रोल नं.
Roll No.

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।
Candidates must write the Q.P. Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **27** हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में **39** प्रश्न हैं ।
- **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।**
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।
- Please check that this question paper contains **27** printed pages.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **39** questions.
- **Please write down the serial number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

विज्ञान
SCIENCE

निर्धारित समय : **3 घण्टे**
Time allowed : 3 hours

अधिकतम अंक : **80**
Maximum Marks : 80

General Instructions :

Read the following instructions very carefully and strictly follow them :

*(i)   This question paper comprises **39** questions. **All** questions are compulsory.*

*(ii)   This question paper is divided into **five** sections – **A, B, C, D** and **E**.*

*(iii)   **Section A** – Questions No. **1** to **20** are multiple choice questions. Each question carries **1** mark.*

*(iv)   **Section B** – Questions No. **21** to **26** are very short answer type questions. Each question carries **2** marks. Answer to these questions should be in the range of 30 to 50 words.*

*(v)   **Section C** – Questions No. **27** to **33** are short answer type questions. Each question carries **3** marks. Answer to these questions should in the range of 50 to 80 words.*

*(vi)   **Section D** – Questions No. **34** to **36** are long answer type questions. Each question carries **5** marks. Answer to these questions should be in the range of 80 to 120 words.*

*(vii)   **Section E** – Questions No. **37** to **39** are of 3 source-based/case-based units of assessment carrying **4** marks each with sub-parts.*

(viii) There is no overall choice. However, an internal choice has been provided in some sections. Only one of the alternatives has to be attempted in such questions.

SECTION A

*This section has **20** multiple choice questions (Q.No. 1 – 20). **All** questions are **compulsory**.*   *20×1=20*

1.   2 g of yellow sulphur powder is burnt in a china dish and the fumes are collected in a test tube. Water is added in the test tube and the solution is tested separately with blue and red litmus paper. The correct option is :

     (a)   Blue litmus remains blue and red litmus turns blue.

     (b)   Blue litmus turns red and red litmus remains red.

     (c)   Blue litmus turns red and red litmus turns blue.

     (d)   Blue litmus remains blue and red litmus remains red.

2. You want to test for hardness of water but hard water is not available in the laboratory. Which of the following compounds may be dissolved in pure water to make it hard ?

    (i)   Hydrogen Carbonate of Sodium

    (ii)   Sulphate of Magnesium

    (iii)   Chloride of Calcium

    (iv)   Carbonate of Sodium

    (a)   (i) and (ii)

    (b)   (ii) and (iii)

    (c)   (iii) and (iv)

    (d)   (i) and (iv)

3. In the electrolysis of water, if the mass of the gas collected at the anode is m_a and the mass of the gas collected at the cathode is m_c, the value of (m_c/m_a) is :

    (a)   8   (b)   16

    (c) $\dfrac{1}{16}$ (d) $\dfrac{1}{8}$

4. Consider the following substances :

    (i)   Acidified $K_2Cr_2O_7$

    (ii)   Alkaline $KMnO_4$

    (iii)   Oxygen

    (iv)   Hydrogen

Out of these, the commonly used oxidising agents are :

    (a)   (i) and (ii) only

    (b)   (ii) and (iii) only

    (c)   (i), (ii) and (iii)

    (d)   (i), (ii) and (iv)

5. The metal which melts when kept on the palm is :

(a) Sodium   (b) Potassium

(c) Lithium   (d) Gallium

6. Select from the following compounds which is not a base :

(a) Sodium hydroxide

(b) Calcium hydroxide

(c) Sodium sulphate

(d) Zinc oxide

7. When an object is placed beyond 2F of a convex lens, the nature of the image formed is :

(a) Real, inverted and diminished

(b) Real, erect and magnified

(c) Virtual, erect and magnified

(d) Real, inverted and magnified

8. When a narrow beam of white light passes through a glass prism it splits into its component colours ? This phenomenon is called :

(a) Diffusion of light

(b) Total reflection of light

(c) Scattering of light

(d) Dispersion of light

9. A material used for making heating elements of electrical heating devices should have :

(a) High resistivity and high melting point.

