**CBSE**
**Class X Science**
**Sample Paper 2**

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

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**General Instructions:**

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

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

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.

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.

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.

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.

Wherever necessary, neat and properly labeled diagrams should be drawn.

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## SECTION A

**1.** Which alloy is used for making the heating element of electrical appliances? (1)

OR

By what another name is the unit joule/coulomb called?

**2.** What kind of mirror is required for obtaining a virtual image of the same size as the object? (1)

**3.** How much time from sunrise to sunset is lengthened? Give reason. (1)

a) 2 minutes
b) 4 minutes
c) 8 minutes
d) 16 minutes

**4.** No two individuals are absolutely alike in a population. Why? (1)

**5.** Which type of reproduction takes place in plasmodium? (1)

**6.** What is the role of acid in our stomach? (1)

**OR**

What is the role of saliva in the digestion of food?

**7.** How is the increase in demand for energy affecting our environment adversely? (1)

**8.** How does the heart ensure that there is no backflow of blood? (1)

**9.** A normal pea plant bearing coloured flowers suddenly start producing white flowers. What could be the possible cause? (1)

**OR**

Mendel crossed a pure white recessive pea plant with a dominant pure red flowered plant. What will be the first generation $F_1$ hybrids?

**10.** Why is photosynthesis considered an endothermic reaction? (1)

**11.** Why should curd and other sour food stuffs not be kept in metal containers? (1)

**OR**

Why do acids not show acidic behaviour in the absence of water?

**12.** A, B and C are the elements of a Dobereiner's triad. If the atomic mass of A is 7 and that of C is 39, what should be the atomic mass of B? (1)

**OR**

What is the significance of atomic number in the modern classification of elements?

**13.** Where should hydrogen be placed in the modern periodic table? Give reason for your answer. (1)

For question numbers 14, 15 and 16, two statements are given- one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

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

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

c) A is true, but R is false.

d) A is false, but R is true.

**14.** **Assertion**: The Sun appears white when it is overhead in the sky.
**Reason**: Light coming from the Sun has to travel a relatively shorter distance through the atmosphere to reach us. (1)

**15.** **Assertion:** Combustion reactions are also called as exothermic oxidation reactions.
**Reason:** In these reactions, oxygen is added and heat energy is produced. (1)

**OR**

**Assertion:** Respiration is an endothermic process.
**Reason:** In this process energy is produced during this process.

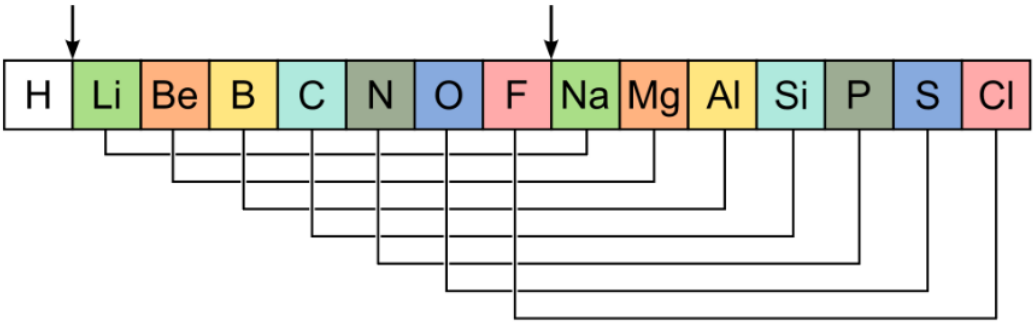
**16.** **Assertion:** An aqueous solution of washing soda is alkaline. (1)
**Reason:** It turns red litmus to blue.

**17.** Read the following and answer any four questions from 17 (i) to 17 (v). (1×4)

**Newlands' Law of Octaves**

In 1864, Newlands arranged the known 56 elements in the order of increasing atomic masses. He observed that the properties of every eighth element are similar to the properties of the first element. Based on this observation, he proposed the Law of Octaves for the classification of elements.

**Law of Octaves:** When the elements are arranged in the increasing order of their atomic masses, the properties of every eighth element are similar to the first.




