in the bylanes of residential colonies. Suggest ways to make people realise that the improper disposal of waste is harmful to the environment.

[2]

25. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (**Hint** – The eight atoms of sulphur are joined together in the form of a ring.)

[2]

26. The image of a candle flame formed by a lens is obtained on a screen placed on the other side of the lens. If the image is three times the size of the flame and the distance between the lens and image is 80 cm, at what distance should the candle be placed from the lens? What is the nature of the image at a distance of 80 cm and the lens?

[2]

OR



- i. An object 1 cm high produces a real image 1.5 cm high when placed at a distance of 15cm from a concave mirror. Calculate the position of the image and the magnification.
- ii. Write two uses of concave mirrors.

### Section C

27. Distinguish between real image and virtual image. [3]
28. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed. [3]
  - i. Write a balanced chemical equation of the reaction.
  - ii. Identify the brown gas X evolved.
  - iii. Identify the type of reaction.
  - iv. What could be the pH range of the aqueous solution of the gas X?
29. Why do we observe difference in colours of the Sun during sunrise, sunset and noon? [3]
30. DNA copies generated during reproduction will be similar but may not be identical to the original. justify this statement. [3]

OR

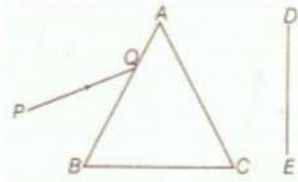
Name one sexually transmitted disease each caused due to bacterial infected and viral infection. How can these prevented?

31. i. In humans, if gene B gives brown eyes and gene b gives blue eyes, what will be the colour of eyes of the persons having the following combination of genes? (a) Bb (b) bb (c) BB [3]  
ii. What do you class this trait of eye colour in human? Explain.

OR

In human beings blue eye colour is recessive to brown eye colour. A brown eyed man has a blue eyed mother.

- a. What is the genotype of man and his mother?
  - b. What are possible genotypes of his father?
  - c. If man marries a blue eyed woman, what are the possible genotypes of their offsprings?
32. A compound X on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound Y. X also reacts with sodium metal to evolve a colourless gas Z. Identify X, Y and Z. Write the equation of the chemical reaction of formation of Y and also write the role of sulphuric acid in the reaction. [3]
  33. A narrow beam PQ of white light is passing through a glass prism ABC as shown in the diagram. [3]



Trace it on your answer sheet and show the path of the emergent beam as observed on the screen DE.

- i. Write the name and cause of the phenomenon observed.
- ii. Where else in nature is this phenomenon observed?
- iii. Based on this observation, state the conclusion which can be drawn about the constituents of white light.

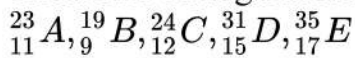
#### Section D

34. Draw labeled diagram of human respiratory system and name the parts. [5]

OR

What are the common features between all the respiratory organs? Explain the mechanism of gaseous exchange between tissues and blood.

35. i. How do you classify elements into metals and non-metals on the basis of their electronic configuration? Choose metal and non-metal out of the following: [5]



- ii. What type of bond will be formed if
  - a. 'A' combines with 'B'?
  - b. 'A' combines with 'E'?
  - c. 'C' combines with 'E'?
  - d. 'D' combines with 'E'?

OR

Discuss the important properties of ionic compounds.

36. a. Draw magnetic field lines produced around a current-carrying straight conductor passing through cardboard. Name, state and apply the rule to mark the direction of these field lines. [5]
- b. How will the strength of the magnetic field change when the point where the magnetic field is to be determined is moved away from the straight wire carrying constant current? Justify your answer.

#### Section E

37. **Read the text carefully and answer the questions:** [4]

We know that a battery or a cell is a source of electrical energy. The chemical reaction within the cell generates the potential difference between its two terminals that sets the electrons in motion to flow the current through a resistor or a system of resistors connected to the battery. To maintain the current, the source has to keep expanding its energy. Where does this energy go? A part of the source energy in maintaining the current may be consumed for useful work (like in rotating the blades of an electric fan). The rest of the source energy may be



expended in heat to raise the temperature of the gadget. We often observe this in our everyday life. For example, an electric fan becomes warm if used continuously for a long time, etc. On the other hand, if the electric circuit is purely resistive, that is, a configuration of resistors only connected to a battery; the source energy continually gets dissipated entirely in the form of heat. This is known as the heating effect of electric current. This effect is utilized in devices such as an electric heater, electric iron, etc.



