ICSE Class 10 Biology Specimen Paper 2

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Maximum Marks: 80 | Time Allowed: Two hours | Reading Time: 15 minutes

Section A is compulsory. Attempt any four questions from Section B.

General Instructions

Write your answers on the separate answer paper provided. The first 15 minutes are for reading the paper, and you may not write during that time. Marks for each question, or part of a question, are shown in brackets. Answer in your own words and keep to the point. Where a question asks for a diagram, draw it in pencil, make it large enough to label clearly, and label the parts with straight lines that do not cross.

SECTION A (40 Marks)

Attempt all questions from this Section.

Question 1 [15]

Choose the correct answer for each part. Write only the option you choose.

(i) The number of chromosomes present in a human gamete is:

(a) 46 (b) 23 pairs (c) 23 (d) 44

(ii) The replication of DNA takes place during:

(a) interphase (b) prophase (c) metaphase (d) anaphase

(iii) The shrinking away of the protoplasm from the cell wall in a strong salt solution is called:

(a) imbibition (b) osmosis (c) diffusion (d) plasmolysis

(iv) Guard cells differ from the other epidermal cells of a leaf in that they:

(a) are dead at maturity (b) contain chloroplasts (c) have no nucleus (d) have no cell wall

(v) The end products of photosynthesis are:

(a) glucose and oxygen (b) carbon dioxide and water (c) starch and carbon dioxide (d) glucose and water

(vi) The plasma protein concerned with the clotting of blood is:

(a) haemoglobin (b) albumin (c) fibrinogen (d) globulin

(vii) The nitrogenous waste excreted by human beings in the largest amount is:

(a) ammonia (b) urea (c) uric acid (d) creatinine

(viii) The hormone that controls the rate of metabolism in the body is:

(a) insulin (b) adrenaline (c) glucagon (d) thyroxine

(ix) The long process of a neuron that carries the impulse away from the cell body is the:

(a) axon (b) dendrite (c) synapse (d) ganglion

(x) Breathing and the beating of the heart are controlled by the:

(a) cerebrum (b) medulla oblongata (c) cerebellum (d) spinal cord

(xi) A couple may have:

(a) only sons (b) only daughters

(c) a son or a daughter with an equal chance at each birth (d) a child whose sex is fixed by the mother

(xii) Colour blindness in human beings is inherited as:

(a) a sex linked recessive character (b) a sex linked dominant character

(c) an autosomal dominant character (d) an acquired character

(xiii) The number of live births per thousand of the population in a year is called the:

(a) death rate (b) growth rate (c) literacy rate (d) birth rate

(xiv) The substances chiefly responsible for the thinning of the ozone layer are:

(a) oxides of nitrogen (b) oxides of sulphur (c) chlorofluorocarbons (d) suspended dust particles

(xv) The heavy use of chemical fertilisers on farmland chiefly leads to:

(a) soil erosion (b) enrichment of nearby water bodies and the growth of algae

(c) depletion of the ozone layer (d) an increase in the oxygen of the air

Question 2 **[10]**

(i) State what is meant by the ascent of sap and name the tissue through which it takes place. **[2]**

(ii) Name the two hormones secreted by the ovary and state one function of either one of them. **[2]**

(iii) Give two differences between inspired air and expired air. **[2]**

(iv) Define the term excretion and name two excretory organs in human beings other than the kidney. **[2]**

(v) State two harmful effects of noise pollution on human beings. **[2]**

Question 3 **[15]**

(i) Describe an experiment to show that light is necessary for photosynthesis. **[3]**

(ii) Name the three kinds of blood cell found in human blood and state one function of each. **[3]**

(iii) State the function of the kidney. Explain briefly how a dialysis machine does the work of a kidney that has failed. **[3]**

(iv) In garden peas the round shape of the seed (R) is dominant over the wrinkled shape (r). Work out the cross between a homozygous round seeded plant and a wrinkled seeded plant, and give the genotype and the phenotype of the first generation. **[3]**

(v) Explain the terms birth rate and death rate. State what happens to the size of a population when the death rate falls while the birth rate stays high. **[3]**

SECTION B (40 Marks)

Attempt any four questions from this Section.

