CBSE
Class X Science
Sample Paper 7

Time: 3 hrs **Total Marks: 80**

General Instructions:

(i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.

(ii) Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each.

(iii) These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.

(iv) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.

(v) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.

(vi) Section–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.

(vii) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(viii) Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A

1. Why is electrolysis of water an endothermic reaction? (1)

OR

Balance the following chemical equations:

(i) $NH_3 \longrightarrow N_2 + H_2$

(ii) $C + CO_2 \longrightarrow CO$

2. Explain the following: Tetravalency (1)

3. Among the alkaline earth metals, which element has high metallic character? (1)

(a) Be

(b) Mg

(c) Ca

(d) Sr

4. Light travels more quickly through water than through glass. What is optically denser among the medium mentioned in the statement? (1)

5. When does the light bend away from the normal during refraction? (1)

6. If a charge of 420 C is flowing from the wire for 5 minutes. Find the value of current. (1)

OR

How is the magnetic field inside the long solenoid carrying current?

7. How does the resistance of a pure metal change if its temperature decreases? (1)

8. Which type of mirror could be used as a dentist's mirror? (1)

9. What is the full form of MRI? (1)

OR

What is meant by saying that the electric potential at a point is 1 volt?

10. In which form food is transported in the plants? (1)

11. Give an example where environmental factors play a major role in sex determination. (1)

OR

What do you mean by the term variation?

12. Ozone is deadly poisonous; still it performs an essential function. How? (1)

OR

How is depletion of ozone layer in the atmosphere responsible for causing skin cancer?

13. Which intestinal juice completes the process of digestion in human beings? (1)

For question numbers 13 and 14, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below:

i) Both A and R are true, and R is the correct explanation of the assertion.
ii) Both A and R are true, but R is not the correct explanation of the assertion.
iii) A is true, but R is false.
iv) A is false, but R is true.

14. **Assertion**: Magnesium is oxidised, when a magnesium ribbon burns in air with a dazzling flame and forms a white ash.
Reason: Magnesium is oxidised as addition of oxygen to magnesium takes place leading to formation of magnesium oxide.

15. **Assertion**: Diffusion does not meet the high energy requirements of multicellular organisms. (1)
Reason: Diffusion is a fast process but only occurs at the surface of the body.

OR

Assertion: Saliva contains an enzyme called amylase.
Reason: Amylase helps to break down simple sugars like glucose into complex molecules like starch.

16. **Assertion**: Reproduction enables the continuity of life for generations. (1)
Reason: Reproduction is a biological process in which an organism gives rise to young ones similar to itself.

Answer Q. No 17 - 20 contain five sub-parts each. You are expected to answer any four subparts in these questions.

17. Read the following and answer any four questions from 17 (i) to 17 (v). (1×4)
Different organisms reproduce in a different manner. The modes by which various organisms reproduce depend on the body design of the organisms.

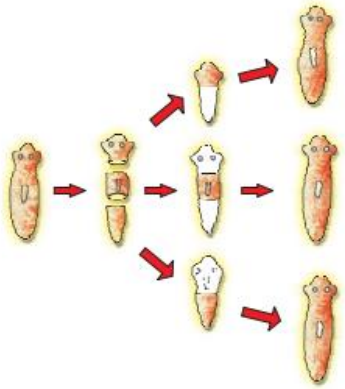
i) Splitting up of a single cell into exactly two daughter cells occurs in
(a) Multiple fission
(b) Binary fission
(c) Regeneration
(d) Segmentation

ii) Multiple fission occurs in
a) Paramoecium
b) Euglena
c) Leishmania
d) Plasmodium

iii) Spirogyra reproduces by
(a) Fragmentation
(b) Fission
(c) Budding
(d) Regeneration

iv) Regeneration is carried out by specialised cells called
(a) Bud cells
(b) Regenerative cells
(c) Stem cells
(d) Proliferative cells

v) Which mode of reproduction is seen in the given picture?