Many limitation were found in Newlands' octaves. This law was found to be applicable only up to calcium. Newlands fitted all the known elements in a table of 7 X 8 that is 56 boxes. Newlands placed two elements each in some boxes to accommodate all the known elements in the table. For example, Co and Ni, Ce and La. Moreover, he placed some elements with different properties under the same note in the octave. For example, Newlands placed the metals Co and Ni under the note 'Do' along with halogens, while Fe, having similarity with Co and Ni, away from them along with the nonmetals O and S under the note 'Ti'. Also, Newlands' octaves did not have provision to accommodate the newly discovered elements. The properties of the new elements discovered later on did not fit in the Newlands' law of octaves.

i) Newland's rule known as _____.
   a) Law of triad
   b) Law of octave
   c) Law of periodic table
   d) Periodic law

ii) Newland's law of octaves based upon_____.
   a) Increasing order of atomic number
   b) Increasing order of atomic mass
   c) Increasing order of electron
   d) Increasing order of atomic size

iii) Newland's law of octaves is applicable to _____.
   a) Sodium
   b) Magnesium
   c) Calcium
   d) Sulphur

iv) A and B are two elements having similar properties which obey the law of octave. How many elements are there in between A and B?
   a) 6
   b) 7
   c) 8
   d) 5

v) Which of the following is true regarding Newland's Law of Octaves?
   a) It worked well with only lighter elements.
   b) It was applicable only up to calcium.
   c) Both are correct.
   d) Both are incorrect.

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

Raj has two wires. Both wires are of same material but are of different lengths and cross - section.

i) Raj want to find the difference in their resistivities. Will there be a change? What is the difference in their resistivities? (1)
   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 Raj 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? (1)
   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? (1)
   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) Raj connect the two wires in series and observe change. What is the change? Why? (1)

a) No change
b) Area increases
c) Resistance increases as length increases
d) Resistance increases as area increases

v) Raj connected the two wires in parallel and observe the change. What is the change? Give reason. (1)

a) Resistance increases as length decreases
b) Resistance increases as length increases
c) Resistance decreases as area increases
d) Resistance increases as area increases

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

Suparna was very curious to know about reproductive health. Her parents wanted to get her married soon and Suparna was not ready for it. There was tremendous pressure from her family and relatives to get married and soon start a family.

i) Which of the following diseases are likely to spread in case of unprotected sexual contact?

a) Typhoid
b) Gonorrhoea
c) Cholera
d) Ringworm

ii) What is the role of mechanical barrier of contraception?

a) To prevent the sperm from reaching the egg
b) To kill the sperm on its way
c) To deactivate the sperm motility
d) To prevent the release of egg

iii) To which category of contraceptives does the copper T belong?

a) Mechanical barrier
b) Hormonal control
c) Chemical control
d) Intrauterine devices

iv) Surgical methods of contraception involve the

a) Vas deferens
b) Uterus
c) Egg
d) Prostate gland

v) Which of the following techniques can be used to detect the sex of the child?
   a) Radiography
   b) Amniocentesis
   c) Surgery
   d) MRI

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

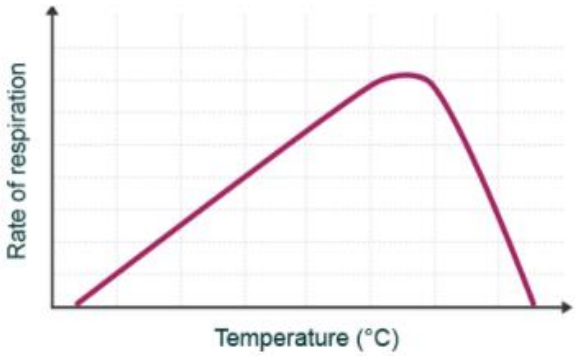
The food material taken in during the process of nutrition is used in cells to provide energy for various life processes. Diverse organisms do this in different ways – some use oxygen to breakdown glucose completely into carbon dioxide and water, some use other pathways that do not involve oxygen.

i) Which three carbon molecule is formed during the breakdown of glucose?
   a) Lactic acid
   b) Glyceraldehyde
   c) Acetic acid
   d) Pyruvate

ii) The process in which pyruvate may be converted into ethanol and carbon dioxide is
   a) Germination
   b) Fermentation
   c) Cellular respiration
   d) Oxidation

iii) Breakdown of pyruvate using oxygen takes place in the
   a) Cytoplasm
   b) Stroma
   c) Mitochondria
   d) Cellular matrix

iv) Observe the graph and interpret which of the following is true w.r.t. rate of respiration?



a) Increases with an increase in temperature
b) Increases first and then decreases with an increase in temperature
c) Decreases with an increase in temperature
d) Decreases first and then increases with an increase in temperature

v) The breakdown of pyruvate in the absence of oxygen producing lactic acid occurs primarily in the
a) Muscle cells
b) Brain cells
c) Cardiac cells
d) Nerve cells

## SECTION B

**21.**

(a) Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibiting both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons. (2)

**OR**

(b) Write the structural formula of two isomers of n-pentane $C_5H_{12}$.

