

Science

Time: 3 Hours

Max. Marks: 80

S. No.	Typology of Question	Very Short Answer (VSA) 1 Mark	Short Answer– I (SA I) 2 Marks	Short Answer– II (SA II) 2 Marks	Long Answer (LA) 5 Marks	Total Marks	% Weightage
1.	Remembering	2	-	1	1	10	15%
2.	Understanding	-	1	4	2	24	35%
3.	Application	-	1	2	2	18	26%
4.	High Order Thinking Skills	-	-	1	1	8	12%
5.	Inferential and Evaluative	-	1	1 + 1**	-	8	12%
	Total (Theory Based Questions)	$2 \times 1 = 2$	$3 \times 2 = 6$	$10 \times 3 = 30$	$6 \times 5 = 30$	68(21)	100%
	Practical Based Questions		$6 \times 2 = 12$	-	-	12(6)	
	Total	$2 \times 1 = 2$	$9 \times 2 = 18$	$10 \times 3 = 30$	$6 \times 5 = 30$	80(27)	

1. Question paper will consist of 27 questions

2. All questions would be compulsory. However, an internal choice will be provided in two questions of 3 marks each and one question of 5 marks.

** One Question of 3 marks will be included to assess the values inherent in the texts.

SCIENCE

Time allowed: 3 hours

Maximum marks: 80

General Instructions:

- (i) The question paper comprises two sections, A and B. You are to attempt both the sections.
- (ii) All questions are compulsory.
- (iii) All questions of Section-A and B are to be attempted separately
- (iv) There is an internal choice in three questions of three marks each, two questions of five marks each and one question of two marks each (practical skills).
- (v) Question numbers 1 and 2 in Section-A are one-mark questions. They are to be answered in one word or in one sentence.
- (vi) Question numbers 3 to 5 in Section-A are two marks questions. These are to be answered in 30 words each.
- (vii) Question numbers 6 to 15 in Section-A are three marks questions. These are to be answered in about 50 words each.

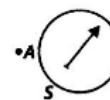
(vii) Question numbers 16 to 21 in Section-A are five marks questions. These are to be answered in 70 words each.

(ix) Question numbers 22 to 27 in Section-B are based on practical skills. Each question is a two marks question.

These are to be answered in brief.

SECTION – A

1. State the role of placenta in the development of embryo. 1
 2. What is the importance of DNA copying in reproduction? 1
 3. Why is improper disposal of waste a curse to environment? 2
 4. Write the chemical equations for the following reactions :
 - (i) Conversion of oils into fats
 - (ii) Oxidation of ethanol2
 5. A magnetic compass needle is placed in the plane of paper near point A as shown in figure. In which plane should a straight current carrying conductor be placed so that it passes through A and there is no change in the deflection of the compass? Under what condition is the deflection maximum and why? 2
 6. Why is charcoal considered a better fuel than wood? What are the disadvantages of converting wood into charcoal? 3
- OR
- Explain why only a small part of the solar energy that strikes the upper regions of atmosphere reaches the surface of the Earth. 3
7. Suggest few measures for controlling carbon dioxide levels in the atmosphere. 3



8. State the rules to determine the direction of (i) magnetic field produced around a straight current carrying conductor (ii) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it and (iii) current induced in a coil due to its rotation in a magnetic field. 3
9. A student X sitting in the last row in the class has difficulty in reading the matter written on the blackboard. The teacher requests the student sitting in the front row to volunteer for exchange of seat to help X. Student Y sitting in the front row volunteers herself to exchange the seat with X. Now X was able to read the matter on blackboard clearly and Y also did not face any difficulty. The teacher also advised X to get his eyes checked-up. Answer the following questions based on the given information. 3
- Which eye defect of vision is student X suffering from?
 - Which values is the teacher displaying through her actions and advice?
 - Which values is Y displaying through volunteering?
10. For a heater rated at 4 kW and 220 V, calculate (a) the current, (b) the resistance of the heater, (c) the energy consumed in 2 hours, (d) the cost, if 1 kW h is priced at 50 paise. 3

OR

Explain the following :