(a) Budding
(b) Regeneration
(c) Fission
(d) Segmentation

18. Read the following and answer any four questions from 18 (i) to 18 (v). (1×4)

	X	Y
Normal electronic configuration	2, 8, 7	2, 8, 2
Nature of oxide	Dissolves in water and turns blue litmus red	Very low solubility in water; dissolves in hydrochloric acid
Tendency for oxidising and reducing reactions	Tends to oxidise elements and compounds	Tends to act as a reducing agent
Electrical and thermal conductivity	Very poor electrical conductor; poor thermal conductor	Good electrical conductor; good thermal conductor
Tendency to form alloys and amalgams	No tendency to form alloys	Forms alloys

Using the information above, answer the following:

i) ..... is the metallic element.
(a) X
(b) Y
(c) Both a and b
(d) None of these

ii) Metal atoms tend to have a maximum of ..... electrons in the outermost energy level.
(a) 1

(b) 2
(c) 3
(d) 4

iii) Non-metallic elements tend to form ..... oxides, while metals tend to form ..... oxides.
(a) Acidic, acidic
(b) Basic, basic
(c) Acidic, basic
(d) Basic, acidic

iv) Non-metallic elements tend to be ..... conductors of heat and electricity.
(a) Good
(b) Better
(c) Poor
(d) Non

v) Metals tend to ..... electrons and act as ..... agents in their reactions with elements and compounds.
(a) Lose, oxidising
(b) Lose, reducing
(c) Gain, oxidising
(d) Gain, reducing

19. Read the following and answer any four questions from 19 (i) to 19 (v) (1×4)

When a spherical mirror is held towards the sun and its sharp image is formed on a piece of carbon paper for some time, a hole is burnt in the carbon paper. Answer the following questions in reference to the above activity.

i) What is the nature of spherical mirror?
a) Convex mirror
b) Concave mirror
c) Plane mirror
d) Plano convex mirror

ii) Why is a hole burnt in the carbon paper?
a) Sun rays are dispersed by the spherical mirror
b) The Sun's heat rays are concentrated at the point of sun's image
c) Sun rays get diverged after reflection from spherical mirror
d) Due to atmospheric refraction

iii) At which point of the spherical mirror the carbon paper is placed?
   a) Between pole and focus
   b) Between centre of curvature and focus
   c) Anywhere between infinity and focus
   d) At focus

iv) What name is given to the distance between spherical mirror and carbon paper?
   a) Image distance
   b) Object distance
   c) Focal length
   d) Principal axis

v) For the above-mentioned spherical mirror, the image formed by it when the object is placed at its centre of curvature is
   a) Twice the size of the object
   b) Greater than size of object
   c) Equal to the size of the object
   d) Less than the size of the object

20. Read the following and answer any four questions from 20 (i) to 20 (v) (1×4)

Sahil has two wires. Both wires are of same material but are of different lengths and cross - section. Sahil have to find the difference in their resistivities for various changes. Will there be a change?

i) What is the difference in their resistivities for the above-mentioned condition?
   a) Data given is insufficient to identify the change
   b) Change in resistivity depends on change in length
   c) Change in resistivity depends on change in area
   d) No difference in resistivities as both wires are of same material

ii) If Sahil stretches one of the wires, it becomes double the original length then is there any change in its resistances? If yes, what is the change?
   a) Area reduces to half and resistance becomes four times the original value
   b) Area becomes twice and resistance becomes four times the original value
   c) Area becomes twice and resistance becomes 2 times the original value
   d) Area decreased by half and resistance becomes 2 times the original value

iii) If he stretches the other wire, it becomes triple its original length then how much is the change?
   a) Area reduces to one – third and resistance becomes nine times the original value
   b) Area becomes twice and resistance becomes four times the original value
   c) Area becomes thrice and resistance becomes 3 times the original value
   d) Area decreased by one – third and resistance becomes 9 times the original value

iv) Sahil connect the two wires in series and observe change. What is the change? Why?
   a) No change
   b) Area increases
   c) Resistance increases as length increases
   d) Resistance increases as area increases

v) Sahil connected the two wires in parallel and observe the change. What is the change? Give reason.
   a) Resistance increases as length decreases
   b) Resistance increases as length increases
   c) Resistance decreases as area increases
   d) Resistance increases as area increases

SECTION B

21. "Industrialization is one of the main causes of deterioration of environment". List any four reasons in favour of this statement. (2)

OR

Pesticides are useful to farmers yet considered as pollutants. Given reasons.

