

**DRUBRICS: HSSC-II 1<sup>st</sup> ANNUAL EXAMINATION 2024**  
**SUBJECT: BIOLOGY (Hard Area) (D)**

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)	
2(i)	<b>What would happen if people do not have ligaments.</b>	Any one correct impact i.e,Ligaments connects bones, their absence results in joint instability/limited mobility and flexibility/joint dislocation etc (1)	Partially correct information (0.5)	Wrong answer. (0)				
	<b>Comparison of tendons and ligaments.</b>	Any two differences or characteristics of tendons and ligaments i.e, tendons connect muscles to bones, transmit force from muscles to bones to enable movement etc while ligaments connect one bone with other bone, provide stability and support to joints etc. (2)	Any one correct difference or characteristic of tendon and ligament. (1)	Some relevant information. (0.5)	Wrong answer. (0)			
OR	<b>Role of bacteria in nitrogen cycle.</b>	Description of two correct roles of bacteria in nitrogen cycle i.e, <b>Biological Nitrogen fixation</b> and denitrification. <b>Biological Nitrogen fixation</b> : Nitrogen fixing bacteria fix 60% of nitrogen gas in the atmosphere. <b>Denitrification</b> :	Partially correct description of two roles of bacteria in nitrogen fixation and denitrification (2)	Correct description of any one role (1)	Some relevant information. (0.5)	Wrong answer. (0)		

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		Nitrification, Denitrifying bacteria releases nitrogen back to the atmosphere.(3)						
2(ii)	<b>Complete the concept map by using the given terms.</b>	All six correct terms in correct space in concept map i.e, 1. Neuron. 2. Cell body. 3. Dendrites. 4. Axon. 5. Neurotransmitter 6. Synapse. (3)	Any five correct terms in correct space in concept map. (2.5)	Any four correct terms in correct space in concept map. (2)	Any three correct terms in correct space in concept map. (1.5)	Any two correct terms in correct space in concept map. (1)	Any one correct term in correct space in concept map. (0.5)	Wrong answer. (0)
OR	<b>Identification of organs A, B and C in given figure.</b>	Correct identification of all three parts i.e, A = Kidney. B = Ureter. C = Urinary bladder/bladder. (1.5)	Correct identification of any two parts. (1)	Correct identification of any one part. (0.5)	Wrong answer.(0)			
	<b>Function of organs A, B and C in given figure.</b>	Correct functions of all three parts i.e, Kidney = To filter the blood from waste materials / Urine formation / osmoregulation.  Ureter =It transport urine from kidney to urinary bladder.  Urinary bladder = Urine reservoir / store urine.	Correct functions of any two parts. (1)	Correct function of any one part. (0.5)	Wrong answer.(0)			

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		(1.5)						
2(iii)	<b>Reason: why dead S-strain bacteria mixed with non-virulent R type bacteria killed the mice?</b>	Correct description i.e, Griffith concluded that the information specifying the polysaccharide capsule and virulence had passed from the heat killed S-type bacteria to the living R-type transforming them into living S-type virulent bacteria that killed the mice. This transfer of genetic material from one organism to another is called transformation. (3)	Partially correct description. (2)	Some relevant information. (1)	Wrong answer. (0)			

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OR	<b>Probability of children to be colour-blind, if daughter of a colour-blind father marries with a man with normal vision.</b>	Correct description of probability i.e, 1/4 (25%) of her children will be colour-blind along with correct pedigree chart. (3)	Partially correct description of probability along with correct pedigree chart. (2)	Only description without / with wrong pedigree chart. (1)	Some relevant information. (0.5)	Wrong answer. (0)		
2(iv)	<b>Path taken by oxygen molecule as it travels from nose</b>	Correct description i.e, Oxygen molecule from air enter in to our nose through nostrils, then it travels through nasal	Partially correct description showing incomplete path. (2)	Some relevant information. (1)	Wrong information. (0)			

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	to body cell.	cavity, pharynx, larynx, trachea, bronchi, bronchioles and alveoli. The blood capillaries of alveoli absorb this oxygen molecule and inside red blood cells it is carried as oxyhaemoglobin which is then released to the body cells again as oxygen molecule. (3)						
OR	<b>Definition of gene mutation.</b>	Correct definition of gene mutation i.e, A gene or point mutation is a change in a base sequence of an individual gene. (1)	Partially correct definition. (0.5)	Wrong answer. (0)				
	<b>Causes and symptoms of sickle cell anaemia as an example of gene mutation.</b>	Correct cause and symptoms i.e, <b>Causes:</b> It is caused by a defect in haemoglobin. Sixth amino acid i.e, glutamic acid in the beta chain of the normal haemoglobin is replaced by valine <b>OR</b> In beta chain gene glutamic acid code (CTT) is substituted to (CAT) which codes for valine. <b>Symptoms :</b> Any two correct symptoms like fatigue, paleness, fever, rapid heartbeat, jaundice, shortness of	Only causes <b>OR</b> symptoms. (1)	Some relevant information. (0.5)	Wrong answer. (0)			