- Why is tungsten used almost exclusively for filament of electric lamps?
 - Why are the conductors of electric heating devices, such as toasters and electric irons, made of an alloy rather than a pure metal?
 - Why is the series arrangement not used for domestic circuits?
 - How does the resistance of a wire vary with its area of cross-section.
 - Why are copper and aluminium wires usually employed for electricity transmission. 3
11. For the following given elements predict the Na(11), Al(13), Cl(17), K(19) 3
- valency
 - period number
 - group number
12. A student was given few metals Mn, Zn, Fe and Cu, which of them 3
- will not displace hydrogen from dil. HCl?
 - will react only with steam to give H_2 gas?
 - will give H_2 gas with 5% HNO_3 ?
- Write the chemical reactions involved.
13. (i) In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved. 3
- (ii) Which among the following changes are exothermic or endothermic in nature?
- Decomposition of ferrous sulphate
 - Dilution of sulphuric acid
 - Dissolution of sodium hydroxide in water
 - Dissolution of ammonium chloride in water 3
14. How does chemical coordination occur in plants? 3

15. Distinguish between homologous organs and analogous organs. In which category would you place wings of a bird and wings of a bat? Justify your answer giving a suitable reason. 3

OR

"It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement. 3

16. (a) Does shortsightedness or long-sightedness imply necessarily that the eye has partially lost its ability of accommodation? If not, what might cause these defects of vision?
(b) An old person wears eye lens of power 2 D to read book at 25 cm. He observes one day that with same lens he must hold the book 40 cm from his eye to see clearly. What are his near points before and after with eye lens? 5
17. (i) Derive an expression for the equivalent resistance of three resistors R_1 , R_2 and R_3 connected in series.
(ii) Fuse of 3 A, 5 A and 10 A are available. Calculate current and select the fuse for operating electric iron of 1.32 kW power at 220 V line. 5

18. What happens when (support your answer with balanced chemical equations.)

- (i) Dilute hydrochloric acid reacts with sodium metal
- (ii) Magnesium hydroxide is added to nitric acid
- (iii) Sodium carbonate is treated with dilute sulphuric acid
- (iv) Zinc metal reacts with caustic soda
- (v) Carbon dioxide gas is bubbled through lime water. 5

OR

Give suitable reasons for the following statements :

- (i) Rain water conducts electricity but distilled water does not.
 - (ii) We feel burning sensation in the stomach when we overeat.
 - (iii) A tarnished copper vessel regains its shine when rubbed with lemon.
 - (iv) The crystals of washing soda change to white powder on exposure to air.
 - (v) An aqueous solution of sodium chloride is neutral but an aqueous solution of sodium carbonate is basic. 5
19. (a) Label the parts of the nerve cell and give one function each.
(b) What are the limitations of electrical impulse? 5
20. Atoms of eight elements A, B, C, D, E, F, G and H have the same number of electronic shells but different number of electrons in their outermost shell. It was found that elements 'A' and 'G' combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements 'A' and 'B' are basic in nature while those of 'E' and 'F' are acidic. The oxide of 'D' is almost neutral. Based on the above information answer the following questions :
- (i) To which group or period of the periodic table do the listed elements belong?
 - (ii) What would be the nature of compound formed by a combination of elements 'B' and 'F'?
 - (iii) Which two of these elements could definitely be metals?
 - (iv) Which one of the eight elements is most likely to be found in gaseous state at room temperature in diatomic form?
 - (v) If the number of electrons in the outermost shell of elements 'C' and 'G' be 3 and 7 respectively, write the formula of the compound formed by the combination of 'C' and 'G'. 5

21. (a) Draw a diagram to show open stomatal pore and label on it :
 (i) guard cells
 (ii) chloroplast
 (b) State two functions of stomata.
 (c) How do guard cells regulate the opening and closing of stomatal pore?

5

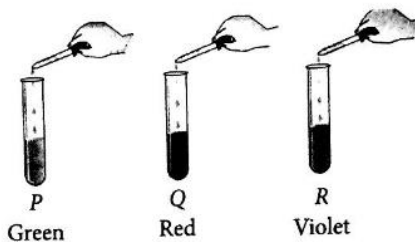
OR

- (a) Draw a schematic representation of transport and exchange of oxygen and carbon dioxide during transportation of blood in human beings and label on it the following :
 Lung capillaries, pulmonary artery to lungs, aorta to body, pulmonary veins from lungs.
 (b) What is the advantage of separate channels in mammals and birds for oxygenated and deoxygenated blood?

5

SECTION – B

22. On adding a few drops of universal indicator to three unknown colourless solutions P, Q and R taken separately in three test tubes shown in the given figure, a student observed the changes in colour as green in P, red in Q and violet in R. What will be the decreasing order of pH?