(b) High resistivity and low melting point.

(c) Low resistivity and high melting point.

(d) Low resistivity and low melting point.

10. The resistance of a wire does *not* depend on its :

(a)   Length

(b)   Area of cross-section

(c)   Shape

(d)   Material

11. The shape of magnetic field lines produced (i) inside a solenoid (ii) around a straight conductor, both carrying current of the same magnitude are, respectively :

(a)   (i) straight, (ii) circular

(b)   (i) circular, (ii) circular

(c)   (i) straight, (ii) straight

(d)   (i) circular, (ii) straight

12. Which one of the following properties of Carbon is *not* responsible for its formation of large number of compounds ?

(a)   Tetravalency

(b)   Isomerism

(c)   Allotropy

(d)   Catenation

13. Which one of the following molecules is produced initially when glucose breaks down in the cytoplasm of a cell in aerobic as well as anaerobic respiration ?

(a)   Lactic acid   (b)   Ethanol

(c)   Carbon dioxide   (d)   Pyruvate

14. As compared to daytime, the amount of carbon dioxide released by the plants during night is more because :

(a)   It is not produced during daytime.

(b)   It is stored in the leaves of plants during daytime.

(c)   Major amount of carbon dioxide produced is used up for photosynthesis during daytime.

(d)   Plants do not respire during daytime.

15. The organism in which an outgrowth on the parent body develops into a new individual is :

    (a)   Amoeba   (b)   Paramecium

    (c)   Rhizopus   (d)   Yeast

16. In a cross between pure tall pea plants (TT) and pure dwarf pea plants (tt) the offsprings of F_1 generation were all tall. When F_1 generation was self-crossed, the gene combinations of the offsprings of F_2 generation will be :

    (a)   TT : Tt : tt   (b)   TT : tt

    (c)   Tt : tt   (d)   TT : Tt

For Questions number 17 to 20, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

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

    (b)   Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A).

    (c)   Assertion (A) is true, but Reason (R) is false.

    (d)   Assertion (A) is false, but Reason (R) is true.

17. *Assertion (A) :* $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$ is a redox reaction.

    Reason (R) : In this reaction, HCl is oxidised to Cl_2 and MnO_2 is reduced to $MnCl_2$.

18. *Assertion (A) :* Cytokinins are present, in greater concentration in areas of rapid cell division such as fruits and seeds.

    Reason (R) : Cytokinins promote cell division.

19. *Assertion (A) :* A rainbow is an artificial spectrum of white light appearing in the sky after a rain shower.

Reason (R) : The water droplets act like small prisms.

20. *Assertion (A) :* Each human trait is influenced by both paternal and maternal DNA.

Reason (R) : As compared to the father, the mother contributes more amount of genetic material to the child.

SECTION B

21. (a) Find the magnification of the image formed by a spherical mirror from the following data :
u = – 20 cm, f = – 15 cm.   *2*

OR

(b) Draw a labelled ray diagram for the image formation by a concave mirror when an object is placed between its centre of curvature and focus.   *2*

22. When leaves of 'Bryophyllum' fall on the soil they develop into new plants, but leaves of a lemon plant cannot do so. Why ? Name the method of reproduction by which these plants multiply.   *2*

23. (a) State any one advantage of using cloth bags over plastic bags.

(b) List any two methods by which the solid wastes generated in urban areas can be safely disposed off.   *2*

24. (a) A metal 'A' reacts violently with cold water and the gas evolved catches fire. Another metal 'B' when dipped in water starts floating. The metal 'C' does not react either with cold or hot water, but reacts with steam. The metal 'D' does not react with water at all. Identify the metals 'A', 'B', 'C' and 'D'.   *2*

OR

(b) When two compounds namely sodium chloride and calcium chloride are heated directly, one by one on the flame of a burner, they impart different colours to the flame.

    (i) Name the colour imparted by (1) sodium chloride and (2) calcium chloride.