22. Pre-natal sex determination has been prohibited by law. State two reasons. (2)

23. Give the balanced chemical equation for the reaction between aluminium and steam. (2)

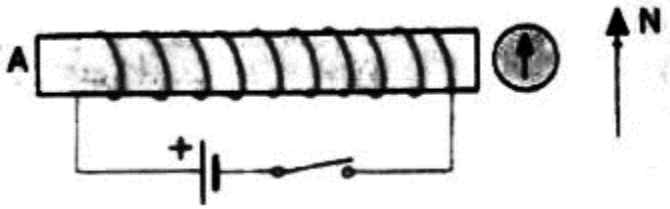
OR

Metals such as sodium and potassium are kept immersed in kerosene. Why?

24. Name a non-metal which is
(a) Liquid at room temperature
(b) Lustrous (2)

25. An object is placed between infinity and the pole of a convex mirror. Draw a ray diagram and also state the position, the relative size and the nature of the image formed. (2)

26. For the coil in the diagram below, when the switch is pressed:



(a) What is the polarity of end A?
(b) Which way will the compass point then? (2)

SECTION C

27. Rahul complained of acidity on reaching home after a marriage. Explain the reason for acidity. (3)

OR

Most of the CO_2 produced in a tissue enters the red blood cells by diffusion. What happens to this CO_2?

28. Give reasons for the following: (3)
(a) Diffusion is insufficient to meet the oxygen requirements of multicellular organisms.
(b) People living in the mountains have more red corpuscles in their blood than people living in the plains.
(c) Energy requirement is less for amphibians than for birds.

29. If we cross a pure-bred tall (dominant) pea plant with a pure-bred dwarf (recessive) pea plant, we will obtain pea plants of the F_1 generation. If we now self-cross the pea plants of the F_1 generation, then we obtain pea plants of the F_2 generation. (3)
(a) What would the plants of the F_1 generation look like?
(b) State the ratio of tall plants to dwarf plants in the F_2 generation.
(c) State the type of plants not found in the F_1 generation but which appeared in the F_2 generation, mentioning the reason for the same.

30. A water-insoluble calcium compound A on reacting with dil. H_2SO_4 released a colourless and odourless gas B with brisk effervescence. When gas B was passed through lime water, the lime water turned milky and again formed compound A. Identify A and B, and write the chemical equations for the reactions involved. (3)

31. An element X belongs to Group 17 and the third period of the periodic table. (3)

(a) Write the electronic configuration of the element. What is its valency?

(b) Predict its nature, whether it is a metal or a non-metal.

(c) Give the formula of the compound formed when it combines with an element Y having a valency three.

32. No chemical reaction takes place when granules of a solid A are mixed with the powder of another solid B. However, when the mixture is heated, a reaction takes place between its components. One of the products, C, is a metal and settles in the molten state, while the other product D floats over it. It was observed that the reaction is highly exothermic.

Based on the given information, make an assumption about A and B and write a chemical equation for the chemical reaction indicating the conditions of reaction, physical state of reactants and products and thermal states of the reaction. Mention any two types of reactions under which the above chemical reaction can be classified. (3)

33. Name and define the phenomenon due to which we observe a rainbow. Explain with a diagram and name the colour of light which bends (i) the most and (ii) the least while passing through a glass prism. (3)

SECTION D

34. Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is (5)

(a) Neutral

(b) Strongly alkaline

(c) Strongly acidic

(d) Weakly acidic

(e) Weakly alkaline

OR

M is an element in the form of a powder. M burns in oxygen and the product obtained is soluble in water. The solution is tested with litmus. Write down only the word which will correctly complete each of the following sentences.

