SCIENCE - Code No. 086

CBSE CLASS 10 SAMPLE PAPER 1

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Time allowed: 3 Hours **Maximum Marks:** 80

General Instructions:

1. This question paper consists of 39 questions in 3 sections.

2. Section A is Biology, Section B is Chemistry, Section C is Physics.

3. All questions are compulsory. However, an internal choice is provided in some questions. Attempt only one option where a choice is given.

4. Marks are indicated against each question.

SECTION A - BIOLOGY (30 Marks)

1. Which of the following is the correct sequence of steps in nutrition in Amoeba? *[1]*

A. Ingestion → Digestion → Egestion → Absorption

B. Ingestion → Digestion → Absorption → Egestion

C. Digestion → Ingestion → Absorption → Egestion

D. Absorption → Ingestion → Digestion → Egestion

2. During heavy exercise, muscle cramps often occur due to accumulation of: *[1]*

A. Ethanol

B. Carbon dioxide

C. Lactic acid

D. Pyruvic acid

3. Which part of the human brain controls involuntary actions such as heartbeat and blood pressure? *[1]*

A. Cerebrum

B. Cerebellum

C. Medulla

D. Pituitary gland

4. Which hormone, if deficient, leads to persistently high blood sugar levels? *[1]*

A. Thyroxine

B. Insulin

C. Adrenaline

D. Growth hormone

5. A cross between a tall pea plant (Tt) and a short pea plant (tt) produced offspring in a 1 tall : 1 short ratio. What does this indicate about the tall parent's genotype? *[1]*

A. Homozygous dominant (TT)

B. Heterozygous (Tt)

C. Homozygous recessive (tt)

D. Cannot be determined

6. Which of the following statements about the ozone layer are correct? (i) It absorbs harmful UV radiation. (ii) It is formed by the action of UV rays on oxygen molecules. (iii) It increases the amount of UV radiation reaching earth. (iv) Its depletion is linked to chlorofluorocarbons. *[1]*

A. (i), (ii) and (iv)

B. (ii), (iii) and (iv)

C. (i) and (iii)

D. (iii) and (iv) only

7. Which human activity contributes most directly to an increase in non-biodegradable waste? *[1]*

A. Composting kitchen waste

B. Using cloth bags for shopping

C. Using plastic packaging materials

D. Planting more trees

The following two questions consist of an Assertion (A) and a Reason (R). Choose the correct option: (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, but R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.

8. Assertion (A): The height of a pea plant is controlled by a specific gene. Reason (R): Genes produce proteins that influence the expression of traits. *[1]*

9. Assertion (A): Organisms at the top of a food chain accumulate the highest concentration of harmful chemicals like pesticides. Reason (R): Energy and harmful substances both increase in concentration as they pass through successive trophic levels. *[1]*

10. Explain why plants do not have a well-developed excretory system like animals, despite producing waste products during their life processes. *[2]*

11. Attempt either option A or B. *[2]*

A.. How many chambers does the human heart have, and how does this structure help prevent mixing of oxygenated and deoxygenated blood?

OR

B.. Explain briefly how water absorbed by root hairs is transported upward to the leaves of a tall tree.

12. A pond ecosystem contains algae, small fish, water insects, frogs, herons and bacteria. Using this information, construct one food chain with at least three trophic levels. *[2]*

13. Draw a simple, labelled diagram of a neuron and briefly explain how it transmits a nerve impulse from one cell to another. *[3]*

14. In a genetics experiment, pea plants with round, yellow seeds (RRYY) were crossed with plants having wrinkled, green seeds (rryy). *[3]*

(i). What will be the phenotype and genotype of the F1 generation?

(ii). If the F1 plants are self-pollinated to produce F2, in what ratio will the four possible phenotypes (round yellow, round green, wrinkled yellow, wrinkled green) appear among 160 F2 seeds?