2

23. In an experiment, a student added 20% of NaOH solution and 20 mL of castor oil in a flask. The flask gets hot. What will you conclude from this?
24. Students were asked to observe the permanent slides showing different stages of binary fission in *Amoeba* under high power of a microscope.
 (i) Which adjustment screw (coarse/fine) would you suggest your friend to move to focus the slides?
 (ii) Draw three diagrams in correct sequence showing binary fission in *Amoeba*.

2

25. List four precautions which are required while preparing a temporary mount of a leaf peel to observe its stomata. 2

26. Two resistors are connected first in series and then in parallel across a battery. What effect will it have on the readings of voltmeter and ammeter? 2

OR

Suppose in an experiment you see that the deflection on ammeter (or voltmeter) scale goes beyond the full scale. What will you infer from such an observation? What will you infer if the deflection takes place in opposite direction? 2

27. The following data was recorded for values of object distance and the corresponding values of image distance in the experiment on study of real image formation by a convex lens of power +5 D. One of these observations is incorrect. Identify this observation and give reason for your choice :

S. No.	1	2	3	4	5	6
Object distance (in cm)	25	30	35	45	50	55
Image distance (in cm)	97	61	37	35	32	30

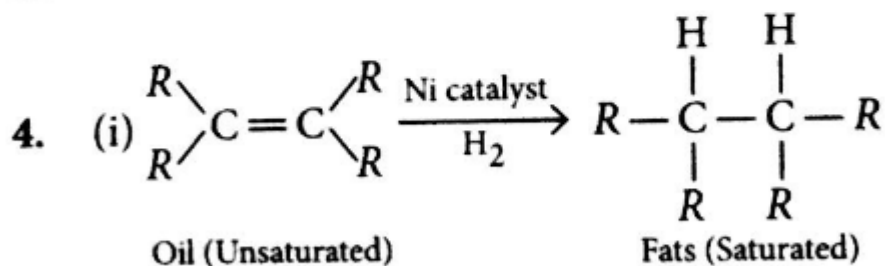
2

SOLUTION

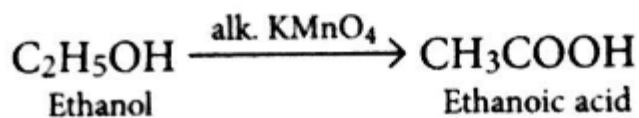
1. Placenta is a physiological connection between an embryo and uterine wall of the mother through which nutrients and other useful substances enter into fetus from mother's blood and waste products like urea and carbon dioxide are expelled into mother's blood from fetus.

2. DNA copying during reproduction is important for the transfer of parental characters to the offsprings.

3. Wastes pollute our environment, air, soil and water and cause harmful effects on all living organisms.



(ii) Oxidation of ethanol :



5. For no change in the deflection of the compass, magnetic field produced by the straight current carrying conductor should be perpendicular to the plane of paper, that is current direction must lie in the plane of paper or conductor should be placed in the plane of paper. When the conductor is placed perpendicular to the plane of paper magnetic field produced by it, will be in the plane of paper and therefore there will be maximum deflection in the galvanometer.

6. Charcoal is considered a better fuel than wood because:

- (i) It has high calorific value.
- (ii) It does not produce any smoke.

Disadvantages :

- (i) 1 kg of wood on destructive distillation produces only 0.25 kg of charcoal making it an expensive fuel.
- (ii) For production of charcoal, more and more trees would have to be cut down which causes deforestation and disturbs the ecological balance of the Earth.

OR

When the solar energy falls on the top surface of the atmosphere then the following happens :

- (i) Some solar energy is reflected back into the space by the atmosphere, and
- (ii) The atmosphere also absorbs a lot of solar energy; for example, most of the ultraviolet rays are absorbed by the ozone layer.

So, the solar energy which reaches us through the Earth's atmosphere are mainly in the form of heat rays (infrared rays) and visible light, which is a small part of the solar energy.

7. Following are the measures for controlling carbon dioxide levels in the atmosphere :

- (i) Use CNG or clean fuel in automobiles
- (ii) Do not burn litter, use it for preparation of manure
- (iii) Use of unleaded petrol
- (iv) Excessive plantation (afforestation) should be done.
- (v) Remove the harmful gases from smoke, before discharging into atmosphere.

8. (i) The direction of magnetic field produced around a current carrying conductor is given by right hand thumb rule. If the conductor carrying current is held in the right hand in such a way that the thumb points in the direction of current, then direction of curl of fingers gives the direction of the magnetic field.