(a) If M is a metal, then the litmus will turn _____.

(b) If M is a non-metal, then the litmus will turn _____.

(c) If M is a reactive metal, then _____ will be evolved when M reacts with dilute sulphuric acid.

(d) If M is a metal, it will form _____ oxide, which will form _____ solution with water.

(e) If M is a non-metal, it will not conduct electricity in the form of _____.

35. (5)

(a) Draw a diagram of the excretory unit of the human kidneys and label the following parts:
Bowman's capsule, glomerulus, collecting duct, renal artery

(b) Write the important function of the structural and functional unit of the kidneys.

(c) Write any one function of an artificial kidney.

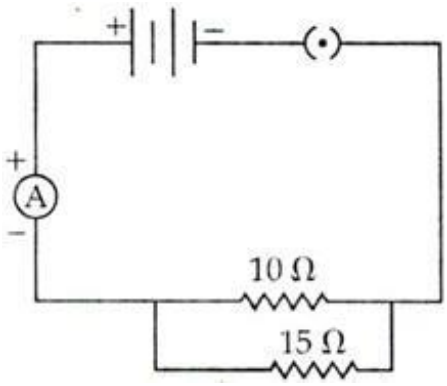
36. (a)What is an electric circuit?

(b)Calculate the number of electrons that flow per second to constitute a current of one ampere. Charge on an electron is 1.6×10^{-19}C.

(c) Draw an electric circuit for studying Ohm's law. Label the circuit component used to measure electric current and potential difference. (5)

OR

Study the following circuit and answer the questions that follow.



(a) State the type of combination of the two resistors in the circuit.

(b) How much current is flowing through the
   i. 10 Ω resistor
   ii. 15 Ω resistor

(c) What is the ammeter reading?

(d) Define the SI unit of current.

CBSE
Class X Science
Sample Paper 7 – Solution

SECTION A

1. Electrolysis of water to form oxygen and hydrogen is an endothermic reaction because electrical energy is absorbed during this reaction.

OR

(i) $2NH_3 \longrightarrow N_2 + 3H_2$

(ii) $C + CO_2 \longrightarrow 2CO$

2. Tetravalency: Carbon can neither lose nor gain electrons to attain octet. Thus it shares four electrons with other atoms. This characteristics of carbon by virtue of which it forms four covalent bonds, is called Tetravalency of carbon.

3. (d) In a group, the metallic character increases from top to bottom. So, Sr has high metallic character.

4. Glass is optically denser than water.

5. When lights rays pass from optically denser to optically rarer medium.

6. $I = q/t$

$q = 420$ C

$t = 5$ minutes $= 5 \times 60 = 300$ s

$I = 420/300 = 1.4$ A

OR

Magnetic field is uniform inside the long solenoid carrying current.

7. On decreasing the temperature, the resistance decreases.

8. Concave mirror

9. Magnetic Resonance Imaging

OR

Electric potential at a point is 1 volt means 1 joule of work is done in moving 1unit positive charge from infinity to that point.

10. Food is transported in the plants in the form of sucrose.

11. In lizards, sex is determined by the temperature at which the egg is incubated.

OR

Variation refers to the number of changes that appear among the same members of species and their offspring as a result of genetic recombination.

12. Ozone performs an essential function by forming an ozone layer which shields the surface of the earth from the entry of UV rays from the sun.

OR

Ultraviolet rays can pass through ozone hole and causes skin cancer.

13. The intestinal juice, succus entericus completes the process of digestion in human beings.

14. (i) Both assertion and reason are true, and reason is the correct explanation of the assertion. When a magnesium ribbon burns in air with a dazzling flame and forms a white ash, it is oxidised as addition of oxygen to magnesium takes place leading to formation of magnesium oxide.

15. (iii) Assertion is true but reason is false. Since diffusion is a slow process it cannot meet the energy requirements of multicellular organisms. If an oxygen molecule travels form lungs to toe by diffusion, it will take 3 years to reach its target site.