- (i) Explain Joule's heating law.
- (ii) In practical situations, when an electric appliance is connected to a known voltage source, then how does the heating effect of electric current can be calculated?

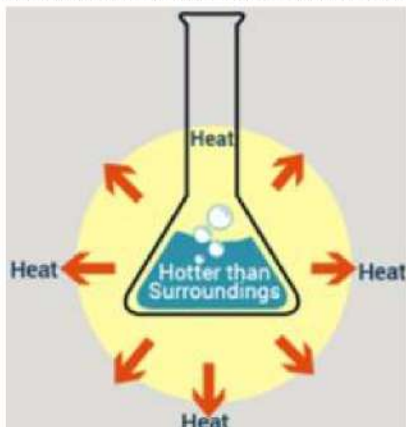
**OR**

Write the relation between heat energy produced in a conductor when a potential difference  $V$  is applied across its terminals and a current  $I$  flows through for  $t$ .

38. **Read the text carefully and answer the questions:**

**[4]**

The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- (i) What is the exothermic reaction?
- (ii) Write an example of an exothermic reaction.
- (iii) How will you obtain sulphuric acid from an acidic oxide?

**OR**



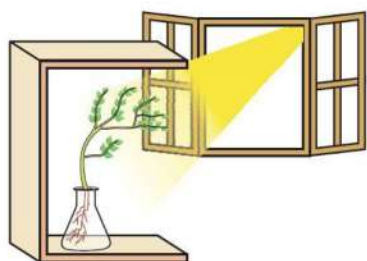


While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid ?

39. **Read the text carefully and answer the questions:**

[4]

Fill a conical flask with water. Cover the neck of the flask with a wire mesh. keep two or three freshly germinated bean seeds on the wire mesh. Take a cardboard box which is open from one side. Keep the flask a wire mesh. Kin the box in such a manner that the open side of the box faces light coming from a window as shown in the given figure. After two or three days, you will notice that the shoots bend towards light and roots away from light. Now turn the flask so that the shoots are away from light and the roots towards the light. Leave it undisturbed in this condition for a few days. Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is obviously, geotropism.



- (i) What has represented by the given activities?
- (ii) Do old parts of the shoot and root change direction? Is there any difference in the direction of the new growth?
- (iii) What can we conclude from this activity?

**OR**

What is geotropism?



# Solution

## Section A

1. (b) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

**Explanation:**

- Genes are the primary unit of inheritance that are specific for a specific individual.
- Factors are the traits which are transferred from parents to offsprings.
- Fossils are the dead remains of extinct species.
- Sex chromosomes decide the sex of an organism whereas autosomes decide the phenotypic expressions.

2. (b) resistors have been connected correctly but the voltmeter has been wrongly connected

**Explanation:** Voltmeter should measure the potential difference across the combination of resistors. (in parallel/series)

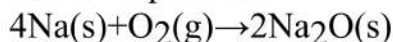
3. (d) Cytoplasm

**Explanation:** Cellular Respiration is divided into two series of biochemical reactions: anaerobic and aerobic reactions. Anaerobic reactions occur in the cytoplasm of the cell and aerobic reactions occur in the mitochondria of the cells.

4. (a) Na

**Explanation:** Sodium (Na) is an alkali metal. It is so soft that it can be cut with a knife. Sodium is so reactive that it vigorously catches fire when kept open in the air and hence, we keep it immersed in kerosene oil.

Sodium oxide is the basic oxide formed as sodium metal reacts with oxygen of air at room temperature.



5. (b) red, blue, green

**Explanation:** The mains supply is delivered to houses using three core wiring called the live, neutral, and the earth. The live wire is red in colour and brings in the current, the neutral coloured blue is the return wire. The earth is green or yellow. These wire supply electricity to separate circuits within the house.

6. (b) NaCl, CaCO<sub>3</sub>, NH<sub>3</sub>

**Explanation:** In this process a concentrated solution of sodium chloride (brine) is saturated with ammonia, carbon dioxide is passed through it, and the product is calcined by calcium carbonate.

7. (d) C<sub>4</sub>H<sub>8</sub>

**Explanation:** The general formula for this compound is C<sub>n</sub>H<sub>2n</sub>, while that of other options is C<sub>n</sub>H<sub>2n+2</sub>.