Question 4 **[10]**

(a) Define each of the following terms: gene, allele, haploid number. **[3]**

(b) Describe what happens during telophase of mitosis, and state one way in which cytokinesis in a plant cell differs from that in an animal cell. **[3]**

(c) State two ways in which mitosis is important to a living organism and two ways in which meiosis is important. **[4]**

Question 5 **[10]**

(a) Define imbibition, turgidity and a hypotonic solution. **[3]**

(b) Explain the parts played by root pressure and by transpiration pull in the ascent of sap. **[3]**

(c) State four ways in which a plant growing in a desert is adapted to reduce the loss of water. **[4]**

Question 6 **[10]**

(a) Name the raw materials needed for photosynthesis and state the source from which the plant obtains each of them. **[3]**

(b) Describe the steps taken in testing a leaf for starch, giving the reason for each step. **[3]**

(c) Define geotropism and hydrotropism. Describe an experiment to show that the root of a plant is positively geotropic. **[4]**

Question 7 **[10]**

(a) Name the parts of the human respiratory tract in the order in which air passes through them on its way to the lungs. **[3]**

(b) Explain the mechanism of expiration in human beings. **[3]**

(c) Trace the path of a drop of blood from the right atrium until it returns to the right atrium, naming in order the chambers and the main blood vessels through which it passes. **[4]**

Question 8 [10]

(a) Name three parts of the human kidney as seen in longitudinal section, and name the tube that carries urine from the kidney to the urinary bladder. **[3]**

(b) Explain the terms stimulus, receptor and effector, using the example of a person withdrawing the hand from a hot plate. **[3]**

(c) Name the hormone and the gland concerned in each of the following conditions: diabetes mellitus, cretinism, gigantism. State one function of adrenaline. **[4]**

Question 9 [10]

(a) State Mendel's law of dominance. Explain the terms homozygous and heterozygous. **[3]**

(b) A colour blind man marries a woman who is not a carrier of the gene. Work out the cross and state the condition of their sons and of their daughters. **[3]**

(c) Explain the term global warming. State two human activities that cause it and two of its effects on the earth. **[4]**

ANSWER KEY AND MARKING SCHEME

Marks shown in italics are the step marks an examiner would award. Accept any correct alternative wording, and accept a correct labelled diagram in place of a description where the candidate has given one.

Question 1 [15]

(i) (c) 23. A gamete is haploid and carries one chromosome of each of the 23 pairs found in a body cell.

(ii) (a) interphase. The chromosomes are duplicated in the S phase of interphase, before division begins.

(iii) (d) plasmolysis.

(iv) (b) contain chloroplasts. This lets them make food and build up the sugar that draws in water and opens the stoma.

(v) (a) glucose and oxygen.

(vi) (c) fibrinogen. It is changed into insoluble fibrin, whose threads form the mesh of the clot.

(vii) (b) urea. It is made in the liver from excess amino acids and removed by the kidney.

(viii) (d) thyroxine.

(ix) (a) axon.

(x) (b) medulla oblongata.

(xi) (c) a son or a daughter with an equal chance at each birth, since half the sperms carry an X and half a Y.

(xii) (a) a sex linked recessive character, carried on the X chromosome.

(xiii) (d) birth rate.

(xiv) (c) chlorofluorocarbons.

(xv) (b) enrichment of nearby water bodies and the growth of algae, which is eutrophication.

1 mark for each correct option. No marks are deducted for a wrong option.

Question 2 [10]

(i) The ascent of sap is the upward movement of water, together with the mineral salts dissolved in it, from the root to the leaves and other aerial parts of the plant. It takes place through the xylem.

Meaning 1. Xylem 1.

(ii) The ovary secretes oestrogen and progesterone. Oestrogen brings about the secondary sexual characters of the female and helps to repair the lining of the uterus after menstruation. Progesterone keeps the lining of the uterus thick and ready to receive the embryo, and maintains pregnancy.

Both hormones 1. One function of either 1.