OR

(i) Both assertion and reason are true, and reason is the correct explanation of the assertion. Saliva contains an enzyme called amylase which helps to break down simple sugars like glucose into complex molecules like starch.

16. (i) Both assertion and reason are true, and reason is the correct explanation of the assertion. Reproduction is a biological process in which an organism produces young ones (offspring) like itself. It is one of the most important characteristics of the living organisms. Reproduction maintains the continuity of species by producing the same form over generation.

17.

i) (b) Binary fission results in the splitting up of a single cell into exactly two daughter cells.

ii) (d) Malarial parasite, *Plasmodium*, divide into many daughter cells simultaneously by multiple fission

iii) (a) *Spirogyra* breaks up into smaller pieces upon maturation. These pieces or fragments grow into new individuals by fragmentation.

iv) (c) Regeneration is carried out by specialised cells called regenerative cells.

v) (b) The given figure shows regeneration in *Planaria*.

18.

i) (b) Y is the metallic element.

ii) (c) Metal atoms tend to have a maximum of 3 electrons in the outermost energy level.

iii) (c) Non-metallic elements tend to form acidic oxides, while metals tend to form basic oxides.

iv) (c) Non-metallic elements tend to be poor conductors of heat and electricity.

v) (b) Metals tend to lose electrons and act as reducing agents in their reactions with elements and compounds.

19.

i) b) Concave mirror
Nature of spherical mirror is concave.

ii) b) The Sun's heat rays are concentrated at the point of sun's image
A lot of sun's heat rays are concentrated at the point of sun's image which burn the hole in carbon paper.

iii) d) At focus
carbon paper must be placed at the focus of the concave mirror as the light rays will get concentrated at that point and thus burn the paper.

iv) c) focal length
As the carbon paper is at focus, the distance between spherical mirror and carbon paper will be called focal length.

v) c) equal to the size of the object
The image formed by concave mirror when object is placed at the centre of curvature is real, inverted and of same size as that of the object.

20.

i) d) No difference in resistivities as both wires are of same material
No, there will not be change. Resistivities depends on material of the conductor and not on its dimensions. So, both the wires will have same resistivities.

ii) a) Area reduces to half and resistance becomes four times the original value
When the wire is double the original length the resistance of the wire changes.
We know,

$$R = \frac{\rho \ell}{A}$$

Thus,

$$R' = \frac{\rho(2\ell)}{\left(A/2\right)} = \frac{\rho(4\ell)}{A} = 4\left(\frac{\rho\ell}{A}\right) = 4R$$

Thus, when the wire is stretched to double the area is reduced to half and thus, the resistance becomes four times the original resistance.

iii) d) Area decreased by one – third and resistance becomes 9 times the original value

When wire is stretched and its length becomes three times the original length,

Area, A = A/3

$$R' = \frac{\rho(3\ell)}{\left(A/3\right)} = \frac{\rho(9\ell)}{A} = 9\left(\frac{\rho\ell}{A}\right) = 9R$$

Thus, resistance increases by 9 times the original resistance.

iv) c) resistance increases as length increases
When wires are connected in series, there is increase in length.
As resistance is directly proportional to length, resistance increases on increasing the length.

v) c) resistance decreases as area increases
When wires are connected in parallel, area increases and as we know that resistance is inversely proportional to cross – sectional area resistance decreases.

SECTION B

21. Industrialisation causes following effects on the environment-

- Noise and air pollution caused due to industrialization disturbs the environment.
- Waste released from industries leads to water pollution.
- SO_2, NO_2 etc. emitted by the industries, are toxic.
- Radioactive radiations emitted by nuclear power stations are toxic to living organisms.

OR

Pesticides kill insects and pests thereby protect the crops but these pesticides remain on the crops which enter the food chain and get accumulated in the organisms at the top most tropic level that causes diseases. When these are washed away by rain river water, it also causes pollution.

22. Pre-natal sex determination has been prohibited by law because of the following reasons:
(a) Indiscriminate female foeticide and desire for a male child.
(b) Declining female-male sex ratio.