(ii) The direction of force experienced by a straight conductor carrying current placed in a magnetic field, which is perpendicular to it is determined by Fleming's left hand rule. Hold the thumb and first two fingers of the left hand at right angles to each other with the first finger pointing in the direction of the field and the second finger in the direction of the current, then the thumb points in the direction of the motion.

(iii) The direction of current induced in a circuit by changing magnetic flux due to motion of a magnet is determined by Fleming's right hand rule. If we stretch our right hand in such a way that the thumb, forefinger and central finger remain perpendicular to each other, so that the forefinger indicates the direction of the magnetic field and the thumb in the direction of motion of conductor; then the central finger indicates the direction of induced current.

9. (i) Myopia/Shortsightedness.

(ii) Concern for students, helpfulness, duty/role as a guide, counselling.

(iii) Empathy, helpfulness, cooperation.

10. Power, $P = 4 \text{ kW} = 4000 \text{ W}$

Voltage, $V = 220 \text{ V}$

Time, $t = 2 \text{ h}$

(a) Current, $I = \frac{P}{V} = \frac{4000 \text{ W}}{220 \text{ V}} = 18.2 \text{ A}$

(b) Resistance, $R = \frac{V}{I} = \frac{220 \text{ V}}{18.2 \text{ A}} = 12.1 \, \Omega$

(c) Energy consumed = VIt

$$= 220 \text{ V} \times 18.2 \text{ A} \times 2 \text{ h}$$

$$= 8008 \text{ W h} = 8 \text{ kW h}$$

(d) Cost = $8 \text{ kW h} \times ₹ 0.50/\text{kW h} = ₹ 4.00$

OR

(a) Tungsten has a high melting point (3380°C) and becomes incandescent (*i.e.*, emits light at a high temperature) at 2400 K .

(b) The resistivity of an alloy is generally higher than that of pure metals of which it is made of.

(c) In series arrangement, if any one of the appliances fails or is switched off, all the other appliances stop working because the same current is passing through all the appliances.

(d) The resistance of a wire (R) varies inversely as its cross-sectional area (A) as $R \propto 1/A$.

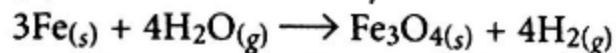
(e) Copper and aluminium wires possess low resistivity and as such are generally used for electricity transmission.

11.

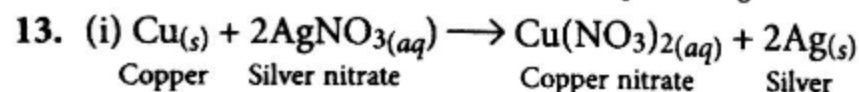
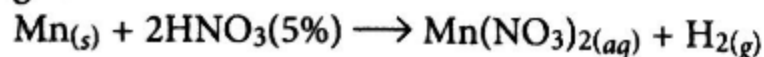
Element	Atomic Number	Valency	Period Number	Group Number	Electronic configuration
Na	11	1	3	1	2, 8, 1
Al	13	3	3	13	2, 8, 3
Cl	17	1	3	17	2, 8, 7
K	19	1	4	1	2, 8, 8, 1

12. (a) Copper will not displace hydrogen from dil. HCl.

(b) Iron will react only with steam to liberate H₂ gas.



(c) Manganese will react with 5% HNO₃ to give H₂ gas.



Thus, silver metal can be recovered.

(ii) (a) It is endothermic reaction.

(b) It is exothermic process.

(c) It is exothermic process.

(d) It is endothermic process.