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		breath etc.(2)						
2(v)	<b>Functions of male reproductive system.</b>	Correct description of male reproductive system i.e, Production of sperms which is also called spermatogenesis. (2)	Partially Correct information. (1)	Wrong answer. (0)				
	<b>Effect of high fever on sperm production.</b>	The process of sperm production (spermatogenesis) decreases in high fever. Spermatogenesis is most efficient around 35 °C. (1)	Wrong information. (0)					
OR	<b>Three stages of sewage treatment.</b>	Correct description of all three stages of sewage treatment i.e, a) Primary Treatment. b) Secondary treatment. c) Tertiary treatment. (3)	Correct description of any two stages of sewage treatment. (2)	Correct description of any one stage of sewage treatment. (1)	Some relevant information. (0.5)	Wrong answer. (0)		
2(vi)	<b>Why embryo is most vulnerable to drugs/harmful substances between 2 to 7 weeks.</b>	Correct description i.e, because major organs and body systems are forming between 2 to 7 week in embryo. The drugs/harmful substances taken by mother cause harm to the development of foetus and leads to birth defects and even miscarriage. (2)	Partially correct description. (1)	Some relevant information. (0.5)	Wrong answer. (0)			

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	<b>How foetus gets nourishment from mother?</b>	Correct name i.e,placenta is the organ through which foetus gets nourishment from mother. (1)	Some relevant information (0.5)	Wrong answer. (0)				
OR	<b>Differentiate between Nucleosome and primosome</b>	Correct difference i.e, Approximately every 200 nucleotides of the duplex DNA wrap twice around the core of eight histones forming a structure called nucleosome <b>while</b> the primase and DNA helicase enzymes are found in the form of a complex called primosome.(1)	Partially correct difference. (0.5)	Wrong answer. (0)				
	<b>Heterochromatin and euchromatin.</b>	Correct difference i.e, heterochromatin is highly condensed and unexpressed region of a chromatin fiber <b>while</b> euchromatin is the non condensed region of a chromatin fiber whose genes are expressed. (1)	Partially correct difference. (0.5)	Wrong answer. (0)				
	<b>Sense codon and non-sense codon</b>	Correct difference i.e, The codons that encode specific amino acids are called sense codons <b>while</b> the codons that do not encode any amino acid are called non sense codons. (1)	Partially correct difference. (0.5)	Wrong answer. (0)				

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2(vii)	<b>Difference in inheritance pattern of an X linked dominant trait from X linked recessive trait.</b>	Any two correct differences / characteristics i.e, <b><u>X linked dominant traits</u></b> : A male or female child of an effected mother has 50% chance of inheriting the mutation, all female children of an effected father will be affected, no male children of an affected father is affected etc. <b><u>X linked recessive traits</u></b> : All males having X-linked recessive mutation will be affected, all offsprings of a carrier female have 50% chance of inheriting the mutation, no male of an affected father will be affected, zigzag inheritance (3)	Any one correct difference <b>OR</b> characteristic of X linked dominant and X linked recessive trait. (2)	Some relevant information. (1)	Wrong answer. (0)			
OR	<b>Comment</b> <b>“Migration may increase or decrease the effect of selection”.</b>	Correct description i.e, migration can both increase and decrease the effect of selection on a population by gene flow , adaptation to new environments and both immigration and emigration changes the	Partially correct description. (2)	Some relevant information. (1)	Wrong answer. (0)			



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		allele frequency etc. (3)						
2(viii)	<b>Inheritance of homologous and analogous structures results in convergent and divergent evolution.</b>	<p>Correct description of both i.e,  <u><b>Convergent evolution</b></u>  : Body parts that are similar in functions but different in structure are called analogous organs e.g, wings of birds and butterfly. This pattern of evolution in which different species have been evolved from ancestors at a common habitat is called convergent evolution.</p> <p><u><b>Divergent evolution:</b></u>  Body parts that are similar in structure but different in function, they are inherited from common ancestors are called homologous organs e.g, limb-bone (pentadactyl limb) pattern of all tetrapods from amphibians to mammals has similar structural plan. This pattern of evolution in which different species have been evolved from</p>	Partially correct description of both. (2)	Description of any one evolution pattern. (1)	Some relevant information. (0.5)	Wrong answer. (0)		