23. Aluminium reacts readily with steam to give aluminium oxide and hydrogen gas. The reaction does not always occur because of a thin but strong layer of aluminium oxide being coated onto the metal.

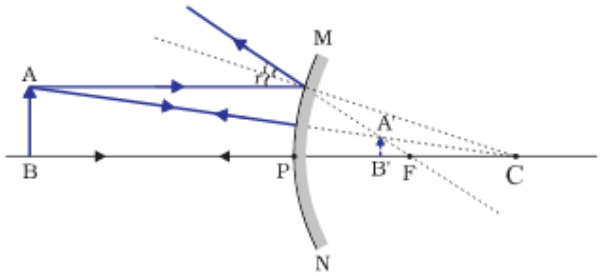
$$\underset{\text{Aluminium}}{2Al_{(s)}} + \underset{\text{Steam}}{3H_2O_{(g)}} \rightarrow \underset{\text{Aluminium oxide}}{Al_2O_{3(s)}} + \underset{\text{Hydrogen}}{3H_{2(g)}}$$

OR

Metals such as sodium and potassium are kept immersed in kerosene because they are very reactive, have high affinity towards oxygen and will violently react with atmospheric oxygen on contact with air.

24. (i) Non-metal which is a liquid at room temperature: Bromine
(ii) Non-metal which is lustrous: Iodine

25.



When an object is placed between infinity and the pole of a convex mirror, the image formed is
(a) Behind the mirror at the focus (F)
(b) Virtual and erect
(c) Highly diminished

26. (a) End A becomes S-pole because current flows in clockwise direction at A.
(b) When A becomes S-pole, the other end becomes N-pole. So, the tip of the compass (with also has North polarity) moves away from this end i.e., tip moves towards right.

SECTION C

27. When we eat more food or spicy food, our digestive system has to work more by releasing more enzymes for digestion. The stomach releases more HCl to digest more food because of which a lot of acid is formed; this may cause acidity. Acidity can also cause diarrhoea, i.e. vomiting and loose motions.

OR

Most of the CO_2 produced in a tissue enters RBCs by diffusion. RBCs consist of a pigment called haemoglobin. This pigment binds with CO_2 and gets transported to the lungs through blood from where it is released out through the nostrils.

28.

(a) Diffusion is insufficient to meet the oxygen requirement of multicellular organisms because the volume of the human body is so large that oxygen cannot diffuse into all the cells of the body quickly.
(b) People living in the mountains have more red corpuscles in their blood than people living in the plains because the low air pressure requires more red blood corpuscles to supply the body cells with oxygen.
(c) Amphibians are cold-blooded animals whose body temperature depends on the temperature in the environment. They do not need energy to maintain their body temperature, and hence, their requirement of energy is less

29.

(a) In the F_1 generation, all the plants would be tall.

(b) Tall : Dwarf = 3 : 1

(c) Dwarf plants are found in the F_1 generation but appear in the F_2 generation. This is because the trait for tallness is dominant over the trait for dwarfness.

30.

$$\underset{\substack{\text{(water insoluble)}\\ \text{(A)}}}{CaCO_3} + \text{dil. } H_2SO_4 \rightarrow \underset{\text{(B)}}{CaSO_4} + H_2O + CO_2$$

$$\underset{\text{(lime water)}}{Ca(OH)_2} + CO_2 \rightarrow \underset{\substack{\text{(A)}\\ \text{Milky}}}{CaCO_3} + H_2O$$

A - $CaCO_3$ (lime water)

B - $CO_{2(g)}$

31.

(a) Electronic configuration of the element is 2, 8, 7 and its valency is 1.

(b) Non-metal

(c) The formula of the compound formed when element X combines with an element Y is YX_3.

32.