8. (a) Sodium hydrogen carbonate and tartaric acid

**Explanation:** Baking soda is a mixture of sodium hydrogen carbonate (NaHCO<sub>3</sub>) and a mild edible tartaric acid.

9. (d) (i), (iii) and (iv)

**Explanation:** Asexual reproduction is the mode of reproduction in single-parent produces offsprings.

- Amoeba reproduces asexually by binary fission.
- Asexual reproduction occurs in yeast by means of budding and in banana asexual reproduction occurs by the means of vegetative propagation from the stem.





- Dogs reproduced sexually.

10. (d) 1-C, 2-B, 3-D, 4-A

**Explanation:**

- Darwin's Theory of Evolution by Natural Selection. More individuals are produced each generation that can survive. Phenotypic variation exists among individuals and the variation is heritable. Those individuals with heritable traits better suited to the environment will survive.
- Father of Genetics. Gregor Mendel, through his work on pea plants, discovered the fundamental laws of inheritance. He deduced that genes come in pairs and are inherited as distinct units, one from each parent.
- Danish botanist Wilhelm Johanssen coins the word 'gene' for the unit associated with an inherited trait.
- The Boveri–Sutton chromosome theory (also known as the chromosome theory of inheritance or the Sutton–Boveri theory) is a fundamental unifying theory of genetics which identifies chromosomes as the carriers of genetic material.

11. (a) multiple fission

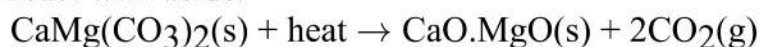
**Explanation:** The ability of a cell to divide itself into several cells during reproduction is called multiple fission. e.g., Plasmodium.

12. (d) Black absorbs all the colours

**Explanation:** Black absorbs all the colours

13. (c) Calcined dolomite

**Explanation:** Refractory materials that retain their strength at high temperatures are used in linings for furnaces, kilns, incinerators, and reactors. Calcined dolomite is used in areas where slags and atmosphere are basic; it is stable to alkaline materials but could react with acids.



14. (d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

**Explanation:**

- Insects, and some other invertebrates, exchange oxygen and carbon dioxide between their tissues and the air by a system of air-filled tubes called tracheae. Tracheae open to the outside through small holes called spiracles.
- Earthworms need oxygen just like humans, but they don't have lungs. They have a special skin that allows them to “breathe” oxygen right through it.
- Most fish exchange gases using gills on either side of the pharynx (throat). Gills are tissues that consist of threadlike protein structures called filaments. These filaments have many functions including the transfer of ions and water, as well as the exchange of oxygen, carbon dioxide, acids, and ammonia.
- The lungs are the primary organs of the respiratory system in mammals.

15. (b) 12.83 V

**Explanation:** 12.83 V

16. (c) A is true but R is false.

**Explanation:** In a conductor, the average velocity of electrons is zero. Hence no current flows through the conductor. Hence, no force acts on this conductor.

17. (c) (ii) and (iv)

**Explanation:** The true statement regarding the flowers are:

- Plants have sexual reproductive organs such as stamen and pistil.
- The fruit is formed after fertilisation in plants.

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

**Explanation:** A is false but R is true.

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

**Explanation:** pH = 7, signifies neutral solution.

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

**Explanation:** A is false but R is true.

### Section B

21. **Gibberellic Acid**, commonly referred to as GA<sub>3</sub>, is a naturally occurring plant growth hormone that is harvested from fungus and produced commercially for the agriculture and home gardening industries.

22. 1. Soaps are biodegradable compounds while detergents are non biodegradable compounds .

2. Soaps do not work well with hard water while detergents work well.

3. Soap takes time to dissolve in water while detergents not.

OR

i. Ni acts as a catalyst.

ii. Concentrated Sulphuric acid acts as a catalyst.

iii. Alkaline Potassiumpermanganate acts as an oxidising agent.

23. i. Harmful effects of plastic bags:

a. Plastics do not undergo degradation, thus stay in soil for many years. This may affect the soil fertility and degrades the soil quality.

b. When plastic artifacts enter the drainage and sewerage system, they block the pipes and drains causing water logging.

c. Littering of plastics in open spaces creates unhygienic conditions, as it acts as breeding ground for insects and mosquitoes.

We can reduce the use of plastic bags and carry jute bags and paper bags to carry items from the market.

ii. Measures taken for proper disposal of waste produced at our homes are:-

a. Prepare a compost pit for kitchen wastes.

b. Safe disposal of plastic bags.

c. Segregation of biodegradable and non-biodegradable wastes.

d. Fruit peels can be placed near trees or plants, which on decomposition will enrich the soil with nutrients.