**22.** Complete and balance the following equations: (2)

(a) $NaOH + \_\_\_\_\_ \longrightarrow Na_2SO_4 + H_2O$

(b) $Ca(OH)_2 + \_\_\_\_\_ \longrightarrow CaCO_3 + H_2O$

**23.** Two resistors each of 10 Ω are connected in i) series ii) and then in parallel to a battery of 6 V. Calculate the ratio of power consumed in the combination of resistor in two case.

**OR**

What is a voltmeter? How is a voltmeter connected in the circuit to measure the potential difference between two points? Explain with the help of a diagram. (2)

**24. Characteristics of image formed**: - (2)

| Position of object | Position of image | Size of image | Nature of image |
|---|---|---|---|
| At infinity | At focus F1 | Highly diminished | Virtual and erect |
| Between infinity and O | Between focus F1 and O | Diminished | Virtual and erect |

Characteristics of image formed for an optical device is given in the above table.

i) To which spherical lens/ mirror does the characteristics mentioned in the table belongs to?

ii) What sign is assigned to the value of focal length of this lens/mirror according to New Cartesian sign convention?

**25.** Damage to the ozone layer is a cause for concern." Justify this statement. Suggest any two steps to limit this damage. (2)

**26.** What is a clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity? (2)

## SECTION C

**27.** Explain the process of breakdown of glucose in a cell presence of oxygen and in absence of oxygen. (3)

**OR**

How are fats digested in our bodies? Where does this process take place?

**28.** A water-insoluble calcium compound (A) on reacting with dil. $H_2SO_4$ released a colourless and odourless gas (B) with brisk effervescence. When this 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)

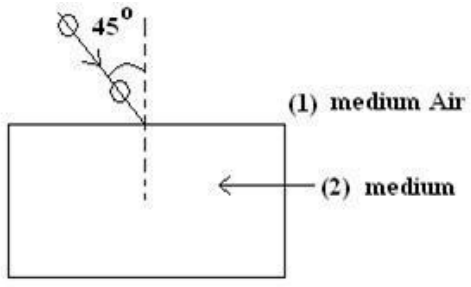
**29.** Identify compound X on the basis of the reactions given below. Also, write the name and chemical formulae of A, B and C. (3)

$$\text{Compound 'X'} \xrightarrow{+Zn} \text{'A'} + H_{2(g)}$$
$$\text{Compound 'X'} \xrightarrow{+HCl} \text{'B'} + H_2O$$
$$\text{Compound 'X'} \xrightarrow{+CH_3COOH} \text{'C'} + H_2O$$

**30.** What is the focal length of a concave mirror if the radius of curvature is 12 cm? What is the nature of the image formed by a concave mirror when an object is placed between its focus and pole? Draw the diagram for the same. (3)

**31.** Draw a circuit diagram to show how 3 bulbs can be lit from a battery so that 2 bulbs are controlled by the same switch while the third bulb has its own switch. (3)

**32.** A ray of light is incident at an angle of 45° at the interface of medium (1) and medium (2) as shown in the above diagram. Redraw this diagram in the answer book and complete it. If the angle of refraction is 30°, find the refractive index of medium (2) with respect to medium (1).



(Given that $\sin 45^0 = \frac{1}{\sqrt{2}}$ sin and $\sin 30^0 = \frac{1}{2}$)

If the second medium is water in place of medium (2), will the angle of refraction increase or decrease? Why? (Refractive index of water = 4/3) (3)

**33.** How do Mendel's experiments show that traits are inherited independently? (3)

## SECTION D

**34.** (5)

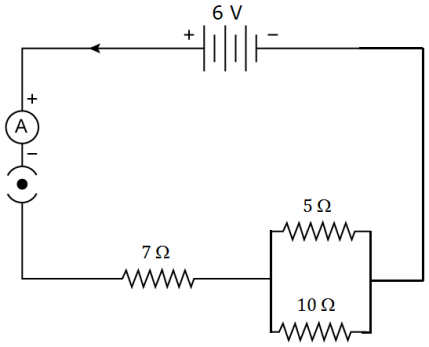
(a) Derive an expression for the heat produced in a conductor of resistance R when a current I flows through it for time t.

