General Instructions:

i. This question paper consists of 39 questions in 5 sections.

ii. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

iii. Section A consists of 20 objective-type questions carrying 1 mark each.

iv. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.

v. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.

vi. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.

vii. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20

1. What happens when dilute hydrochloric acid is added to iron filings?
   (a) Hydrogen gas and iron chloride are produced.
   (b) Chlorine gas and iron hydroxide are produced.
   (c) No reaction takes place.
   (d) Iron salt and water are produced.

2. Which of the following statements about the given reaction are correct?
   \[ 3\text{Fe (s)} + 4\text{H}_2\text{O (g)} \rightarrow \text{Fe}_3\text{O}_4 (s) + 4 \text{H}_2 (g) \]
   (i) Iron metal is getting oxidised
   (ii) Water is getting reduced
   (iii) Water is acting as reducing agent
   (iv) Water is acting as oxidising agent
   (a) (i), (ii) and (iii)
   (b) (i) and (iv)
   (c) (i), (ii) and (iv)
   (d) (ii) and (iv)

3. Which of the following statements is correct for the water with detergents dissolved in it?
   a) low concentration of hydroxide ion (\(\text{OH}^-\)) and high concentration of hydronium ion (\(\text{H}_3\text{O}^+\))
   b) high concentration of hydroxide ion and low concentration of hydronium ion
   c) high concentration of hydroxide ion as well as hydronium ion
   d) equal concentration of both hydroxide ion and hydronium ion

4. The table provides the pH value of four solutions P, Q, R and S.

<table>
<thead>
<tr>
<th>Solution</th>
<th>pH value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>Q</td>
<td>9</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
</tr>
<tr>
<td>S</td>
<td>11</td>
</tr>
</tbody>
</table>

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

(a) \(P>Q>R>S\)
(b) \(P>S>Q>R\)
5. Which of the following pairs will give displacement reactions?
(a) NaCl solution and copper metal.
(b) MgCl₂ solution and aluminium metal.
(c) FeSO₄ solution and silver metal.
(d) AgNO₃ solution and copper metal.

6. Which of the following is a saturated hydrocarbon:
   a) C₃H₆  
   b) C₅H₁₀  
   c) C₆H₁₄  
   d) C₂H₄  

7. Butanone is a four-carbon compound with the functional group
   (a) carboxylic acid.
   (b) aldehyde.
   (c) ketone.
   (d) alcohol.

8. Which of the following enzymes helps in breaking sucrose into glucose and fructose?
   a) Invertase  
   b) Diastase  
   c) Zymase  
   d) Maltase  

9. Identify the two components of Phloem tissue that help in transportation of food in plants.
   a) Phloem parenchyma and sieve tubes.
   b) Sieve tubes and companion cells.
   c) Phloem parenchyma and companion cells.
   d) Phloem fibers and sieve tubes.

10. In a synapse, chemical signal is transmitted from:
    a) Axon to cell body of the same neuron.
    b) Cell body to axon end of the same neuron.
    c) Dendrite end of one neuron to axon end of adjacent neuron.
    d) Axon end of one neuron to dendrite end of adjacent neuron.

11. **Statement A**: fertilization is possible if ovulation has taken place during the middle of the menstrual cycle.
    **Statement B**: fertilization is not possible if ovulation has taken place during the middle of the menstrual cycle.
    a) Statement A is true, B is false.
    b) Both the statement A & B are true.
    c) Statement B is true, A is false.
    d) Neither statement A nor statement B is true.