    (ii) Are these compounds soluble in organic solvents such as kerosene or petrol ? Justify your answer. *2*

25. Differentiate between direct and alternating current. Name the type of current produced by the power plants in our country. Also state its frequency. *2*

26. "In human beings, the sex of a newborn child depends on the father and not the mother." Justify this statement with the help of a flow diagram. *2*

SECTION C

27. Observe the given diagram and answer the following questions : *3*
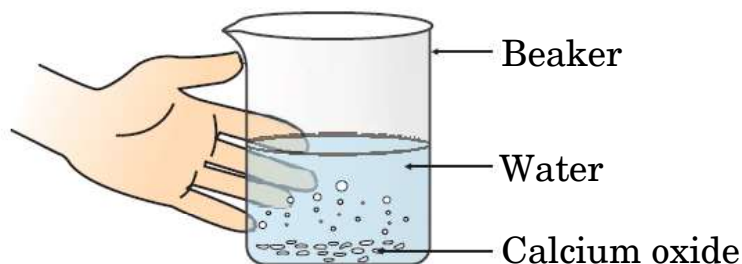
(a) Write a balanced chemical equation for the reaction taking place in the beaker.

(b) Name the two types of reactions in which the above reaction can be placed, giving justification for each.

28. Write any two ways by which plants obtain carbon dioxide. What causes the opening and closing of the stomata ? *3*

29. Explain how oxygen is delivered to all parts of the body in human beings. In what form is carbon dioxide transported in our blood ? *3*

30. (a) (i) Differentiate between a solenoid and a circular coil.

(ii) Explain how a solenoid can be made in a school laboratory.

(iii) Write one use of the strong magnetic field produced inside a current carrying solenoid. *3*

OR

(b) With the help of a labelled circuit diagram, illustrate the pattern of the magnetic field lines of the magnetic field produced around a straight current carrying conductor. Explain how, with the help of right-hand thumb rule, we can determine and mark the direction of magnetic field lines due to a current. *3*

31. (a) White light is dispersed into seven visible coloured components by a glass prism. Name the colour which bends (i) the most and (ii) the least.

(b) How can the coloured components of white light be recombined after a prism has separated them ? Draw a labelled diagram to justify your answer. *3*

32. (a) An organic compound 'X' when reacts with sodium liberates hydrogen. The same compound 'X' when heated at 443 K in the presence of concentrated sulphuric acid gives an unsaturated hydrocarbon.

(i) Identify 'X'.

(ii) Write the chemical equations for the above mentioned reactions and state the role of concentrated sulphuric acid in the second reaction. *3*

OR

(b) (i) Why are carbon compounds exceptionally stable ?

(ii) Differentiate between saturated and unsaturated compounds. Give structures of both the types of compounds having three carbon atoms in their molecules. *3*

33. (a) Construct a food chain of four trophic levels operating in a grassland. If the energy available to the organisms of 4th trophic level is 75 joules, how much energy was available with the organisms of the 2nd trophic level for transfer to the next trophic level ? Justify your answer.

(b) Why is the flow of energy unidirectional in a food chain ? *3*

34. (a) (i) Name the parts in the human female reproductive system where the following functions take place :
(1) Maturation of eggs
(2) Fusion of the egg and the sperm
(3) Implantation of the zygote

(ii) What happens to the egg
(1) when it is fertilised ?
(2) when it is not fertilised ? *3+2=5*

OR

(b) (i) Explain by giving one example each :
(1) Unisexual flowers
(2) Bisexual flowers

(ii) Name the labelled parts A, B, C and D in the diagram given below.
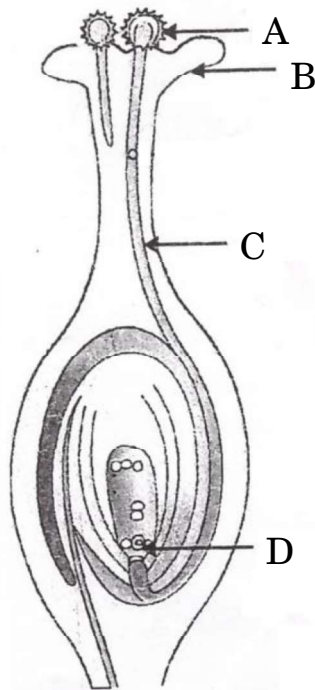
(iii) "Pollination may occur without fertilisation but fertilisation will not take place without pollination." Give reason to justify this statement. *5*

35. (a) (i) An aqueous solution turns blue litmus red. Which of the following solutions when added in excess would reverse the change ?