(b) Two identical resistors of resistance R are connected in series with a battery of potential difference V for time t. The resistors are then connected in parallel with the same battery for the same time t. Compare the heat produced in the two cases.

**OR**

(a) Deduce the expression for the equivalent resistance of the parallel combination of three resistors $R_1$, $R_2$ and $R_3$.

(b) Consider the following electric circuit:




Calculate:

(i) Resultant resistance

(ii) Total current

(iii) Voltage across 7-Ω resistor

**35.** (5)

(a) What is the electronic configuration of (i) a sodium atom, and (ii) an oxygen atom?

(b) What is the number of outermost electrons in (i) a sodium atom, and (ii) an oxygen atom?

(c) Show the formation of $Na_2O$ by the transfer of electrons between the combining atoms.

(d) Why are ionic compounds usually hard?

(e) How is it that ionic compounds in the solid state do not conduct electricity but they do so when in molten state?

**36.** (5)

(a) Draw a diagram showing the germination of pollen on the stigma. Label the style, male germ cell, ovule and female germ cell.

(b) What happens to the following parts of a flower after fertilisation—ovule, zygote, ovary?

**OR**

Describe triple fusion in plants. Where does it occur? Draw a neat and well labelled diagram to support your answer.

# CBSE
# Class X Science
# Sample Paper 2 – Solution

## SECTION A

**1.** Nichrome, an alloy, is used to make the heating element of electrical appliances.

**OR**

Joule/Coulomb = **Volt**

**2.** Plane mirror

**3.** b) 4 minutes

Sunrise appears 2 minutes before actual sunrise and 2 minutes after actual sunset due to atmospheric refraction. Thus, the day is lengthened by 2 + 2 = 4 minutes.

**4.** No two individuals are absolutely alike in a population as there are variation in the DNA due to the crossing-over and recombination during the DNA copying process.

**5.** Asexual reproduction takes place in plasmodium through multiple binary fission in which a single parent cell give birth to many gametes or daughter cells.

**6.** Hydrochloric acid in the stomach creates a medium of gastric juice acidic so that the enzyme pepsin digests the protein and kills the bacteria present in them.

**OR**

Saliva contains a digestive enzyme called salivary amylase, which converts carbohydrates into maltose sugars and helps in digestion of food.

**7.** The increase in demand for energy affects our environment adversely. Due to this increase, pollutants like CO, $CO_2$ and $SO_2$ are released into the atmosphere which leads to greenhouse effect.

**8.** During contraction of the heart, the valves ensure that there is no backflow of blood.

**9.** The appearance of white flowers may be due to mutation.

**OR**

The first generation $F_1$ hybrids will all produce red coloured flowers.

**10.** Photosynthesis is an endothermic reaction because sunlight energy is absorbed by green plants during this process.

**11.** Curd and other sour substances contains acids which can react with the metals of brass and copper vessels to form toxic (poisonous) metal compounds which can cause food poisoning and damage our health.

**OR**

The acidic behaviour of an acid is due to the presence of hydrogen ions [$H^+$(aq) ions] which are produced only when acids are dissolved in water. In the absence of water, acids do not produce hydrogen ions and hence do not show acidic behaviour.

**12.**

$$\text{Mass of B} = \frac{7 + 39}{2} = 23$$

**OR**

The real significance of atomic number in the modern periodic classification is that it relates the periodicity in the properties of elements to the periodicity in their electronic configurations.

**13.** Position of hydrogen: Hydrogen has been placed at the top of group 1, above the alkali metals in the modern periodic table because the electronic configuration of hydrogen is similar to those of alkali metals. Both, have 1 valence electron each.

**14.** (i) Both assertion and reason are true, and reason is the correct explanation of the assertion.

**15.** (i) Combustion reactions are also called as exothermic oxidation reactions because in these reactions, oxygen is added and heat energy is produced.

**OR**

(iv) Respiration is an exothermic process as in this process energy is produced.

**16.** (i) An aqueous solution of washing soda is alkaline because it turns red litmus to blue.

**17.**

i. b) Newland's rule known as 'law of octave'.
ii. b) Newland's law of octaves based upon increasing order of atomic mass.
iii. c) Newland's law of octaves is applicable to calcium.
iv. a) 6 elements are there in between A and B.
v. c) Both the statements are correct. Hence, option C is correct.