12. The genetic constitution of an organism is called:
    a) Genome  
    b) Trait  
    c) Genotype  
    d) Phenotype

13. Kilowatt hour is the unit of
    (a) power  
    (b) energy  
    (c) impulse  
    (d) force

14. The SI unit of resistance is
    (a) ohm m  
    (b) ohm m⁻¹  
    (c) ohm  
    (d) (ohm)⁻¹

15. The most suitable material for making the core of an electromagnet is:
    (a) Steel  
    (b) Iron  
    (c) Soft iron
16. The front face of a circular loop of a wire is the North pole, the direction of current in this face of the loop will be:
   (a) Clockwise
   (b) Anticlockwise
   (c) Towards North
   (d) Towards South

Q. no 17 to 20 are Assertion - Reasoning based questions. These consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
   (a) Both A and R are true and R is the correct explanation of A
   (b) Both A and R are true and R is not the correct explanation of A
   (c) A is true but R is false
   (d) A is False but R is true

17. **Assertion (A)**: Brown fumes are produced when lead nitrate is heated.
    **Reason (R)**: Nitrogen dioxide gas is produced as a by product due to the decomposition of lead nitrate.
18. **Assertion (A)**: Human body produces highly toxic substances, which if not eliminated may cause the death.
    **Reason (R)**: Excretory substances removes nitrogenous waste from body.
19. **Assertion (A)**: Variation is high in sexually reproducing organisms compared to asexually reproducing organisms.
    **Reason (R)**: Inaccuracies during DNA copying give rise to variation.
20. **Assertion (A)**: On freely suspending a current - carrying solenoid, it comes to rest in N-S direction just like a bar magnet.
    **Reason (R)**: One end of current carrying straight solenoid behaves as a North pole and the other end as a South pole.

**SECTION-B**

Q. no. 21 to 26 are very short answer questions.

21. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte ?
    **OR**
    Write chemical equations that show aluminium oxide reacts with acid as well as base.
22. In what way is nerve control in multicellular animals’ superior to chemical control?
23. a) How many types of blood vessels are there in the human body? Name them.
   b) Why does the heart need valves?
24. What is meant by reflex – action? With the help of a labelled diagram trace the sequence of events which occur when we touch a hot object.
25. Name the colour of light which bends (i) the most, (ii) the least, while passing through a glass prism.
    **OR**
    State two reasons of Hypermetropia.
26. a) The first trophic level in a food chain is always a green plants. Why?
    b) In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer?
    
    Plants → Deer → Lion

**SECTION-C**

Q. no. 27 to 33 are short answer questions.
27. Give reasons:
(a) Sodium, potassium and lithium are stored under oil.
(b) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.
(c) Carbonate and sulphide ores are usually converted into oxides in the process of extraction.

28. How can you distinguish experimentally between an alcohol and a carboxylic acid by-
   a. Litmus test
   b. NaHCO₃ (Sodium hydrogen carbonate test.
   c. Alkaline KMnO₄ test.

29. In each of the following situations what happens to the rate of photosynthesis?
   i) Cloudy days.
   ii) No rainfall in the area.
   iii) Good manuring in the area.
   iv) Stomata get blocked due to dust.

   OR
   If a plant is releasing carbon dioxide and taking in oxygen during the day, does it mean that there is no photosynthesis occurring? Justify your answer.

30. A person needs a lens of power – 4.5 D for correction of his/her vision.
   (a) What kind of defect in vision is he/she suffering from?
   (b) What is the focal length of the corrective lens?
   (c) What is the nature of the corrective lens?

31. An object of height 6 cm is placed perpendicular to the principal axis of a concave lens of focal length 5 cm. Use lens formula to determine the position, size and nature of the image if the distance of the object from the lens is 10 cm.

32. Explain briefly two different ways to induce current in a coil. State the rule which determines direction of induced current.
   OR
   (a) A stationary charge is placed in a magnetic field. Will it experience force?
   (b) Under what conditions is the force experienced by a current carrying conductor placed in a uniform magnetic field is maximum.

33. a) Why should ozone layer be protected to save the environment?
   b) List any two ways which can help in protection of ozone layer as well as the environment.

SECTION-D
Q.no. 34 to 36 are Long answer questions.

34. What happens when (write chemical equation in each case)
   (a) ethanol is burnt in air?
   (b) ethanol is heated with excess conc. H₂SO₄ at 443 K?
   (c) a piece of sodium is dropped into ethanol?
   (d) Ethanol is treated with alkaline KMnO₄.
   (e) Ethanol treated with ethanoic acid in presence of catalyst Conc. H₂SO₄.