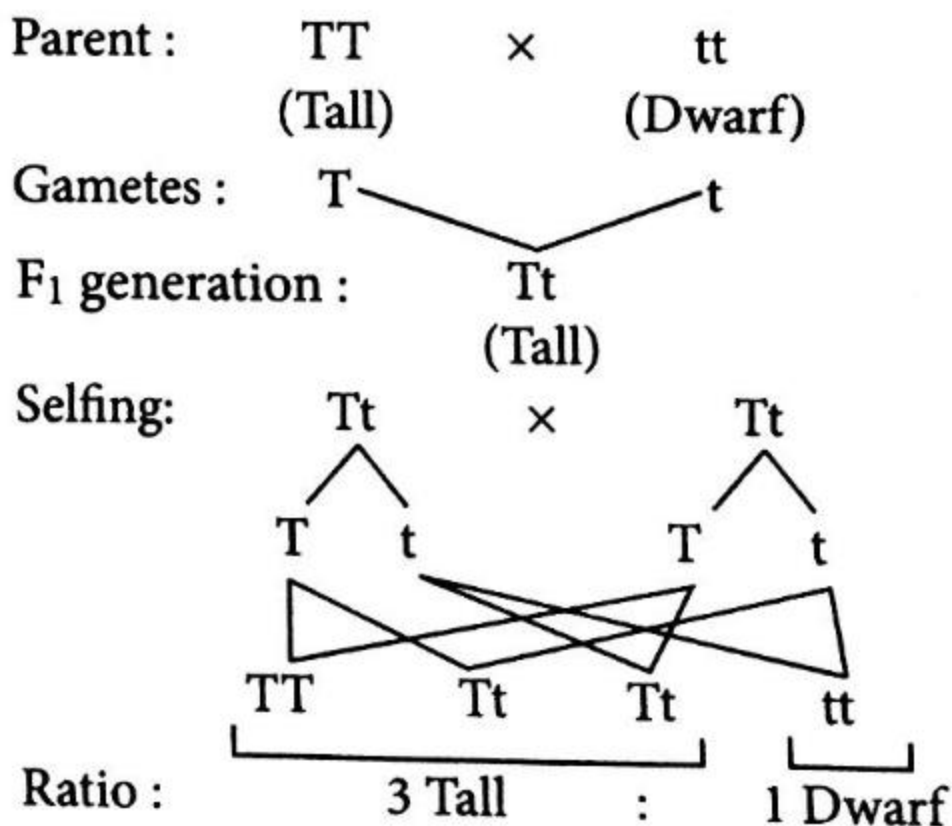
14. In plants, chemical coordination occurs with the help of plant hormones (phytohormones). Different plant hormones help to coordinate growth, development, and responses to the environment. They are synthesised at places away from where they act and diffuse to the area for action, for example, auxin

promotes cell growth, gibberellins promote stem growth, cytokinins promote cell division and abscisic acid inhibits growth and its effects include wilting of leaves.

15. Those organs which have the same basic structure and similar embryonic origin but different functions are called as homologous organs. These organs follow same basic plan of organisation during development, but in adults get modified to perform different function as an adaptation to different environments. Those organs which have different basic structure and embryonic origin but perform similar functions are called analogous organs. The wings of bird and wings of bat are analogous organs because the basic structure or design of the wings of bird and bat are different but they perform the similar function of flying.

OR

A trait may be inherited but may not be expressed, this could be explained by the given example. When a tall pea plant was crossed with a dwarf pea plant, then F_1 generation plants were all tall. When F_1 plants were selfed, then F_2 generation plants were both tall and dwarf. This shows that the F_1 plants had inherited both the parental traits but did not express dwarfness or recessive trait in the presence of the trait for tallness or dominant trait. This could be explained by the given cross :



16. (a) No, a person having eye with normal ability of accommodation may be suffering from myopia or hypermetropia. This is due to eye ball either too long or too short or due to old age defect called presbyopia.

(b) Before the given situation, $P = +2 D$

Using lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

Here, $u = -25 \text{ cm} = 0.25 \text{ m}$, $v = -y$

$$\therefore P = \frac{1}{-y} - \frac{1}{-0.25} = 4 - \frac{1}{y}$$

$$P = \frac{4y-1}{y} \text{ or } 2 = \frac{4y-1}{y}$$

$$\text{or } 2y = 4y - 1$$

$$\text{or } y = \frac{1}{2} = 0.5 \text{ m} = 50 \text{ cm}$$

$$v = -y = -50 \text{ cm}$$

After the given situation,

$$f = \frac{1}{P} = \frac{1}{2} = 0.5 \text{ m} = 50 \text{ cm} \text{ and } u = -40 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \text{ or } \frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{50} - \frac{1}{40} = \frac{-1}{200}$$

$$\text{or } v = -200 \text{ cm}$$

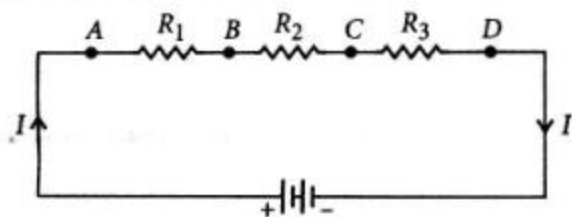
17. (i) When three resistors R_1 , R_2 and R_3 are connected in series, the current flowing through them remains same but the potential difference across each resistor is different.