**18.**

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.

**19.**

i) b) Gonorrhoea, syphilis and AIDS are likely to spread in case of unprotected sexual contact.

ii) a) Mechanical barriers prevent the sperm from reaching the egg and avoid pregnancy.

iii) d) Intrauterine devices such as the loop or the copper-T are placed in the uterus to prevent pregnancy.

iv) a) Surgical methods involve the vas deferens in males and fallopian tubes in females to prevent fertilisation.

v) b) Amniocentesis can be used to detect the sex of the child before pregnancy.

**20.**

i) d) During respiration, the first step is the break-down of glucose, a six-carbon molecule, into a three-carbon molecule called pyruvate.

ii) b) Pyruvate may be converted into ethanol and carbon dioxide. This process takes place in yeast during fermentation.

iii) c) Breakdown of pyruvate using oxygen takes place in the mitochondria.

iv) b) The rate of respiration increases first with an increase in temperature and then decreases as the temperature continues to increase even further.

v) a) Breakdown of pyruvate in the absence of oxygen producing lactic acid occurs primarily in the muscle cells during heavy physical exercise.

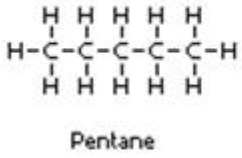
## SECTION B

**21.**

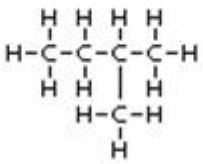
(a) Carbon forms strong bonds among themselves and with other elements and this makes the carbon compounds stable whereas silicon shows catenation property due to which it forms compounds with hydrogen having chains of up to 7 or 8 silicon atoms; but due to weak bonds, these compounds are unstable.

**OR**

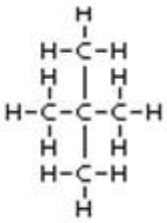
(b) Structural isomers of pentane:



Pentane



Isopentane



Neopentane

**22.** (a) $\mathbf{2}NaOH + \underline{\mathbf{H_2SO_4}} \longrightarrow Na_2SO_4 + \mathbf{2}H_2O$

(b) $Ca(OH)_2 + \underline{\mathbf{CO_2}} \longrightarrow CaCO_3 + H_2O$

**23.**

Total resistance in series,

$R_s = 20\ \Omega$

and

$$\text{Power}, P_s = \frac{V^2}{R_s} = 1.8\ W$$

In parallel, total resistance

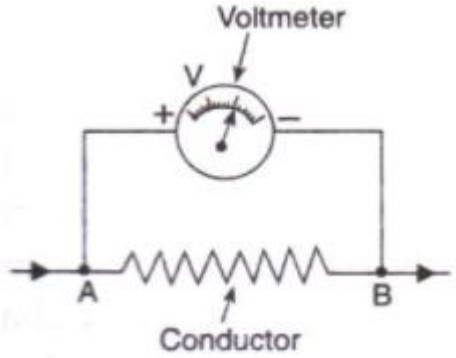
$R_p = 5\ \Omega$

$$\text{Power, } P_p = \frac{V^2}{R_p} = 7.2 W$$

$$\frac{P_s}{P_p} = \frac{1}{4}$$

**OR**

A voltmeter is a device which is used to measure the potential difference between two points in an electric circuit. Voltmeter is always connected in parallel across the two points where the potential difference is to be measured.




**24.**

i) The characteristics mentioned in the given below belongs to the images formed by concave lens.

ii) The diverging les/ concave lens has negative focal length according to the New Cartesian sign convention.

**25.** Ozone layer prevents the harmful ultraviolet radiation to enter the atmosphere and reach the earth's surface. Depletion of ozone layer has become a cause for concern because it can cause serious effects on human body and other organisms of the environment like fatal diseases such as skin cancer, changes in genetic material DNA and eye damage.