15. Aditya ate a meal of rice, dal and a boiled egg for lunch. Answer the following about digestion of this meal. Attempt either subpart A or B. *[4]*

A.. Which component of this meal is rich in protein? In which organ does its digestion begin, and which enzyme and condition are required there?

OR

B.. (i) Which component of the meal is rich in carbohydrates (starch)? Where does its digestion begin? (ii) Name the enzyme present in saliva that acts on starch. (iii) In which part of the alimentary canal is digestion of all food components completed and absorption mainly takes place?

16. Attempt either option A or B. *[5]*

A.. Meera wants to grow a large number of genetically identical rose plants quickly for her nursery. (i) Should she use seeds or a vegetative method of reproduction? Justify your answer. (ii) Explain briefly why offspring produced through vegetative propagation show very little variation compared to those from sexual reproduction. (iii) Is variation in a species generally useful for its survival? Give a reason.

OR

B.. Rohan compared fruit formation in two groups of mustard plants: Group 1 grown in an open field with free access to pollinating insects, Group 2 grown inside a net house that excluded all insects. (i) In which group would you expect a higher number of fruits to form? Explain why. (ii) List three changes that typically occur in a flower after successful fertilisation.

SECTION B - CHEMISTRY (25 Marks)

17. In the reaction $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$, which of the following is correct? *[1]*

A. Zinc is reduced and copper is oxidised.

B. Zinc is oxidised and copper ion is reduced.

C. Both zinc and copper are oxidised.

D. Neither zinc nor copper undergoes oxidation or reduction.

18. Consider these statements: (I) Aluminium oxide reacts with both dilute HCl and NaOH solution. (II) Magnesium oxide reacts only with dilute HCl. (III) Carbon dioxide does not react with either dilute HCl or NaOH. (IV) Zinc oxide reacts only with NaOH solution. Which statements are correct? *[1]*

A. I and II

B. I and III

C. II and IV

D. III and IV

19. An iron nail is dipped separately into aqueous zinc sulphate and aqueous copper sulphate. What would be observed? *[1]*

A. Iron displaces zinc from zinc sulphate but not copper from copper sulphate.

B. Iron displaces copper from copper sulphate, but no reaction occurs with zinc sulphate.

C. No reaction takes place in either test tube.

D. Iron displaces both zinc and copper from their salt solutions.

20. Litmus solution is added to dilute sulphuric acid and separately to aqueous potassium hydroxide. What colour changes would be observed? *[1]*

A. Sulphuric acid turns blue litmus red; potassium hydroxide has no effect on red litmus.

B. Sulphuric acid turns blue litmus red; potassium hydroxide turns red litmus blue.

C. Sulphuric acid has no effect; potassium hydroxide turns red litmus blue.

D. Both have no effect on litmus.

21. Which of the following, when dissolved in equal volumes of water, gives a solution with the lowest pH value? *[1]*

A. Sodium hydroxide

B. Ammonium hydroxide

C. Hydrochloric acid

D. Sodium chloride

22. Dilute hydrochloric acid is added to solid sodium carbonate. The gas evolved, which turns lime water milky, is: *[1]*

A. Hydrogen

B. Oxygen

C. Carbon dioxide

D. Chlorine

23. Aqueous solutions of lead nitrate and potassium iodide are mixed. The observation is: *[1]*

A. A colourless solution with no visible change.

B. A yellow precipitate of lead iodide is formed.

C. A white precipitate of potassium nitrate is formed.

D. The solution turns blue.

The following question consists of an Assertion (A) and a Reason (R). Choose the correct option as described above.

24. Assertion (A): C3H6 and C4H8 belong to the same homologous series. Reason (R): C3H6, C4H8 and C5H10 are all saturated hydrocarbons. *[1]*

25. A metal rod coated with wax at one end, with a pin stuck to the wax, is heated from the other end. The pin falls off after some time. If the same experiment is repeated with a rod of a different metal that conducts heat poorly, will the pin still fall off, and in what time compared to before? Justify your answer. *[2]*

26. Attempt either option A or B. *[3]*

A.. An element 'M' is soft enough to be cut with a knife, reacts vigorously with cold water, and forms an ionic compound with chlorine. (i) Should 'M' be stored under water? Give a reason. (ii) Identify a possible element 'M' and write the equation for its reaction with water.