(iii) Inspired air holds about 21 per cent oxygen while expired air holds about 16 per cent. Inspired air holds about 0.04 per cent carbon dioxide while expired air holds about 4 per cent. Expired air is also warmer and is saturated with water vapour, and it carries more dust and germs than the air breathed in.

1 mark for each correct difference, maximum 2.

(iv) Excretion is the removal from the body of the harmful waste products formed during the chemical activities of the cells, together with any substance present in excess. Besides the kidney, the skin removes water, salts and some urea in sweat, and the lungs remove carbon dioxide and water vapour. The liver also removes bile pigments.

Definition 1. Two organs 1.

(v) Continued loud noise causes partial or complete loss of hearing, and a sudden very loud noise can rupture the ear drum. It also raises the blood pressure and the heart rate, brings on headache and irritability, disturbs sleep and makes it hard to concentrate.

1 mark for each harmful effect, maximum 2.

Question 3 [15]

(i) Destarch a potted plant by keeping it in the dark for about two days, and test one leaf with iodine to confirm that no starch is left. Cover a part of one leaf on both surfaces with a strip of black paper, or with a cork cut to shape, and place the plant in bright sunlight for several hours. Remove the leaf, take off the cover, boil the leaf

in water, then in alcohol to remove the chlorophyll, wash it in warm water and pour iodine solution over it. The part that was covered stays yellow brown while the exposed part turns blue black, which shows that starch has been made only where light fell, so light is necessary for photosynthesis.

Destarching 1. Covering a part of the leaf and exposing to light 1. Result with conclusion 1.

(ii) Red blood cells carry oxygen from the lungs to the tissues, the oxygen being held by the haemoglobin inside them. White blood cells defend the body against disease, some engulfing germs and others producing antibodies. Blood platelets help in the clotting of blood at the site of a wound and so stop bleeding.

1 mark for each cell with its function.

(iii) The kidney filters the blood, removes urea and other nitrogenous wastes together with excess water and salts as urine, and in doing so keeps the composition and the water content of the blood steady. In dialysis the patient's blood is led from an artery into a long coiled tube of semipermeable membrane bathed in dialysing fluid. The fluid has the same concentration of glucose and salts as normal blood but no urea, so urea and excess salts pass out of the blood into the fluid by diffusion while the useful substances stay behind. The cleaned blood is returned to a vein of the patient.

Function of the kidney 1. Semipermeable tube in dialysing fluid 1. Diffusion of wastes with the blood returned 1.

(iv) The homozygous round seeded parent is RR and the wrinkled parent is rr. RR forms only R gametes and rr forms only r gametes, so every offspring of the first generation receives one R and one r. The genotype of the whole first generation is Rr and the phenotype of every plant is round seeded, because R is dominant over r.

Parental genotypes and gametes 1. Genotype Rr 1. All round seeded with reason 1.

(v) Birth rate is the number of live births per thousand of the population in a year. Death rate is the number of deaths per thousand of the population in a year. If the death rate falls while the birth rate stays high, many more individuals are added than are lost, so the population grows quickly and may reach the stage of a population explosion.

Birth rate 1. Death rate 1. Effect on the population 1.

Question 4 [10]

(a) Gene: a unit of inheritance, a segment of DNA occupying a fixed position on a chromosome, which controls a particular character. Allele: one of two or more alternative forms of the same gene, occupying the same position on homologous chromosomes, such as the gene for tallness and the gene for dwarfness. Haploid number: half the full chromosome number, the number found in a gamete, written as n, in which only one chromosome of each homologous pair is present.

1 mark for each definition.

(b) During telophase the chromosomes reach the two poles, uncoil and lengthen into thin threads again, the spindle breaks down, and a nuclear membrane with a nucleolus forms round each group, so that two daughter nuclei are produced. In an animal cell cytokinesis takes place by a furrow that appears in the cell membrane and deepens until it cuts the cell in two, while in a plant cell a cell plate is laid down across the middle from the centre outwards and becomes the new cell wall, because the rigid wall cannot be pinched inwards.