        (1) Lemon juice

        (2) Magnesium hydroxide

        (3) Vinegar

        (4) Calcium sulphate

    (ii) Out of the following, which compound/compounds will turn the phenolphthalein solution pink ?

        (1) CH_3COOH

        (2) $Ca(OH)_2$

        (3) HCl

        (4) NaOH

    (iii) Name a gas whose aqueous solution is basic. Write the formula/name of this solution.

    (iv) A basic substance is used to treat a honey-bee sting. Why ?

    (v) Name the acid which is present in (1) Tomato and (2) Tamarind.   *5*

OR

(b) (i) Define water of crystallisation.

    (ii) Write the chemical name and formula of a compound having water of crystallisation in its molecule and appears blue.

    (iii) Write the chemical formula of bleaching powder. Write a balanced chemical equation of the reaction involved in its preparation. List its three uses.   *5*

36. (a) Calculate the resistance of an aluminium wire of length 1 m and area of cross-section $2\ mm^2$. Resistivity of aluminium is $2\cdot63 \times 10^{-8}\ \Omega m$.

(b) From the values given below, plot a graph of I versus V. Show that the data is in conformity of the Ohm's law. *5*

Current – I (ampere)	0·1	0·2	0·3	0·4
Potential Difference – V (volt)	1·2	2·4	3·6	4·8

SECTION E

The following questions are source-based/case-based questions. Read the case carefully and answer the questions that follow.

37. The iron pillar in Qutab Minar complex in Delhi was built 1600 years ago. It is still standing intact and shows no signs of rusting even today. This shows that the ancient metallurgists of India in those times had fully developed metallurgical processes as well as the techniques of protection of different metals. The protection of metals, was done by several processes like coating of a thin film of another metal, alloying etc.

(a) Where is iron placed in the reactivity series of metals ? Write the form/forms in which its ores are found in nature. *1*

(b) Differentiate between roasting and calcination. *1*

(c) Explain any two methods that are employed to prevent rusting/corrosion of metals. *2*

OR

(c) Why is aluminium used to join railway tracks or the cracked machine parts of 'iron' ? Write a balanced chemical equation for the reaction which occurs. *2*

38. In animals the control and coordination is provided by nervous and muscular tissues. Nervous tissue is made of an organized network of nerve cells or neurons. In human beings, thinking is a complex activity which involves more complex mechanisms and neural connections. These are concentrated in the brain which is the main coordinating centre of the human body. The brain and spinal cord constitute the Central Nervous System which receives information from all parts of the body and integrates it.

(a) How is the brain protected from shocks and injuries ? *1*

(b) Write the main functions of (i) sensory neuron and (ii) motor neuron in a reflex arc. *1*

(c) Which part of the brain is involved in activities like (i) picking a pencil and (ii) vomiting ? State whether these actions are voluntary or involuntary. *2*

OR

(c) How does the central nervous system communicate with the other parts of the body to carry out various activities ? Name two components of this system. *2*

39. When a ray of light moving in a medium enters obliquely into another medium, it bends from its path. This phenomenon is called refraction of light. The ability of a medium to refract light is also expressed in terms of optical density. It is not the same as mass density. We use the terms 'rarer medium' and 'denser medium' which actually means 'optically rarer medium' and 'optically denser medium' respectively. When we say that a medium 'A' is optically denser than the other medium 'B', we mean that the refractive index of medium A is more than the refractive index of medium 'B'. The speed of light is higher in a rarer medium than a denser medium. Thus a ray of light travelling from a rarer medium to a denser medium slows down and bends towards the normal.

(a)   Define the term absolute refractive index of a medium.   *1*

(b)   Absolute refractive indices of water and glass are $\dfrac{4}{3}$ and $\dfrac{3}{2}$ respectively.