The total potential difference V across AD will be sum of potential difference across AB , BC and CD , i.e.,

$$V = V_1 + V_2 + V_3 \quad \dots(i)$$

$$V_1 = IR_1 ; V_2 = IR_2 ; V_3 = IR_3 \quad \dots(ii)$$

If the equivalent resistance of the series combination of three resistors is R , then



$$V = IR \quad \dots(iii)$$

From eqn. (i), (ii) and (iii), we get

$$IR = IR_1 + IR_2 + IR_3$$

$$\therefore R = R_1 + R_2 + R_3$$

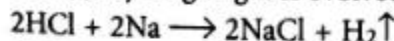
$$(ii) \text{ Power} = 1.32 \text{ kW} = 1320 \text{ W}$$

$$V = 220 \text{ V}$$

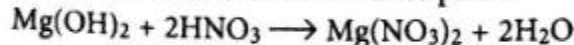
$$P = VI \Rightarrow I = \frac{P}{V} = \frac{1320 \text{ W}}{220 \text{ V}} = 6.0 \text{ A}$$

\therefore 10 A fuse will be suitable for operating the electric iron.

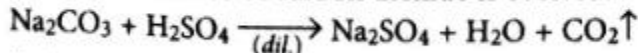
18. (i) Hydrogen gas is evolved.



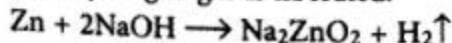
(ii) Neutralisation reaction takes place.



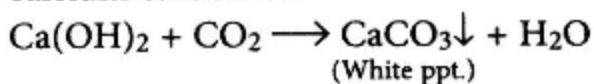
(iii) Effervescence of carbon dioxide is evolved.



(iv) Hydrogen gas is liberated.



(v) The solution turns milky due to formation of calcium carbonate.



OR

(i) Distilled water does not conduct electricity because it does not contain any ionic compound like acids, bases or salts dissolved in it while rain water contains ions which conduct electricity.

(ii) When we overeat, excess of acid is produced in the stomach which causes burning sensation.

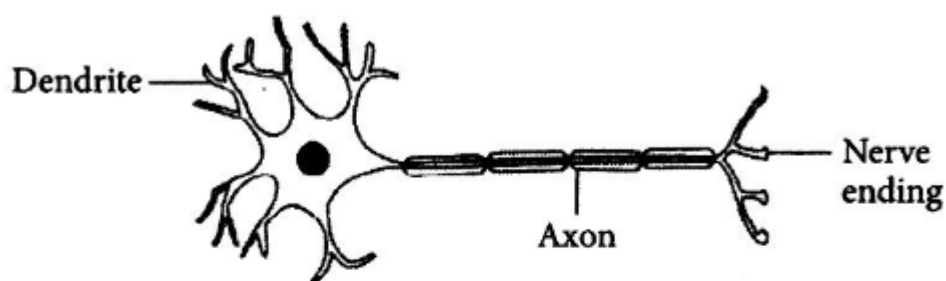
(iii) Copper vessels tarnish due to formation of basic copper carbonate which gets neutralised when rubbed with lemon and the copper vessel regains its shine.

(iv) Washing soda is sodium carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) which when exposed to air loses its water of crystallization and changes to white powder (Na_2CO_3).

(v) Sodium chloride is a salt of strong acid (HCl) and strong base (NaOH) so, it is a neutral salt.

Sodium carbonate is a salt of weak acid (H_2CO_3) and strong base (NaOH) so, it is a basic salt.

19. (a) The parts of nerve cell with their functions are:



(i) Dendrite: It receives the impulse from the stimulus and transmit it further to the cell body.

(ii) Axon: It receives the message from dendrite and sends it further to nerve ending.

(iii) Nerve ending: It transmits or sends the signal to the other nerve cell *via* synapse.

(b) The limitations of electrical impulse is that impulse reaches only those cells having nerve connections and it cannot continue to create the electrical impulse.

20. Eight elements A, B, C, D, E, F, G and H have the same number of electronic shells. So, they belong to the same period.

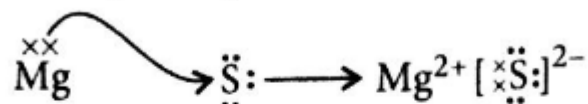
The biggest hint in the question is that the compound formed when 'A' and 'G' combine is used in almost all vegetable dishes which is NaCl.