Events of telophase 2. Difference in cytokinesis 1.

(c) Mitosis is important because it adds cells for the growth of the body from the zygote to the adult, and because it replaces cells lost by wear and tear or injury, as in the healing of a wound. It also keeps the chromosome number of every body cell the same, so all the cells of an organism carry the same genetic information. Meiosis is important because it halves the chromosome number in the gametes, so that the diploid number of the species is restored at fertilisation and does not double in each generation. It also produces variation, through crossing over and the independent assortment of the chromosomes, and variation is the raw material of evolution.

Two points for mitosis 2. Two points for meiosis 2.

Question 5 [10]

(a) Imbibition: the absorption of water by a solid colloidal substance such as a dry seed or a piece of wood, which swells as a result without forming a solution. Turgidity: the firm and swollen state of a plant cell that has taken in all the water it can hold, so that its contents press hard against the cell wall. Hypotonic solution: a solution

that is more dilute than the cell sap, so that a cell placed in it gains water and becomes turgid.

1 mark for each definition.

(b) Root pressure is the pressure set up in the root as water is pushed into the xylem by the living cells of the cortex, and it forces a column of water some way up the stem from below. Transpiration pull is the much stronger force that acts from above. As water evaporates from the mesophyll cells into the air spaces of the leaf, those cells draw water from the cells next to them and finally from the xylem of the leaf. Because the water molecules cling to one another by cohesion and to the walls of the narrow xylem vessels by adhesion, the whole column is pulled up as one unbroken thread from the root to the leaf.

Root pressure 1. Evaporation creating the pull 1. Cohesion holding the column together 1.

(c) The leaves are reduced to spines or scales, which cuts down the surface from which water can evaporate, and the work of photosynthesis is taken over by a green fleshy stem. The stomata are few in number, sunk in pits and often open only at night, so that water vapour escapes slowly. The surface carries a thick waxy cuticle, and sometimes a dense covering of hairs, which checks evaporation. The root system is long and spreading, so water is drawn from a large volume of soil, and the stem stores water in its fleshy tissue to carry the plant through the dry season.

1 mark for each correct adaptation, maximum 4.

Question 6 [10]

(a) Carbon dioxide, which the plant takes from the air through the stomata of the leaves. Water, which the plant absorbs from the soil through its root hairs and which travels up the xylem. Sunlight, which supplies the energy and is trapped by the chlorophyll in the chloroplasts of the leaf. Chlorophyll itself is not used up and so is better called a necessary condition than a raw material.

Carbon dioxide with its source 1. Water with its source 1. Sunlight with the part played by chlorophyll 1.

(b) Boil the leaf in water for about a minute, which kills the cells and breaks down the cell walls so that the chemicals can pass through freely. Boil it in alcohol, using a water bath and not a direct flame because alcohol catches fire easily, until the green colour is removed, since the chlorophyll would mask the colour of the test. Dip the leaf in warm water to soften it, as alcohol leaves it brittle. Spread it out and pour iodine solution over it. A blue black colour shows that starch is present.

Boiling in water 1. Removing chlorophyll with alcohol on a water bath 1. Softening and the iodine test with the result 1.

(c) Geotropism is the growth movement of a part of a plant in response to the pull of gravity, the root growing towards it and the shoot away from it. Hydrotropism is the growth movement of a part of a plant in response to water, the root growing towards the source of moisture. To show that the root is positively geotropic, germinate a bean seed until the radicle is a few centimetres long, pin it to a cork with the radicle pointing horizontally, and fix the cork inside a bell jar or a wide jar with a little water at the bottom to keep the air moist. Keep the jar in the dark so that light has no effect. After two or three days the radicle is seen to have curved downwards, which shows that the root grows in the direction of gravity.

Geotropism 1. Hydrotropism 1. Set up kept dark and moist 1. Result with conclusion 1.

Question 7 [10]

(a) Air passes through the nostrils into the nasal chamber, then the pharynx, the larynx, the trachea, the two bronchi, the bronchioles, and finally the alveoli of the lungs.

Correct sequence 2. All the main parts named 1.