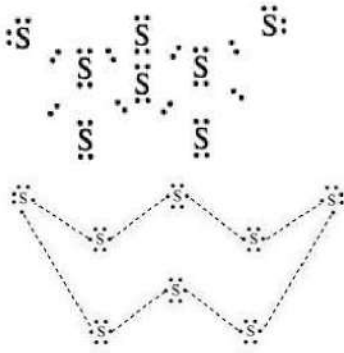
e. Recycling of paper wastes.

24. i. Banners and signboards indicating ill effects of improper waste disposal should be used to educate people.

ii. Street plays can be organised highlighting this issue.

25. The atomic number (Z) of sulphur is sixteen and its electronic configuration is 2, 8, 6. The sulphur atom has six valence electrons. The chemical formula of sulphur molecule is S<sub>8</sub>. Each sulphur atom is linked to similar atoms on either side by single covalent bonds and thus, completes its octet. The molecule is in the form of a ring also represented by crown shape.





26. As the image is obtained on the screen, it is real.

So.

Magnification,  $= -3$

$v = 80 \text{ cm}$

$u = ?$

As  $m = \frac{v}{u}$

so,

$$-3 = \frac{80}{u}$$

$$u = \frac{-80}{-3} \text{ cm}$$

From

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

$$= \frac{1}{80} + \frac{3}{80} = \frac{4}{80}$$

$$= \frac{1}{20}$$

$$\frac{1}{f} = \frac{1}{20} \text{ cm}$$

so.

$f = 20 \text{ cm}$

The lens is convex and image formed at 80 cm from the lens is real and inverted.

OR

i. Given,  $h_o = 1 \text{ cm}$ ,  $h_i = -1.5 \text{ cm}$ ,  $u = -15 \text{ cm}$

$$\text{As we know, } m = -\frac{v}{u} = -\frac{h_i}{h_o} \Rightarrow \frac{-v}{-15} = -\frac{1.5}{1}$$

$v = -15 \times 1.5 = -22.5 \text{ cm}$ . Hence, the image will be formed 22.5 cm in front of mirror.

$$\therefore m = \frac{-v}{u} = -\left(\frac{-22.5}{-15}\right) = -1.5$$

ii. (a) It is used in making shaving mirror.

(b) It is used by dentists to see magnified image of patient's tooth.

### Section C

27.	Real Image	Virtual Image
	1. It is formed by the actual meeting of reflected (or refracted) ray.	1. It is formed when reflected (or refracted) rays appear to meet when produced backward
	2. It can be obtained on the screen.	2. It cannot be obtained on the screen.
	3. It is always inverted.	3. It is always erect.
	4. It is formed by concave mirror or convex lens.	4. It is formed by concave, convex and plane mirror (or concave and convex lens.)

28.



ii. Nitrogen dioxide is the brown gas(X).

iii. Thermal decomposition reaction

iv.  $pH < 7$  because  $NO_2$  dissolves in water to form acidic solution ( $pH$  lies below 7).

29. This is because of scattering of light near the horizon, most of the blue light and shorter wavelengths are scattered away by the particles present in the atmosphere during sunrise and sunset. So, the light that reaches our eyes is of longer wavelength (e.g. red). This gives rise to the reddish appearance of the sky. But during the day sun appears white as sun is near the surface of earth nearly overhead, thus the sunlight passes through much smaller distance and thus the scattering is much less and sun appears white.

30. DNA copies generated will be similar, but may not be identical to the original as some variation are so drastic that new DNA copy cannot work with the cellular apparatus it inherits. Such a newborn cell will simply die. Therefore, there could be many other variations in the DNA copies that would not lead to such a drastic outcome. Thus, the surviving cells are similar but slightly different from each other. This tendency of variation during reproduction is the basis for evolution.

OR

Sexually transmitted disease caused due to

1. Bacterial infection is gonorrhoea, and
2. Viral infection is AIDS (Acquired Immune Deficiency syndrome). These disease can be prevented by responsible sexual behaviour such as use of condom during intercourse, etc.

31. i. Bb will have brown eyes.

bb will have blue eyes.

BB will have brown eyes.

ii. Eye colour in humans is an inherited trait. These are traits that are present in the DNA of an organism and are passed on to their progeny.