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		common ancestors at different habitats is called divergent evolution. (3)						
OR	<b>Definition of Animal husbandry.</b>	Correct definition i.e, Animal husbandry deals with the care of livestock like cows, buffaloes, sheep, goats, chicken, horses etc. (1)	Partially correct definition. (0.5)	Wrong answer. (0)				
	<b>Role of livestock in national economy.</b>	Any two correct roles i.e, major source of livelihood for many farmers, contribution in GDP (Gross domestic product) etc. (2)	Any one correct role of livestock in national economy. (1)	Some relevant information. (0.5)	Wrong answer. (0)			
2(ix)	<b>Role of microbes in industrial production.</b>	Any three correct role i.e, a) They produce high yields and have higher specificity than conventional processes. b) A wide range of chemicals can be used and produced. c) Some complex chemicals such as hormones and antibiotics can be manufactured etc. (3)	Any two correct roles. (2)	Any one correct role. (1)	Some relative information. (0.5)	Wrong answer. (0)		

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OR	<b>Flow chart to show how hormones control the function of male reproductive cycle.</b>	Correct flow chart of any three hormones controlling function of male reproductive cycle showing GnRH, LH, FSH, Testosterone, inhibin. (3)	Partially correct flow chart. (2)	Incomplete flow chart showing any one hormone. (1)	Some relevant information. (0.5)	Wrong answer. (0)		
2(x)	<b>Process of gene amplification through PCR.</b>	Correct description of all three steps of gene amplification through PCR i.e, a) Denaturation. b) Primer annealing. c) Extension or polymerization OR flow chart of PCR. (3)	Correct description of any two steps OR partially correct flow chart. (2)	Correct description of any one step OR incomplete flow chart. (1)	Some relevant information. (0.5)	Wrong answer (0)		
OR	<b>Explanation of polygenic inheritance.</b>	Correct description of polygenic inheritance i.e, Some traits have large number of alternative phenotypes that have small and less striking difference such as height, weight, intelligence, skin colour in humans and grain colour in wheat. Such	Partially correct description. (2)	Some relevant information. (1)	Wrong answer. (0)			

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		traits cannot be encoded by a single gene with two alleles but are encoded by alleles of two or more different gene pairs located at different loci that influence the same trait in additive way. These qualitative traits are called polygenic traits and genes that control them are called polygenes. (3)						
2(xi)	<b>Anchorage dependent animal cell culture</b>	Correct description of any three criteria i.e anchorage dependent process; monolayer cell culture attached to vessel, cell grow for limited generation, finite cell line. (1.5)	Partially correct description of anchorage dependent animal cell culture. (1)	Some relevant information. (0.5)	Wrong answer (0)			
	<b>Anchorage independent animal cell culture</b>	Correct description of any three criteria i.e anchorage independent process; suspension cells survive and proliferate without substratum , hematopoietic cells(derived from blood, spleen or bone marrow), some transformed cell lines from malignant tumors, unlimited generations,	Partially correct description of anchorage independent animal cell culture. (1)	Some relevant information. (0.5)	Wrong answer (0)			

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OR		continuous cell lines(1.5)						
	<b>Air filtration in Nose and trachea</b>	Correct description of air filtration by; Nose hairs, mucous and cilia in nose etc (3)	Partially Correct description of air filtration (2)	Some relevant information. (1)	Wrong answer. (0)			
2(xii)	<b>Hematoma formation</b>	Correct description like; blood vessels ruptures during bone breakage, hemorrhage occurs as a result a mass of clotted blood forms at the fracture site.(1)	Some relevant information (0.5)	Wrong answer. (0)				
	<b>Callus formation</b>	Correct description of any three criteria i.e fibro cartilaginous callus formation; Capillaries grow in hematoma and phagocytic cells clean up debris, production of osteoblasts in conjunction with cartilage forming cells, secrete porous mass of bone and cartilage called callus surrounding the site. (2).	Partially Correct description of fibro cartilaginous callus formation (1)	Some relevant information (0.5)	Wrong answer. (0)			