     (i)   In which one of the two media is the speed of light more ?

     (ii)   If a ray of light enters obliquely from glass to water, will it bend towards the normal or away from the normal ?   *1*

(c)   The absolute refractive indices of water and glass are $\dfrac{4}{3}$ and $\dfrac{3}{2}$ respectively. If the speed of light in glass is 2×10^8 m/s, find the speed of light in (i) water and (ii) vacuum.   *2*

<p align="center">OR</p>

(c)   "A ray of light incident on a rectangular glass slab immersed in any medium emerges parallel to itself." Draw a labelled ray diagram to justify this statement.   *2*

<table>
<tr><td colspan="2"><div align="center">Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Supplementary Examination, July- 2023</div>
SUBJECT NAME: SCIENCE   SUBJECT CODE : 086   PAPER CODE : 31/C/2</td></tr>
</table>

General Instructions: -

1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under various rules of the Board and IPC."**
3	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-X, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
4	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after delibration and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6	Evaluators will mark(√) wherever answer is correct. For wrong answer CROSS 'X" be marked. Evaluators will not put right (✓)while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note

	"Extra Question".
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _____80_____(example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- Giving more marks for an answer than assigned to it. ● Wrong totaling of marks awarded on an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. Wrong question wise totaling on the title page. ● Leaving answer or part thereof unassessed in an answer book. ● Wrong totaling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.
15	Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the **"Guidelines for spot Evaluation"** before starting the actual evaluation.
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME
SECONDARY SCHOOL SUPPLEMENTARY EXAMINATION - JULY, 2023
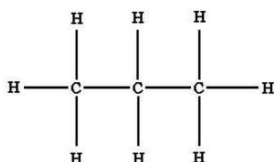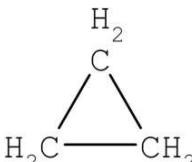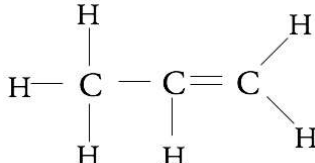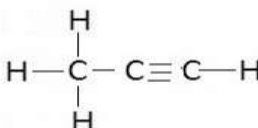## SUBJECT : SCIENCE CODE–086
[PAPER CODE: 31/C/2]

Maximum Marks:80

Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks	Total Marks
	SECTION—A		
1	(b)	1	1
2	(b)	1	1
3	(d)	1	1
4	(a) / (c)	1	1
5	(d)	1	1
6	(c)	1	1
7	(a)	1	1
8	(d)	1	1
9	(a)	1	1
10	(c)	1	1
11	(a)	1	1
12	(c)	1	1
13	(d)	1	1
14	(c)	1	1
15	(d)	1	1
16	(a)	1	1
17	(a)	1	1
18	(a)	1	1
19	(d)	1	1
20	(c)	1	1
	SECTION—B		
21	(a) $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$	½	

	$$= \frac{1}{-15} - \frac{1}{-20} = \frac{-1}{60}$$ v = - 60 cm $$m = \frac{-v}{u}$$ $$= - \frac{-60}{-20} = -3$$ **OR** (b) Diagram Direction of the rays	½ ½ ½ 1½ ½	2
22	• Leaves of Bryophyllum have buds in their notches along the leaf margin whereas leaves of lemon plant do not have such buds. • Method- vegetative propagation.	1 1	2
23	(a) Cloth bag is biodegradable / eco-friendly. (b) i. Segregation of biodegradable and non-biodegradable waste at source. ii. By composting iii. Recycling of solid wastes (any two) (any other suitable way)	1 ½+½	2
24	(a) A = Potassium / K **or** Sodium /Na B = Calcium / Ca **or** Magnesium / Mg C = Aluminium / Al **or** Iron / Fe **or** Zinc / Zn D = Lead / Pb **or** Copper / Cu **or** Silver / Ag **or** Gold / Au **OR** (b) (i) (1) Sodium chloride -yellow (2) Calcium chloride – brick red (credit full marks for any other colour) (ii) No Justification : Because they are ionic or electrovalent compounds which are insoluble in organic solvents.	½ ×4 ½ ½ ½ ½	2
25	• DC always flow in one direction while AC reverses its direction periodically. • AC /Alternating Current	1 ½	