OR

B.. Statues made of iron often develop a reddish-brown coating over time when exposed to moist air. (i) Name this phenomenon and the compound formed. (ii) Suggest one method to prevent it. (iii) Why does this process not occur, or occur much more slowly, on gold or platinum objects?

27. Priya set up an electrolysis experiment using dilute sulphuric acid as electrolyte, with two electrodes connected to a battery. She observed gas bubbles at both electrodes, with the volume at one electrode being twice that at the other. *[3]*

(i). Identify the gases formed at the anode and the cathode.

(ii). Why was dilute sulphuric acid added to water rather than using pure distilled water directly?

(iii). Write the chemical name of the gas formed in the larger volume.

28. Rehan took 2 mL of dilute sodium hydroxide solution in a test tube and added two drops of phenolphthalein; the solution turned pink. He added dilute hydrochloric acid drop by drop until the pink colour disappeared, requiring 30 drops. He repeated this with different volumes: Volume of NaOH (mL): 2, 3, 4 → Drops of HCl required: 30, 45, 60. *[4]*

A.. What type of reaction is taking place in this experiment? Name it.

B.. If Rehan used 5 mL of the same NaOH solution, how many drops of HCl would likely be required, based on the pattern observed?

C.. Write the balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

29. Attempt either option A or B. *[5]*

A.. A hydrocarbon with formula CxHy undergoes complete combustion as: $C_xH_y + 5O_2 \rightarrow 3CO_2 + 4H_2O$. (a) Determine the values of x and y. (b) Give the IUPAC name of this hydrocarbon. (c) Is it a saturated or unsaturated hydrocarbon? (d) Write the equation for its reaction with hydrogen gas in the presence of a nickel catalyst, if possible, or explain why such a reaction cannot occur. (e) Name the general process used to obtain ethanol from a hydrocarbon of this homologous series.

OR

B.. Two elements, X (atomic number 11) and Y (atomic number 17), react to form a compound. (a) What type of bond will form between X and Y? (b) Write the chemical formula of the compound formed. (c) Will an aqueous solution of this compound conduct electricity? Justify your answer. (d) What will be the nature (acidic, basic or neutral) of this compound's aqueous solution? (e) If element X reacts with oxygen instead, what would be the nature of the oxide formed?

SECTION C - PHYSICS (25 Marks)

30. Which of the following statements about image formation by a concave mirror is correct? *[1]*

A. A concave mirror always forms a virtual, erect image regardless of object position.

B. A concave mirror can form either a real or a virtual image depending on the position of the object.

C. A concave mirror always forms a real, inverted image regardless of object position.

D. A concave mirror cannot form a magnified image.

31. Which of the following best explains why the sky appears blue during the day? *[1]*

A. Blue light has a shorter wavelength and is scattered more than other colours by atmospheric particles.

B. All colours are scattered equally, but the human eye is more sensitive to blue.

C. Red and orange light, having longer wavelengths, scatter more than blue light.

D. The atmosphere contains blue particles that reflect blue light.

The following question consists of an Assertion (A) and a Reason (R). Choose the correct option as described earlier.

32. Assertion (A): An object is placed at a distance of 20 cm from a convex mirror of focal length 20 cm. The image will not form at infinity. Reason (R): Using $1/f = 1/v + 1/u$ for this system gives v = infinity. *[1]*

33. A converging lens forms a real, inverted image of an object, three times the size of the object, on a screen placed 60 cm from the lens. *[2]*

(i). What is the image distance from the lens?

(ii). Calculate the object distance from the lens using the magnification relation.