OR

a. Genotype of man: Bb (Heterozygous)

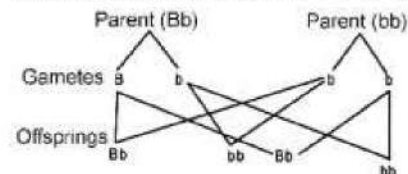
Genotype of mother: bb

(homozygous recessive)

b. Possible genotype of his father: Bb (Heterozygous) or BB (homozygous dominant)

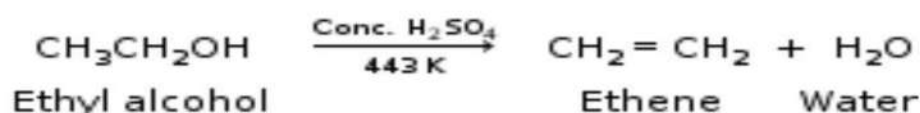
c. Cross between heterozygous man and homozygous recessive blue-eyed woman Bb x bb  
50% Blue-eyed  
50% Brown eyed.

The ratio obtained is 1 : 1 it is an example of test cross also.



32. X is Ethanol ( $C_2H_5OH$ ), Y is Ethene ( $C_2H_4$ ), Z is Hydrogen gas ( $H_2$ ).

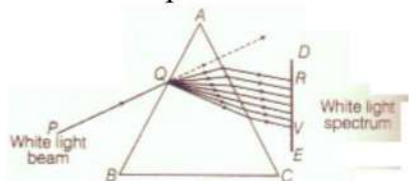
Equations of the chemical reaction for formation of Y:





Role of sulphuric acid: It is used as a dehydrating agent in the above reaction.

33.

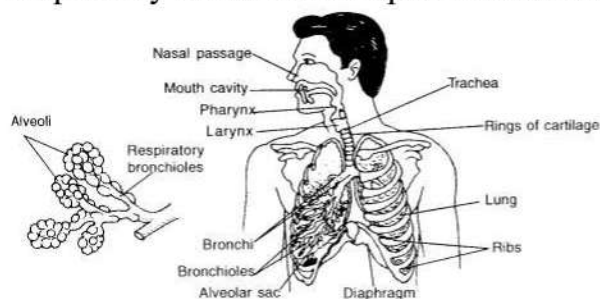


- i. The phenomenon of splitting of white light into its constituent colours is called dispersion of light. It is caused due to difference in speed of constituent colours of light travel in the medium other than air/vacuum because of different speed they bend at different angles.
- ii. In nature, this Phenomenon is observed in formation of rainbow where all the seven colours constituting white light is visible.
- iii. Based on phenomenon of dispersion, we can conclude that
  - a. White light consists of seven colours. Violet, indigo, blue, green, yellow, orange and red.
  - b. Violet light suffers maximum deviation and red light suffers minimum deviation.

#### Section D

34. Respiratory system of human beings and other mammals consists of air passage or respiratory tract, a pair of lungs.

Respiratory tract is made up of nasal cavity, pharynx, larynx, trachea and bronchi.



The lungs are a pair of brownish grey coloured spongy structures situated in the thoracic cavity.

The left lung consists of two lobes while the right lung consists of three lobes.

Each lobule of a lung consists of bronchioles which terminate into a bunch of spherical thin-walled air sacs, called **alveoli**.

Each alveolus or air has a diameter of 75 to 300 microns and has a very thin wall. The walls of the alveoli are elastic and are supplied with capillaries. Through these thin walls gases are exchanged between the capillaries and the air sacs.

OR

Common features between all the respiratory organs are:

- (i) All the respiratory organs have large surface areas to get enough oxygen.
- (ii) All the respiratory organs are thin-walled for easy diffusion of gases and substances.
- (iii) All the respiratory organs (like skin, lungs, gills) have a rich supply of blood for transporting respiratory gases.

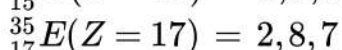
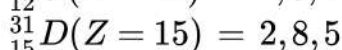
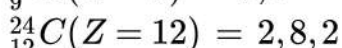
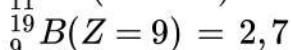
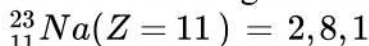
The mechanism of gaseous exchange between tissues and blood is as follows:

- (i) The blood reaching the tissues has higher concentration of oxygen than in the cells so it gets diffused into the cells.
- (ii) The carbon dioxide, which is formed in the cells, gets accumulated in higher concentration as compared in the blood, so it easily diffuses into the blood.
- (iii) The blood with takes this gas to the lungs, from where it is expelled out during exhalation.