	• 50 Hz	½	2
26	Diagram Labelling (Award 1 mark if explained through words only)	1 1	2
	SECTION—C		
27	(a) $CaO + H_2O \longrightarrow Ca(OH)_2$ (b) • Combination reaction – A single product is formed from two reactants. • Exothermic reaction – Large amount of heat is evolved.	1 ½ , ½ ½ , ½	3
28	• Exchange of gases through stomata. • By the process of respiration. • The guard cells absorb water and swell causing the stomatal pore to open. • The guard cells lose water and shrink and hence the pore closes.	½ ½ 1 1	3
29	• Through blood as haemoglobin in RBC's present in blood has high affinity for oxygen. • In the dissolved form in the blood.	2 1	3
30	(a) (i) Solenoid : A coil of many turns of insulated copper wire wrapped closely in the shape of cylinder. Circular coil : Straight wire bent in the form of circular loop with many turns. (ii) By taking a non-conducting cylindrical tube and winding a long, insulated copper wire tightly over it in the shape of a spring such that the turns are closely placed and lie side by side. (iii) To magnetise a piece of magnetic material like soft iron / To make an electromagnet (any one) **OR**	1 1 1	

(b)

| | Diagram | 1 | |
| | Labelling of magnetic field | 1 | |

(Please check the direction of magnetic field lines corresponding to the direction of current in the conductor.)

Right hand Thumb Rule : Imagine that you are holding a current-carrying straight conductor in your right hand such that the thumb points towards the direction of current. Then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

| | | 1 | 3 |

31	(a) (i) Violet	½	
	(ii) Red	½	
	(b) By placing another identical prism in an inverted position with respect to the first prism.	½	

| | | 1½ | 3 |

32	(a)		
	(i) 'X' is Ethanol / C_2H_5OH	1	
	(ii)		

$$2C_2H_5OH \; + \; 2Na \longrightarrow 2C_2H_5O^-Na^+ \; + \; H_2$$

| | | 1 | |

$$C_2H_5OH \xrightarrow[443K]{H_2SO_4(conc)} CH_2=CH_2 + H_2O$$

| | | ½ | |

(Do not deduct marks if equations are not balanced)

• Sulphuric acid acts as a dehydrating agent.

| | | ½ | |

OR

(b) (i) due to the formation of strong covalent bonds.

| | | 1 | |

(ii)

Saturated compounds	Unsaturated compounds
• Compounds containing	• Compounds containing carbon-

carbon- carbon single bonds.	carbon double or triple bonds. (Any other difference)	1

- Structure of saturated compound

½

- Structure of unsaturated compound

(any one in each)   ½

3

33	(a) • Grass → Grass hopper → Frog → Snake (or any other chain) • Energy at the second trophic level = 7500 J • Justification – Only 10 % of energy is available for transfer to the next level of consumers. / 10% Law (b) The energy that is captured by autotrophs does not revert back to the solar input. / The energy which is passed to the herbivores does not come back to autotrophs.	1 ½ ½ 1	 3

<div align="center">SECTION D</div>

34.	(a)
	 (i) (1) Ovary
	     (2) Oviduct / Fallopian tube
	     (3) Lining of the uterus
	 (ii) (1) Zygote is formed
	      (2) When egg is not fertilised, egg lives for about one day, the lining of the uterus slowly breaks down and comes out through vagina along with blood and mucous.
	