Thus, A = Na and G = Cl.

(i) These elements belong to period number 3.

Group :	1	2	13	14	15	16	17	18
	A	B	C	D	E	F	G	H
	Na	Mg	Al	Si	P	S	Cl	Ar

(ii) The compound formed by the combination of 'B' and 'F' *i.e.*, Mg and S will be ionic in nature as the bond will be formed by complete transfer of electrons.



(iii) A and B *i.e.*, sodium and magnesium will definitely be metals.

(iv) G *i.e.*, Cl (chlorine) is found as gaseous diatomic (Cl_2) molecule at room temperature.

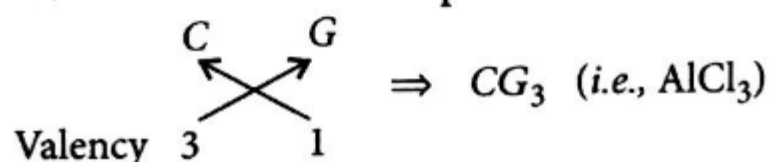
(v) Number of electrons in outermost shell of C = 3

Number of electrons in outermost shell of G = 7

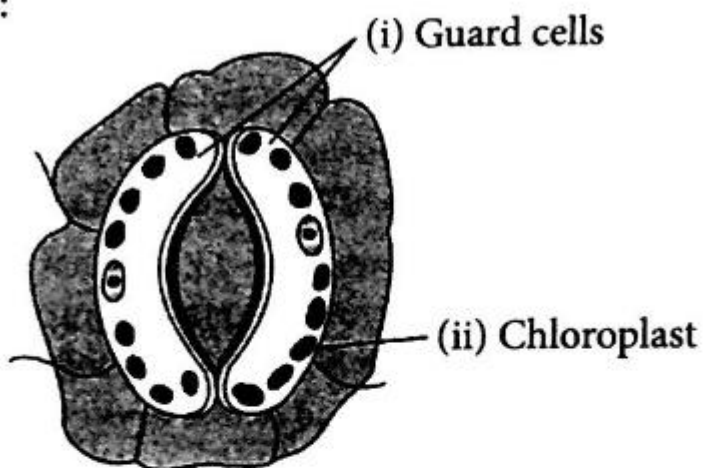
\therefore Valency of C = 3

Valency of G = $8 - 7 = 1$

Thus, the formula of the compound will be



21. (a) Diagrammatic representation of stomatal pore is :



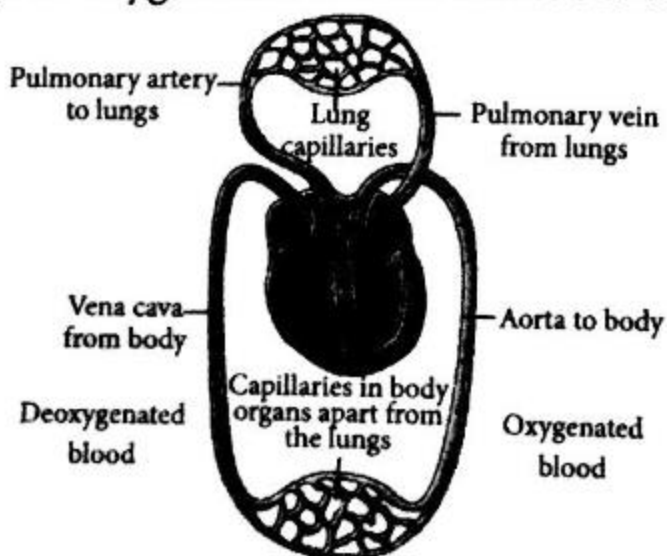
(b) Two functions of stomata are :

(i) Exchange of gases between the plant and the atmosphere takes place through stomata.

(ii) Transpiration in plants take place through stomata.

(c) The opening and closing of the stomatal pore is a function of the guard cells. The guard cells swell when water flows into them causing the stomatal pore to open. Similarly, the pore closes if the guard cells shrink. As large amount of water is lost through these stomata, the plant closes these pores when it does not require carbon dioxide for photosynthesis.