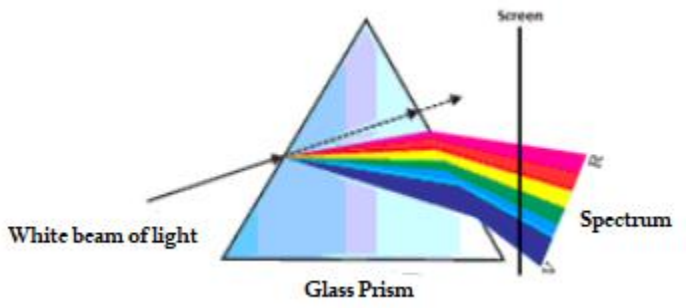
(a) 'A' is aluminium, and 'B' is iron (III) oxide.

(b)

$$\underset{A}{2Al_{(s)}} + \underset{B}{Fe_2O_{3(s)}} \xrightarrow{\text{heat}} \underset{D}{Al_2O_{3(s)}} + \underset{C}{2Fe_{(s)}} + \text{heat}$$

(c) The reaction is highly exothermic. It is a displacement reaction and redox reaction.

33. The phenomenon due to which we observe a rainbow is called dispersion of light. Splitting of white light into its constituent colours is called dispersion of white light.



When light is passed through a glass prism, white light disperses into seven colours—violet, indigo, blue, green, yellow, orange and red.

Violet light bends the most, while red light bends the least.

SECTION D

34.

(a) Neutral: Solution D with pH 7
(b) Strongly alkaline: Solution C with pH 11
(c) Strongly acidic: Solution B with pH 1
(d) Weakly acidic: Solution A with pH 4
(e) Weakly alkaline: Solution E with pH 9
pH is inversely proportional to hydrogen ion concentration. Hence, the pH can be arranged in the increasing order of the concentration of hydrogen ions as 11 < 9 < 7 < 4 < 1.

OR

(a) blue
(b) red
(c) hydrogen gas
(d) basic, alkaline
(e) graphite

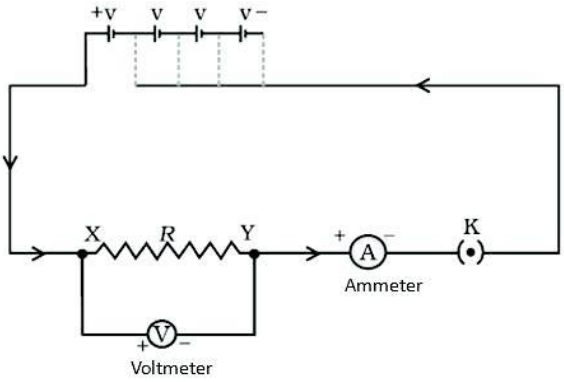
35.

(a) Excretory unit of the human kidneys
(b) The structural and functional unit of the kidneys is the nephron. Its functions are filtration of blood, reabsorption and secretion.
(c) Functions of an artificial kidney: (Any one)
- Helps to remove harmful wastes, extra salts and water
- Controls blood pressure
- Maintains the balance of sodium and potassium salts in a patient whose kidneys have failed

36. (a) A continuous conducting path consisting of wires and other resistances (like electric bulb etc.) and a switch between the two terminals of a cell or a battery along which an electric current flow is called an electric circuit.

(b) Given:
I = 1 A
t = 1 sec
Q = 1 C
1.6×10^{-19} C is the charge on 1 electron.
1 C is the charge on electrons = (6.25×10^{18}) electrons.
6.25×10^{18} electrons flow per second to constitute the current of one ampere.

(c)



OR

(a) Parallel combination

(b) Let V be the voltage applied.

i. Current flowing through 10 Ω resistor is

$$I_1 = \frac{V}{R_1} = \frac{V}{10}\ A$$

ii. Current flowing through 15 Ω resistor is

$$I_2 = \frac{V}{R_2} = \frac{V}{15}\ A$$

(c) Equivalent resistance of the circuit, R, is given as

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

$$\frac{1}{R} = \frac{1}{10} + \frac{1}{15}$$

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

$$R = 6\ \Omega$$

Ammeter reading, $I = \frac{V}{R} = \frac{V}{6}\ A$

(d) The SI unit of current is Ampere.