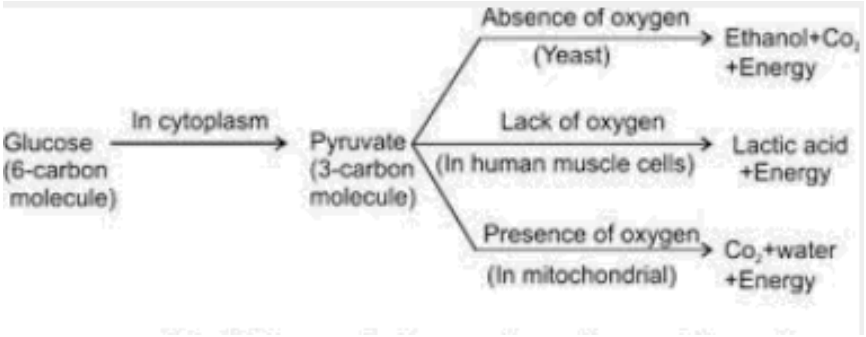
<u>Two steps to limit this damage are as follows:</u>

- Judicious use of aerosol spray propellants such as fluorocarbon and chlorofluorocarbons which cause depletion or hole in the ozone layer.
- Control over large scale nuclear explosions and limited use of supersonic planes.

**26.** Cells derived from a common ancestor are known as clones. Offspring obtained from asexual reproduction have a single parent. Hence, there is no chance of variation in their chromosomes. Hence, they are exactly similar to their parents.

## SECTION C

**27.** Glucose is broken down into a three carbon molecule called pyruvate in the cell cytoplasm. Pyruvate is further broken down by different ways to provide energy in various organisms. Pyruvate is broken down in different ways in different organisms as shown below:




i. In yeast cells, during fermentation, pyruvate is converted into ethanol and carbon dioxide in the absence of oxygen.

ii. In mitochondria, breakdown of pyruvate takes place in the presence of oxygen to give rise to three molecules of carbon dioxide and water.

iii. Sometimes, when there is lack of oxygen, especially during vigorous activity, in our muscles, pyruvate is converted into lactic acid.

**OR**

Digestion of fats takes place in the small intestine.

- Bile juice secreted by the liver is poured into the intestine along with pancreatic juice.
- The bile salts present in the bile juice emulsify the large globules of fats. Therefore, by emulsification, large globules break down into fine globules to provide larger surface area to act upon by the enzymes.
- Lipase enzyme present in the pancreatic juice causes break down of emulsified fats.
- Glands present in the wall of small intestine secrete intestinal juice which contains lipase enzyme that converts fats into fatty acids and glycerol.

$$\text{Fats} \xrightarrow[\text{by bile salts}]{\text{emulsified}} \text{Emulsified fats} \xrightarrow[\text{lipase}]{\text{pancreatic juice}} \text{Break down of fats} \xrightarrow[\text{juice lipase}]{\text{intestinal}} \text{Fatty Acids + Glycerol}$$

**28.** $CaCO_3$ + dil. $H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$

A B

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(Lime water) A

A: $CaCO_3$ (Limestone)

B: $CO_2$ (g)

**29.** Compound 'X' is sodium hydroxide (NaOH).

$$\underset{\text{Sodium hydroxide}}{\underset{'X'}{2NaOH}} + Zn \longrightarrow \underset{\text{Sodium zincate}}{\underset{'A'}{Na_2ZnO_2}} + H_2\uparrow$$

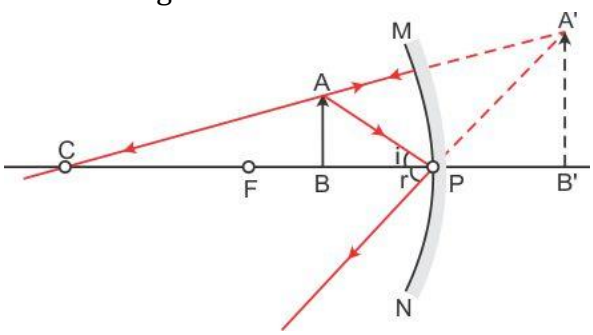
$$\underset{\text{Sodium hydroxide}}{\underset{'X'}{NaOH}} + HCl \longrightarrow \underset{\text{Sodium chloride}}{\underset{'B'}{NaCl}} + H_2O$$

$$\underset{\text{Sodium hydroxide}}{\underset{'X'}{NaOH}} + CH_3COOH \longrightarrow \underset{\text{Sodium ethanoate}}{\underset{'C'}{CH_3COONa}} + H_2O$$

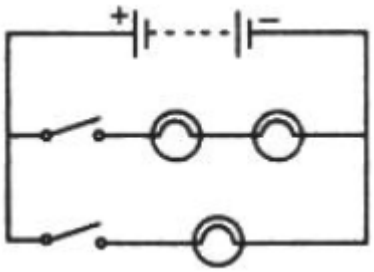
**30.** R = –12 cm (Radius of curvature of a concave mirror)

We know, f = R/2 = – 12/2 = – 6 cm.