(a) The schematic representation of transport and exchange of oxygen and carbon dioxide is as follows:



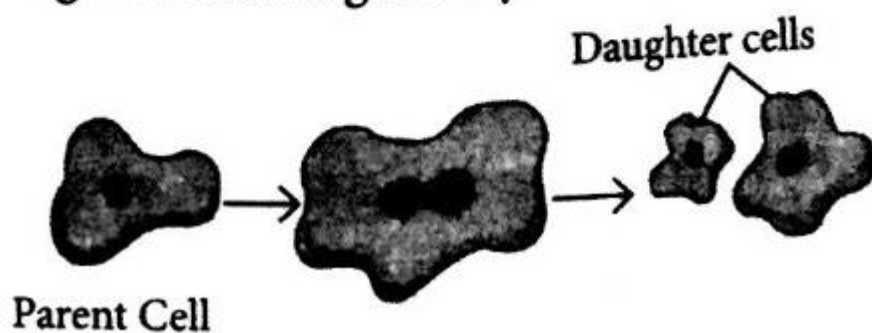
(b) In mammals and birds, the two circulatory system (oxygenated and deoxygenated blood) become fully separated sending low pressure pumping to lungs and high pressure flow of blood to rest of the body. This prevents any mixing of oxygenated and deoxygenated blood ensuring maximum supply of oxygen to all body parts. This allows optimum oxidation of glucose to release energy required by these animal groups to maintain their body temperature making them homeothermic.

22. The decreasing order of pH will be $R > P > Q$. The reason is that the test tube showing green colour has a pH = 7, test tube showing red colour has pH = 1 and the test tube showing violet colour has pH = 13.

23. The addition of NaOH solution to castor oil is an exothermic reaction, as the heat is evolved during the reaction. Hence, the beaker becomes hot.

24. (i) Fine adjustment screw

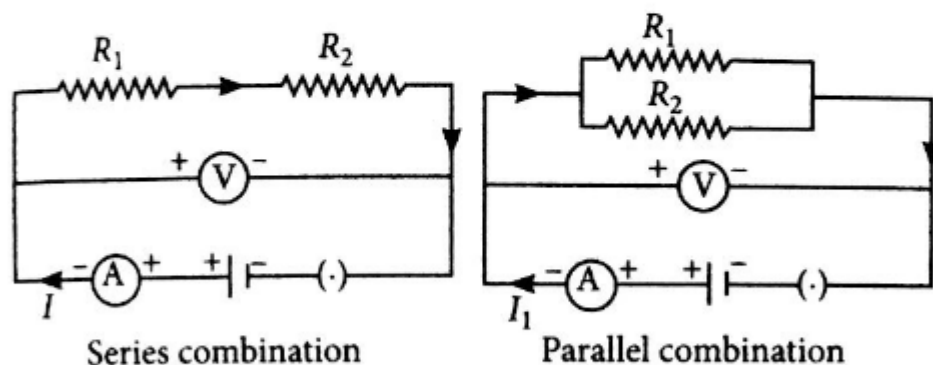
(ii) Diagram showing binary fission in *Amoeba* is :



25. The four precautions are given as :

- (i) We take epidermal peel from a freshly plucked leaf.
- (ii) Curling of the leaf peel is avoided.
- (iii) Removed extra stain/glycerine using filter paper.
- (iv) We cover the stain leaf peel gently with a cover slip to avoid formation of air bubbles.

26. There will be no change in the reading of voltmeter because applied voltage remains the same in both the cases but ammeter reading will be less in case of series combination as compared to parallel combination of the same resistors because $R_s > R_p$ and $I \propto \frac{1}{R}$ (for constant applied voltage) as shown in the following circuit diagrams.



OR

If the deflection on ammeter (or voltmeter) scale goes beyond the full scale, we can infer that

(i) the higher range ammeter must be used for

measuring the higher value of current in the circuit.

(ii) the applied voltage will be very high so there will be a need of higher range voltmeter to measure the applied voltage.

If deflection takes place in opposite direction, the device is not properly connected in the circuit. We must interchange the terminal connection, so that devices can be used properly in the circuit.

27. Power of lens, $P = 5 \text{ D}$

\therefore Its focal length is $f = \frac{1}{P} = \frac{1}{5} = 0.2 \text{ m}$

or $f = + 20 \text{ cm}$ and $2f = 40 \text{ cm}$.

When object is between F and $2F$ i.e., $f < |u| < 2f$, then image is formed beyond $2F$ i.e., $|v| > 2f$

so, when $|u| = 35 \text{ cm}$ then $|v| > 40 \text{ cm}$.

However in the table $v = 37 \text{ cm}$

\therefore Third observation ($u = 35 \text{ cm}$, $v = 37 \text{ cm}$) is not correct.