34. Attempt either option A or B. *[2]*

A.. Three resistors of 2Ω, 3Ω and 5Ω are connected in series to a 20 V battery. Calculate (i) the total resistance of the circuit, and (ii) the current flowing through the circuit.

OR

B.. Two resistors of 4Ω each are connected in parallel, and this combination is connected in series with a 2Ω resistor across a 12 V battery. Calculate the current flowing through the 2Ω resistor.

35. A person can see distant objects clearly but cannot read a book held closer than 75 cm from the eyes. *[3]*

(i). Name the defect of vision this person is suffering from.

(ii). What type of lens should be used to correct this defect?

(iii). State one possible cause of this defect.

36. A wire of length 4 m and cross-sectional area 0.2 mm^2 has a resistance of 20 Ω. *[3]*

(i). Calculate the resistivity of the material of the wire.

(ii). If the length of the wire is doubled while keeping the cross-sectional area the same, what will be the new resistance?

37. State two important properties of magnetic field lines around a bar magnet. Using these properties, explain why magnetic field lines appear closer together near the poles of a magnet compared to regions farther away. *[3]*

38. A simple magnifying glass (convex lens) is used by a stamp collector to view small stamps. The lens has a focal length of 10 cm. *[4]*

A.. What type of image (real/virtual, magnified/diminished) is formed when the stamp is placed within the focal length of this lens?

B.. Is this type of image formed on a screen? Explain.

Attempt either subpart C or D.

C.. If the stamp is placed 5 cm from the lens, calculate the position of the image formed using the lens formula.

OR

D.. A magnifying glass forms a virtual image at a distance of 24 cm from the lens when an object is placed 6 cm from the lens. Calculate the focal length of the lens.

39. Attempt either option A or B. *[5]*

A.. In a circuit, a 60Ω and 30Ω resistor are connected in parallel, and this combination is connected in series with a 5Ω resistor. This series combination is connected to a battery, and the power dissipated in the 5Ω resistor is found to be 20 W. Calculate: (i) the current flowing through the circuit (ii) the voltage across the parallel combination (iii) the total voltage of the battery.

OR

B.. Three heating elements, each rated 1000 W, 250 V, and having equal constant resistance, are connected as follows: elements P and Q are connected in series with each other, and this series combination is connected in parallel with element R. The circuit is connected to a 250 V supply. (i) Calculate the resistance of one heating element. (ii) Calculate the current through element R when the circuit is switched on. (iii) Calculate the total power consumed by the circuit.

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MARKING SCHEME - CBSE CLASS 10 SAMPLE PAPER 1

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General Instructions: The value points below are suggested guidelines only. Award marks for any scientifically correct alternative method or expression.

SECTION A - BIOLOGY (30 Marks)

1. B *[1]*

2. C *[1]*

3. C *[1]*

4. B *[1]*

5. B *[1]*

6. A *[1]*

7. C *[1]*

8. A (Both A and R are true, and R is the correct explanation of A) *[1]*

9. A (Both A and R are true, and R is the correct explanation of A) *[1]*

10. Plants do not need an elaborate excretory system because most of their waste products (like oxygen from photosynthesis or CO2 from respiration) are gases that diffuse out through stomata, while other wastes are stored in vacuoles, old leaves, bark, or as resins and gums, which are eventually shed by the plant. *[2]*

11. A. The human heart has four chambers (two atria, two ventricles). A muscular septum divides the right and left sides completely, preventing oxygenated blood (left side) from mixing with deoxygenated blood (right side). OR B. Water absorbed by root hairs moves into the xylem vessels of the root and rises upward through the stem to the leaves due to transpiration pull created by the loss of water vapour from leaf surfaces, aided by cohesion between water molecules. *[2]*

12. Sample food chain: Algae → Water insects → Small fish → Herons (any valid three-or-more level chain using the given organisms with correct trophic order is acceptable). *[2]*

13. Diagram should show a neuron with dendrites, cell body (with nucleus), axon and axon terminals/synaptic knobs, correctly labelled. A nerve impulse is generated at the dendrite tip, travels as an electrical signal through the cell body and along the axon; at the synapse, it triggers release of chemicals that cross the gap and generate a new impulse in the next neuron. *[3]*