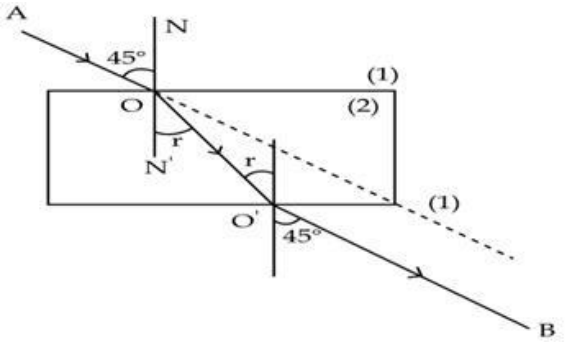
The image formed by a concave mirror when an object is placed between the focus and pole is virtual, erect and magnified.




**31. Circuit diagram: -**



**32.**



Using Snell's law, the refractive index of medium (2) with respect to medium (1) is given as

$$n_{21} = \frac{\sin i}{\sin r} = \frac{\sin 45^0}{\sin 30^0} = \frac{1/\sqrt{2}}{1/2} = \sqrt{2} = 1.414$$

If the second medium is water in place of medium (2), the angle of refraction will decrease because water is rarer than medium (2).

**33.** Mendel carried out dihybrid crosses by crossing two pea plants differing in contrasting traits of two characters.

For example, he crossed a pea plant having yellow colour and round seeds with another pea plant bearing green colour and wrinkled seeds. In the $F_2$ generation, he got pea plants with two parental and two recombinant phenotypes as yellow round and green wrinkled (parental) and yellow wrinkled and green round (recombinant). This indicated that traits separated from their original parental combinations and got inherited independently.

## SECTION D

**34.**

(a) A conductor offers resistance to the flow of current. Hence, work must be continuously done by the current to keep itself flowing.

When an electric charge Q moves against a potential difference V, the work done is W = QV.

From the definition of current,

$$I = \frac{Q}{t}$$

$$\therefore Q = It$$

From Ohm's law,

$$V = IR$$

$$\therefore W = It \times IR = I^2Rt$$

Assuming that all this work goes in producing heat energy.

Therefore, the heat produced in a conductor of resistance 'R' when current 'I' is flowing for time 't' is

$$H = I^2Rt$$

(b) When resistors are connected in series:

$$R_s = R + R = 2R$$

$$\therefore H_s = \frac{V^2}{R_s} = \frac{V^2}{2R} \quad \text{..... (1)}$$

When resistors are connected in parallel:

$$\frac{1}{R_p}=\frac{1}{R}+\frac{1}{R}=\frac{2}{R}$$

$$\therefore R_p=\frac{R}{2}$$

$$\therefore H_p=\frac{V^2}{R_p}=\frac{2V^2}{R} \qquad \text{..... (2)}$$

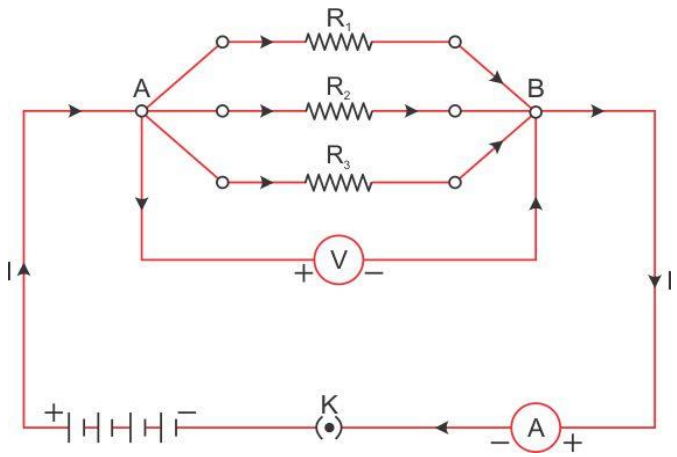
From (1) and (2),

$$\frac{H_s}{H_p}=\frac{V^2}{2R}\times\frac{R}{2V^2}=\frac{1}{4}$$

$$\therefore H_p=4H_s$$

**OR**

(a) When two or more resistors are joined to the same end, they are connected in parallel.




Potential difference in a parallel circuit remains the same across all resistors.

The current is the sum of the currents across all the individual resistors.

$$I=I_1+I_2+I_3 \qquad \text{..... (1)}$$

Let $R_p$ be the resultant resistance of the circuit.