(b) In expiration the muscles of the diaphragm relax, so the diaphragm returns to its domed shape and rises into the thorax. The external intercostal muscles relax, so the ribs move downwards and inwards and the sternum returns to its position. The volume of the thoracic cavity is reduced from top to bottom and from front to back, the pressure of the air inside the lungs rises above that of the atmosphere, the elastic lungs recoil, and air is driven out through the respiratory tract. Normal expiration is a passive process that needs no effort.

Diaphragm relaxing and arching up 1. Ribs and sternum moving down 1. Reduced volume raising the pressure and driving air out 1.

(c) From the right atrium the blood passes through the tricuspid valve into the right ventricle, and out through the pulmonary artery to the lungs, where it is oxygenated. It returns through the pulmonary veins to the left atrium, passes through the bicuspid valve into the left ventricle, and is pumped out through the aorta to the arteries of the body. After giving up oxygen in the capillaries of the tissues it is collected by the veins and brought back through the superior and inferior vena cava to the right atrium.

Right side to the lungs with the pulmonary artery 1. Return by the pulmonary veins to the left atrium 1. Left ventricle and aorta to the body 1. Return by the vena cava 1.

Question 8 [10]

(a) In longitudinal section the kidney shows an outer dark cortex, an inner lighter medulla containing the conical pyramids, and the pelvis, the funnel shaped cavity into which the urine drains. The tube that carries urine from the kidney to the urinary bladder is the ureter.

Three parts 2. Ureter 1.

(b) A stimulus is any change in the surroundings, or inside the body, that brings about a response in a living organism; here the heat of the plate is the stimulus. A receptor is the organ or cell that detects the stimulus and starts an impulse; here the heat receptors in the skin of the fingers. An effector is the organ that carries out the response when the impulse reaches it; here the muscle of the arm, which contracts and pulls the hand away.

1 mark for each term correctly explained with its example.

(c) Diabetes mellitus: too little insulin, from the islets of Langerhans in the pancreas. Cretinism: too little thyroxine in a child, from the thyroid gland. Gigantism: too much growth hormone in a child, from the anterior lobe of the pituitary gland. Adrenaline prepares the body to meet an emergency by raising the heart rate, widening the air passages and releasing glucose from the liver into the blood.

1 mark for each condition with its hormone and gland. Function of adrenaline 1.

Question 9 [10]

(a) Mendel's law of dominance states that when two pure parents differing in a pair of contrasting characters are crossed, only one of the two characters appears in the first generation. The character that shows itself is said to be dominant and the one that stays hidden is said to be recessive. Homozygous means that the two alleles of a gene in an individual are alike, as in TT or tt, so the individual breeds true for that character. Heterozygous means that the two alleles are unlike, as in Tt, so the individual carries the recessive gene without showing it.

Law 1. Homozygous 1. Heterozygous 1.

(b) The colour blind father is X^cY and the mother, who is not a carrier, is XX. The father forms two kinds of gamete, X^c and Y, and the mother forms only X. The daughters are X^cX, so every daughter receives the defective gene from her father and the normal gene from her mother. Since the normal gene is dominant the daughters have normal vision, but each is a carrier. The sons are XY, taking the X from the mother and the Y from the father, so no son receives the defective gene and all the sons have normal vision.

Parental genotypes with gametes 1. Daughters normal but carriers 1. Sons normal with the reason 1.

(c) Global warming is the steady rise in the average temperature of the atmosphere and the oceans, brought about by the building up of greenhouse gases that let the short wave radiation of the sun through but trap the long wave heat radiated back from the earth. It is caused by the burning of coal, oil and natural gas in power stations, factories and vehicles, which pours carbon dioxide into the air, and by deforestation, which removes the trees that would have absorbed that carbon dioxide. Its effects are the melting of glaciers and polar ice, which raises the sea level and threatens low lying coasts and islands, and a shift in rainfall and weather patterns that brings longer droughts, heavier floods and a loss of crops and wildlife.

Explanation of the greenhouse effect 1. Two causes 1.5. Two effects 1.5.