14. (i) F1 genotype: RrYy; phenotype: round, yellow seeds (both dominant traits expressed). (ii) Expected ratio of phenotypes in F2 is 9 round yellow : 3 round green : 3 wrinkled yellow : 1 wrinkled green. Out of 160 seeds: 90 round yellow, 30 round green, 30 wrinkled yellow, 10 wrinkled green. *[3]*

15. A. The boiled egg is rich in protein. Protein digestion begins in the stomach, where the enzyme pepsin acts on proteins in the presence of hydrochloric acid (acidic condition), breaking them into smaller peptides. OR B. (i) Rice is rich in starch (carbohydrate); its digestion begins in the mouth. (ii) Salivary amylase acts on starch, breaking it into maltose (a simpler sugar). (iii) Digestion of all food components is completed in the small intestine, where digested food (nutrients) is mainly absorbed into the bloodstream through the villi. *[4]*

16. A. (i) Meera should use a vegetative method (such as cutting or grafting) since it produces genetically identical (clone) plants quickly, unlike seeds which involve sexual reproduction and variation. (ii) Vegetative propagation does not involve fusion of gametes from two parents, so offspring inherit an exact copy of the parent's genetic material, resulting in little to no variation. (iii) Yes, variation is generally useful, as it increases the chances that at least some individuals in a population can survive changes in the environment, supporting the long-term survival of the species. OR B. (i) Group 1 (with insect pollinators) would show a higher number of fruits, since pollination is essential for fertilisation and subsequent fruit formation, and insects carry pollen between flowers. (ii) After fertilisation: the ovary develops into a fruit, the ovules develop into seeds, and the petals, sepals and stamens typically wither and fall off. *[5]*

SECTION B - CHEMISTRY (25 Marks)

17. B *[1]*

18. A *[1]*

19. B *[1]*

20. B *[1]*

21. C *[1]*

22. C *[1]*

23. B *[1]*

24. C (A is true, but R is false, since C3H6 and C4H8 are unsaturated alkenes, not saturated hydrocarbons) *[1]*

25. The pin would still fall off eventually, but it would take a longer time than before, because a poor conductor transfers heat along its length more slowly, so the wax at the far end takes longer to melt and release the pin. *[2]*

26. A. (i) Yes, 'M' should be stored under kerosene, not water, since it reacts vigorously with water/cold water, releasing hydrogen gas and heat which could cause a fire or explosion. (ii) 'M' is likely sodium (Na); $2Na + 2H_2O \rightarrow 2NaOH + H_2$ (equation should be balanced correctly). OR B. (i) This phenomenon is called rusting; the compound formed is hydrated iron(III) oxide ($Fe_2O_3.xH_2O$). (ii) Prevention methods include painting, galvanising (zinc coating), or applying oil/grease. (iii) Gold and platinum are highly unreactive (very low in the reactivity series) and do not readily react with oxygen or moisture in air, so they do not corrode. *[3]*

27. (i) Hydrogen gas forms at the cathode (larger volume) and oxygen gas forms at the anode (smaller volume), since water decomposes into hydrogen and oxygen in a 2:1 ratio by volume. (ii) Pure water is a poor conductor of electricity as it has very few free ions; adding dilute sulphuric acid increases the concentration of ions, allowing current to flow and electrolysis to proceed. (iii) The gas formed in the larger volume is hydrogen (H_2). *[3]*

28. A. This is a neutralisation reaction. B. Based on the pattern (15 drops of HCl per mL of NaOH), 5 mL of NaOH would require approximately 75 drops of HCl. C. $NaOH + HCl \rightarrow NaCl + H_2O$ (balanced neutralisation equation). *[4]*