   OR
   Write at least three differences between soap and detergent. Explain the mechanism of the cleaning action of soaps.
   (3+2)

35. (a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.
   (b) Name the parts of the human female reproductive system where
      (i) Fertilization takes place.
      (ii) Implantation of the fertilized egg occurs

   OR
   a) The embryo gets its nourishment from the mother’s blood with the help of special tissue.
      i. What is this special tissue called?
      ii. Give any other function of this tissue apart from one mentioned above.
      iii. Explain the structure of this special tissue.
36. What do you mean by Resistance?
A wire has a resistance of 10Ω. It is melted and drawn into a wire of half of its length. Calculate the resistance of the new wire. What is the new resistivity? What is the percentage change in its resistance?

**SECTION-E**

Q.no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. Read the following and answer any four questions from 37.1 to 37.5:

Marble’s popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.

37.1 The substance not likely to contain CaCO₃ is
a) Dolomite
b) A marble statue
c) Calcined gypsum
d) Sea shells

37.2 A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?

- a) 15-20 min
- b) 10-15 min
- c) 5-10 min
- d) 0-5 min

37.3 Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process –
- a) Respiration
- b) Photosynthesis
- c) Transpiration
- d) photolysis

37.4 Marble statues are corroded or stained rain water. Identify the main reason
- a) decomposition of calcium carbonate to calcium oxide
- b) polluted water is basic in nature hence it reacts with calcium carbonate
- c) polluted water is acidic in nature hence it reacts with calcium carbonate
- d) calcium carbonate dissolves in water to give calcium hydroxide

37.5 Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?
- a) Sodium
- b) sodium oxide
- c) calcium
38. Vivek performed an experiment crossed tall pea plants to study the inheritance pattern of genes. He crossed tall pea plants (TT) with short pea plants (tt) and obtained all tall plants. In F1 generation.
   a) What will be set of genes present in the F1 generation? [1m]
   b) Give reason why only tall plants are observed in F1 progeny. [1m]
   c) When F1 plants were self (1 Mark) pollinated, a total of 800 plants were produced. How many of these would be tall, medium height or short plants? Give the genotype of F2 generation.

   OR

   When F1 plants were cross pollinated with plants having tt genes, a total of 800 plants were produced. How many of these would be tall, medium height or short plants? Give the genotype of F2 generation.

39. A concave mirror always forms a real and inverted image for different positions of the object. But if the object is placed between the focus and pole, the image formed is virtual and erect. A convex mirror always forms a virtual, erect and diminished image. A concave mirror is used as doctor’s head mirror to focus light on body parts like eyes, ears, nose etc., to be examined because it can form erect and magnified image of the object. The convex mirror is used as a rear view mirrors in automobiles because it can form an small and erect image of an object.

   (i) When an object is placed at the centre of curvature of a concave mirror, the image formed is
       (a) larger than the object
       (b) smaller than the object
       (c) same size as that of the object
       (d) highly enlarged.

   (ii) No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be
       (a) plane
       (b) concave
       (c) convex
       (d) either plane or convex.

   (iii) A child is standing in front of a magic mirror. She finds the image of her head bigger, that of the middle portion of her body of the same size and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.
       (a) Plane, convex and concave
       (b) Convex, concave and plane
       (c) Concave, plane and convex
       (d) Convex, plane and concave

   (iv) To get an image larger than the object, one can use
       (a) convex mirror but not a concave mirror
       (b) a concave mirror but not a convex mirror
       (c) either a convex mirror or a concave mirror
       (d) a plane mirror.

   OR

   (v) When a concave mirror is held towards the sun and its sharp image is formed on a piece of paper, a hole is burnt in the carbon paper. What is the name given to the distance between the mirror and the carbon paper?
       (a) Radius of curvature
       (b) Focal length
       (c) Principal focus
       (d) Principal axis