35.

- i. Elements which contain 1 to 3 electrons in their outermost shell are metals. Elements containing 4 to 7 electrons in their valence shell are non-metals.

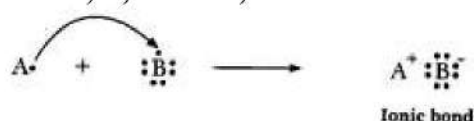
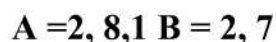
Electronic configurations:



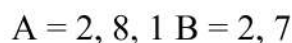
Hence A and C are metals whereas, B, D and E are non-metals.

ii. Type of bonds

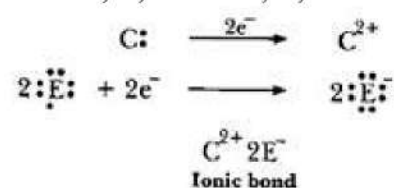
- a. 'A' is metal and 'B' is non-metal, so the bond formed will be ionic.



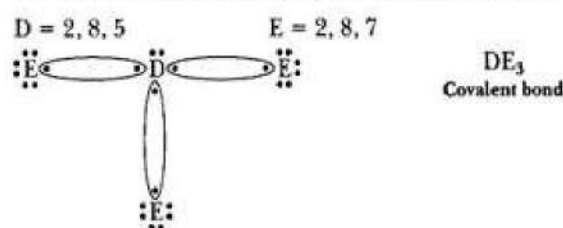
- b. 'A' is metal and 'E' is non-metal, so the bond formed is ionic.



- c. 'C' is metal and 'E' is non-metal, so the bond formed is ionic.



- d. 'D' is a non-metal and 'E' is also a non-metal, so the bond formed will be covalent.



OR

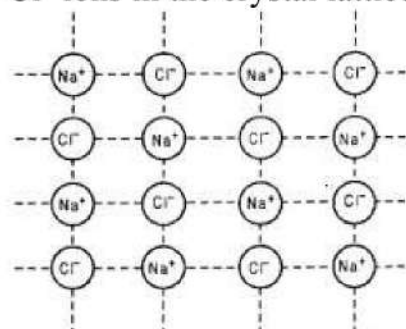
Important properties of ionic compounds.

The important properties of the ionic or electrovalent compounds are given below:

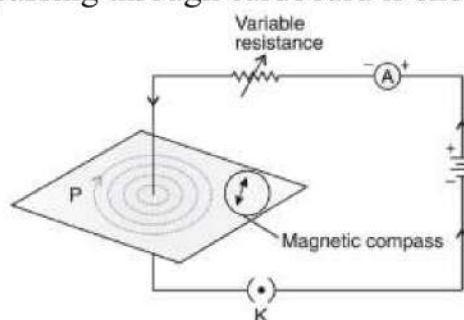
- i. Ionic compounds consist of ions. The ionic compounds consist of positive ions or cations and negative ions or anions. These ions are attracted towards each other by force of attraction called electrostatic force of attraction.
- ii. Ionic compounds are crystalline solids. The ionic compounds exist as solids. These solids are in the form of crystals. The crystals are formed by the combination of a large number of cations and anions. For example, sodium chloride is made up by  $\text{Na}^+$  and  $\text{Cl}^-$  ions. The arrangement of ions in the crystals is called crystal lattice. The crystal lattice is different for different ionic compounds. The arrangement of  $\text{Na}^+$  and



$\text{Cl}^-$  ions in the crystal lattice of NaCl is as shown.



- iii. Ionic compounds have high melting and boiling points. We know that the ionic compounds are solids in which a large number of cations and anions are closely packed in space. If these compounds are to melt or boil, the ions are to be separated from each other. For the separation of ions, energy is needed. Therefore, ionic compounds have high melting and boiling points.
  - iv. Ionic compounds do not conduct electricity in the solid state. In ionic compounds, the current is to be carried by the movement of cations and anions. As these are closely packed in the crystalline solids, their movement is almost nil. Since the ions are not in a position to move, the ionic compounds do not conduct electricity.
  - v. Ionic compounds conduct electricity in molten state or in solution. When heated the ionic compounds melt. Similarly, when added to a solvent like water, they dissolve. In molten state or in solution, the cations and anions are free to move. Because of the movement of the ions, these compounds conduct electricity.
  - vi. Ionic compounds are generally soluble in water. When an ionic compound is added to water, the force which binds the ions with one another becomes weak. Therefore, these oppositely charged ions get separated and dissolve in water.
  - vii. Ionic compounds have high densities.
  - viii. Ionic compounds are hard and brittle.
  - ix. Ionic compounds undergo ionic reactions which are quick and proceed to completion.
36. a. The magnetic field lines produced around a current-carrying straight conductor passing through cardboard is shown below.