29. A. (a) x=3, y=8 (the hydrocarbon is C_3H_8). (b) IUPAC name: propane. (c) It is a saturated hydrocarbon (alkane). (d) Propane is already saturated, so it cannot undergo further addition reaction with hydrogen; addition reactions occur only with unsaturated hydrocarbons (alkenes/alkynes). (e) Ethanol is generally obtained from alkenes (like ethene) through a hydration reaction in the presence of an acid catalyst, not directly from alkanes like propane; alternatively, ethanol is obtained industrially by fermentation of sugars. OR B. (a) X (sodium, group 1) and Y (chlorine, group 17) form an ionic bond. (b) Chemical formula: NaCl. (c) Yes, an aqueous solution of NaCl conducts electricity, since it dissociates into free-moving Na^+ and Cl^- ions that carry charge. (d) The aqueous solution of NaCl is neutral (pH close to 7), as it is a salt of a strong acid and a strong base. (e) Sodium (X) reacting with oxygen forms sodium oxide (Na_2O), which is a basic oxide. *[5]*

SECTION C - PHYSICS (25 Marks)

30. B *[1]*

31. A *[1]*

32. C (A is true, since a convex mirror never forms an image at infinity for a finite object distance; R is false because the correct calculation for a convex mirror gives a finite value of v, not infinity) *[1]*

33. (i) Image distance v = 60 cm (real image, same side as per convention). (ii) Using $m = -v/u$ with $|m| = 3$ (real, inverted, magnified): $-3 = -60/u$, so $u = 20$ cm; the object is placed 20 cm from the lens. *[2]*

34. A. (i) Total resistance = 2+3+5 = 10 Ω. (ii) Current = V/R = 20/10 = 2 A. OR B. Parallel combination of two 4Ω resistors = 2Ω; total resistance with series 2Ω resistor = 4Ω; current = 12/4 = 3 A. *[2]*

35. (i) Hypermetropia (long-sightedness/far-sightedness). (ii) A convex (converging) lens is used for correction. (iii) Possible cause: the eyeball has become too short, or the focal length of the eye lens has increased (power of accommodation reduced). *[3]*

36. (i) Resistivity $\rho = RA/L = (20 \times 0.2\times10^{-6})/4 = 1\times10^{-6}$ Ω·m. (ii) When length is doubled (area unchanged), new resistance = 2 × original = 40 Ω. *[3]*

37. Properties: (a) Magnetic field lines emerge from the north pole and enter the south pole outside the magnet, forming closed loops. (b) No two field lines ever cross each other. Field lines are closer together near the poles because the magnetic field strength is greatest there; the closer spacing of lines represents a stronger magnetic field, which weakens with distance from the poles, causing the lines to spread further apart. *[3]*

38. A. A magnified, virtual and erect image is formed when the object is within the focal length of a convex lens. B. No, this image cannot be formed on a screen since it is virtual; it can only be viewed by looking directly through the lens. C. Using $1/v = 1/f + 1/u$ with f=10, u=-5: $1/v = 1/10 - 1/5 = -1/10$, so v = -10 cm (virtual image, 10 cm from the lens on the same side as the object). OR D. Using $1/f = 1/v - 1/u$ with v=-24, u=-6: $1/f = -1/24 + 1/6 = 3/24 = 1/8$, so f = 8 cm. *[4]*

39. A. Parallel combination of 60Ω and 30Ω = 20Ω. Using $P=I^2R$ for the 5Ω resistor: $20=I^2\times5$, so I=2A. (i) Current = 2 A. (ii) Voltage across parallel combination = I × 20 = 40 V. (iii) Total battery voltage = 40 + (I×5) = 40+10 = 50 V. OR B. (i) Resistance of one element = $V^2/P = 250^2/1000 = 62.5$ Ω. (ii) Current through R (when only R considered

independently across 250V) = 250/62.5 = 4 A. (iii) Total power = power of R (1000 W, at rated voltage) + power of P&Q in series ($V^2/R_{series} = 250^2/125 = 500$ W) = 1500 W. *[5]*