On applying Ohm's law to the entire circuit,

$$I=\frac{V}{R_p} \qquad \text{..... (2)}$$

Applying Ohm's law to individual resistors,

$$\left.\begin{aligned} I_1&=\frac{V}{R_1}\\ I_2&=\frac{V}{R_2}\\ I_3&=\frac{V}{R_3}\end{aligned}\right\}(3)$$

From equations (1), (2) and (3),

$$\frac{V}{R_p}=\frac{V}{R_1}+\frac{V}{R_2}+\frac{V}{R_3}$$

$$\therefore \frac{1}{R_p}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$

(b) For the given circuit,

(i) The resultant resistance is

$$R_{eq}=7+5||10$$

$$\therefore R_{eq}=7+\frac{10\times5}{10+5}=7+\frac{50}{15}$$

$$\therefore R_{eq}=\frac{105+50}{15}=\frac{155}{15}=10.33\ \Omega$$

(ii) The total current is

$$I=\frac{V}{R_{eq}}$$

$$\therefore I=\frac{6}{10.33}=0.58\ A$$

(iii) Voltage across the 7 Ω resistor is

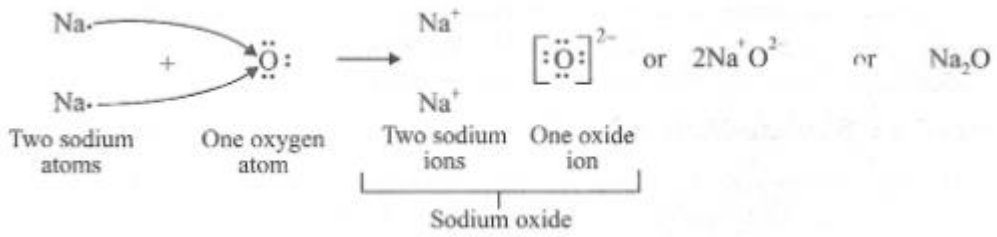
$$V_7=IR_7=0.58\times7=4.06\ V$$

**35.**

(a) (i) 2,8,1 (ii) 2,6

(b) (i) 1 (ii) 6

(c)



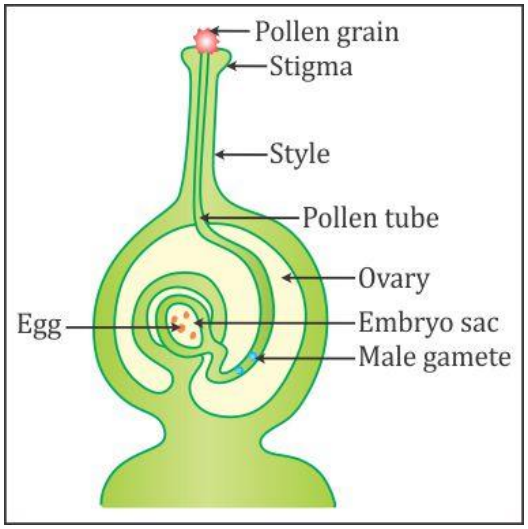

(d) Ionic compounds are usually hard because their oppositely charged ions attract one another strongly and form a regular crystal structure.

(e) Although solid ionic compounds are made up of ions but they do not conduct electricity in solid state. This is because in the solid ionic compound the ions are held together in fixed positions by strong electrostatic forces and cannot move freely. However, when we dissolve the ionic solid in water or melt it, the crystal

structure is broken down and ions become free to move and conduct electricity. Thus, an aqueous solution of an ionic compound conducts electricity because there are plenty of free ions in the solution which are able to conduct electric current.

**36.**

(a)




(b) The ovule becomes a seed, the ovary thickens to form a fruit, and the zygote develops into the embryo of the seed.

**OR**

- After pollination, the pollen grains germinate on the stigma by producing pollen tube.
- This pollen tube is formed from the inner wall of the pollen grain.
- It penetrates the stigma and passes through the style and enters the ovule through an opening.
- It releases two male gametes in the embryo sac.
- One male gamete fuses with the egg cell and forms a diploid zygote.
- The second male gamete fuses with two polar nuclei resulting in the formation of a triploid cell.
- The fusion of one male gamete with the egg cell is called syngamy.
- The fusion of the second male gamete with two polar nuclei is called triple fusion. This process occurs in ovary.