A right-hand thumb rule is applied to find the direction of these field lines. Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of the current. Then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

- b. When we move away from the straight wire, the deflection of the needle decreases which implies the strength of the magnetic field decreases. The reason is that the concentric circles representing the magnetic field around a current-carrying straight wire become larger and longer as the distance increases.

### Section E

37. Read the text carefully and answer the questions:



We know that a battery or a cell is a source of electrical energy. The chemical reaction within the cell generates the potential difference between its two terminals that sets the electrons in motion to flow the current through a resistor or a system of resistors connected to the battery. To maintain the current, the source has to keep expanding its energy. Where does this energy go? A part of the source energy in maintaining the current may be consumed for useful work (like in rotating the blades of an electric fan). The rest of the source energy may be expended in heat to raise the temperature of the gadget. We often observe this in our everyday life. For example, an electric fan becomes warm if used continuously for a long time, etc. On the other hand, if the electric circuit is purely resistive, that is, a configuration of resistors only connected to a battery; the source energy continually gets dissipated entirely in the form of heat. This is known as the heating effect of electric current. This effect is utilized in devices such as an electric heater, electric iron, etc.



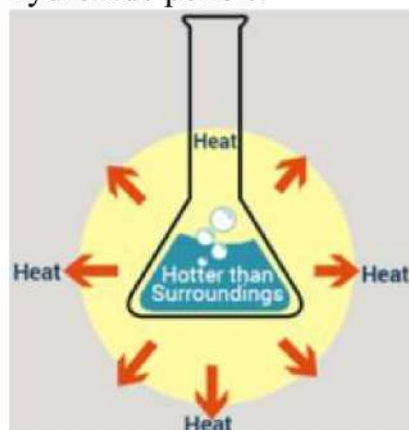
- (i) The law implies that heat produced in a resistor is
- directly proportional to the square of current for a given resistance,
  - directly proportional to resistance for a given current, and
  - directly proportional to the time for which the current flows through the resistor.
- (ii) Firstly, we calculate the current flowing through it, using the relation  $I = \frac{V}{R}$ . Then we apply the formula  $H = I^2Rt$  to calculate the heating effect.

OR

$$\text{Heat produced, } H = VIt$$

**38. Read the text carefully and answer the questions:**

The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.





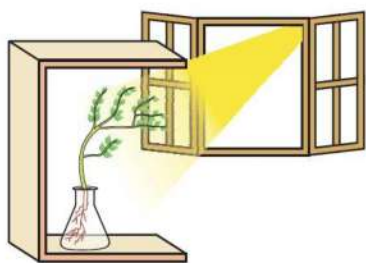
- (i) An exothermic reaction is a chemical reaction that releases energy through light or heat.
- (ii) Mixing of acid with water is a highly exothermic reaction.
- (iii) When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.  
$$\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$$

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.

**39. Read the text carefully and answer the questions:**

Fill a conical flask with water. Cover the neck of the flask with a wire mesh. Keep two or three freshly germinated bean seeds on the wire mesh. Take a cardboard box which is open from one side. Keep the flask and wire mesh in the box in such a manner that the open side of the box faces light coming from a window as shown in the given figure. After two or three days, you will notice that the shoots bend towards light and roots away from light. Now turn the flask so that the shoots are away from light and the roots towards the light. Leave it undisturbed in this condition for a few days. Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity, is obviously, geotropism.



- (i) These activities show tropic movements in plants due to their growth.
- (ii) Yes, old parts of the shoot and root change direction and there is a difference in the direction of new growth.
- (iii) Movement is related to stimulus i.e. plant organs either move towards the source of stimulus or away from it. Stimuli that cause movements in plants are gravity, light, touch, water, and chemical substances.

OR

Movements in the organs of a plant due to gravity are known as geotropism. This causes the roots to bend down towards the soil.