	 OR
	 (b) (i)
	 (1) Unisexual flower – contains either stamens or pistil.
	                 eg: Papaya/ Water melon (any other)
	 (2) Bisexual flower – contains both stamens and pistil
	                 eg: Hibiscus / mustard (any other)
	 (ii) A – Pollen Grain
	     B – Stigma
		1
		 1
		 1
		
		 1
		
		 1
		
		 ½
		 ½
		 ½
		 ½

	C – Pollen tube		
	D – Female germ-cell / egg cell	½ ×4	
	(iii) Transfer of pollen is required for fusion of gametes. /		
	Pollen needs to be transferred from the stamen to the stigma as it brings male germ-cell (Pollen) + female germ-cell (egg) together for fusion.	1	5
35	(a)		
	(i) (2) Magnesium hydroxide	1	
	(ii) (2) $Ca(OH)_2$ and (4) $NaOH$	½+ ½	
	(iii)		
	• NH_3 / Ammonia	½	
	• NH_4OH / Ammonium hydroxide	½	
	(iv) To neutralize the effect of acid in the bee sting.	1	
	(v) (1) Oxalic acid (2) Tartaric acid	½+ ½	
	OR		
	(b)(i) It is the fixed number of water molecules present in one formula unit of salt.	1	
	(ii) hydrated copper sulphate / copper sulphate penta hydrate.	½	
	$CuSO_4.5H_2O$	½	
	(iii)		
	• $CaOCl_2$	½	
	• Chemical equation		
	$Ca(OH)_2$ + Cl_2 $\longrightarrow$ $CaOCl_2$ + H_2O	1	

	• Uses – 1. For bleaching cotton and linen in textile industry.
	          2. As an oxidising agent in a chemical industry.
	          3. For disinfecting water.
		½ ×3	

	(or any other)		5
36	(a) $l = 1$ m		
	$A = 2mm^2 = 2 \times (10^{-3}m)^2 = 2 \times 10^{-6}\, m^2$	½	
	$\rho = 2.63 \times 10^{-8}\ \Omega m$		
	$R = \rho \dfrac{l}{A}$	½	
	$R = (2.63 \times 10^{-8}\ \Omega m) \times \dfrac{1m}{2 \times 10^{-6}\ m^2}$	1	
	$= \dfrac{2.63}{2} \times 10^{-2}$		
	$= 1.315 \times 10^{-2} \Omega$	½	
	(b)		

Since I – V graph is a straight line passing through the origin it shows that I ∝ V which is in accordance with the Ohm's law.

| | | 2 | |
| | | ½ | 5 |

SECTION E

37	(a)		
	• Middle	½	
	• Sulphides /Carbonates/Oxide (any one)	½	
	(b)		

Roasting	Calcination
Ore is heated in excess of air.	Ore is heated in the absence or limited supply of air.
This is used for sulphide ores.	This is used for carbonate ores.

(Any one difference)   — 1

(c)
- Galvanization – coating of iron object with a thin layer of zinc.   — 1
- Alloying – A mixture of two or more metals or a metal and a non-metal.   (or any other)   — 1

OR

(c) The reaction between aluminium and iron oxide is highly exothermic which forms molten iron which is used in welding cracked machine parts. $Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s) + Heat$ — 1, 1 | 4 |

38	(a) • Bony box / Cranium, fluid filled balloon	½, ½	
	(b) •		
	i. Sensory neuron – pass information from receptors to spinal cord.	½	
	ii. Motor neuron – transmit information from spinal cord to effector organ / muscle.	½	
	(c) (i) Cerebellum / Hind Brain – Voluntary Action	½+ ½	
	(ii) Medulla / Hind Brain - Involuntary Action	½+ ½	
	OR		
	(c) Through Peripheral nervous system	1	

	• Cranial nerves and Spinal nerves	½ , ½	4
39	(a) The refractive index of a medium with respect to air or vacuum / Absolute refractive index of a medium $= \dfrac{\text{speed of light in air(vacuum)}}{\text{speed of light in medium}}$	1	
	(b) (i) speed of light is more in water	½	
	(ii) bends away from normal	½	
	(c) Absolute refractive index of a medium $= \dfrac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$		
	$\dfrac{3}{2} = \dfrac{\text{speed of light in vacuum}}{2 \times 10^8}$	½	
	Speed of light in vacuum $= 3 \times 10^8$ m/s	½	
	Speed of light in water $= \dfrac{3}{4} \times 3 \times 10^8$ m/s $= \dfrac{9}{4} \times 10^8$ m/s	1	
	OR		
	(c)		
	Diagram	1	4
	Labelling	1	

* * *