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OR	<b>Drug addiction</b>	Correct definition of drug addiction; dependence on an illegal drug or medication etc (1)	Some relevant information (0.5)	Wrong answer. (0)				
	<b>Effects of drug addiction on CNS</b>	Correct description of any two effects of drug addiction on CNS; i.e in drugs interacts with brain and body to alter moods, emotions and behaviors by changing brain chemistry, slowing down the functions of CNS etc (2)	Partially Correct description of any one effect of drug addiction on CNS; (1)	Some relevant information (0.5)	Wrong answer. (0)			
2(xiii)	<b>Role of kidney in homeostasis</b>	Correct description of any three roles of kidney like; remove metabolic wastes like urea and other nitrogenous wastes, regulate water content of the body fluids, regulate pH of the body fluids, remove excess water, salts, hormones and drugs etc (3)	Correct description of any two roles of kidney (2)	Correct description of any one role of kidney (1)	Some relevant information (0.5)	Wrong answer. (0)		
OR	<b>Principle and process of gel electrophoresis</b>	Correct description of the Principle and process of gel electrophoresis; involve separating molecules like DNA, RNA or proteins based on their size and charge using an electric field applied	Partially Correct description of the Principle and process of gel electrophoresis( 2)	Some relevant information (1)	Wrong answer. (0)			

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		to a gel matrix, smaller molecules move faster and larger moves more slowly through gel.(3)						
2(xiv)	<b>Antagonistic effect of insulin and glucagon</b>	Correct explanation of antagonistic effect of insulin and glucagon; <b>Insulin</b> secreted by pancreases in response to high blood sugar levels, promote uptake of glucose by cells, liver and muscles. conversion of glucose to glycogen etc <b>Glucagon</b> secreted by pancreases when blood sugar level is low, conversion of glycogen to glucose OR flow chart showing <b>Antagonistic effect of insulin and glucagon</b> etc (3)	Partially correct description of the antagonistic effect of insulin and glucagon OR partially correct flow chart showing antagonistic effect of insulin and glucagon (2)	Some relevant information (1)	Wrong answer. (0)			
OR	<b>Methods of plant breeding in crop improvement</b>	Correct description of any three methods of plant breeding in crop improvement; <b>Acclimatization</b> ; introducing and adjustments of new plants from their growing place to new locality with different climate, etc <b>Selection</b> ; Picking up	Correct description of any two methods of plant breeding in crop improvement (2)	Correct description of any one method of plant breeding in crop improvement (1)	Some relevant information (0.5)	Wrong answer. (0)		

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		the better ones out of the entire crop plants etc <b>Hybridization;</b> introducing characters of two desirable species into a single offspring's ( hybrid) by means of artificial pollination etc <b>Backcross etc (3)</b>						
Q3	<b>Mechanism of synaptic transmission</b>	Correct identification of the process; Mechanism of synaptic transmission/ synapse (0.5)	Wrong answer (0)					
		1. An action potential (arrow) (0.5)	Wrong answer (0)					
		2. Synaptic knob vesicles/ neurotransmitters, vesicles (0.5)	Wrong answer (0)					
		3. release of neurotransmitters molecules into synaptic cleft (0.5)	Wrong answer (0)					
	<b>Description of Mechanism of synaptic</b>	Correct description mentioning any four steps of the Mechanism of synaptic	Correct description mentioning any three steps of the Mechanism of	Correct description mentioning any two steps of the Mechanism of	Correct description mentioning any one step of the	Some relevant information (0.5)	Wrong answer (0)	



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	<b>transmission</b>	transmission (4)	synaptic transmission (3)	synaptic transmission (2)	Mechanism of synaptic transmission (1)			
OR	<b>Innate behavior</b>	Correct definition of innate behavior; resulting from genetically determined neural programmes that are the part of nervous system at the time of birth or develop at an appropriate point in maturation or inborn behavior etc....(1)	Some relevant information (0.5)	Wrong answer (0)				
	<b>Orientation and non-orientation behaviors</b>	Correct description of all orientation behaviors i.e Taxis, and tropism and all non-orientation behaviors i.e reflexes and instincts. (5)	Partially correct description of all orientation behaviors i.e Taxis, and tropism and all non-orientation behaviors i.e reflexes and instincts. (4)	Correct description of either orientation behaviors (i.e, Taxis and tropism) OR non-orientation behaviors (i.e reflexes and instincts) (3)	Partially Correct description of either orientation behaviors (i.e, Taxis and tropism) OR non-orientation behaviors (i.e reflexes and instincts) (2)	Correct description of any one criteria from orientation OR non-orientation behavior. (1)	Some relevant information (0.5)	Wrong answer (0)
Q4	<b>Neurulation in human embryo</b>	Correct identification of A; Neural plate border (0.5)	Wrong answer (0)					

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)	
		Correct identification of B; Neural plate (0.5)	Wrong answer (0)					
		Correct identification of C; Ectoderm (0.5)	Wrong answer (0)					
		Correct identification of D; Notochord (0.5)	Wrong answer (0)					
	<b>Events of Neurulation</b>	Correct description of events of Neurulation; any four like neural plate, neural groove, neural tube, neurala, (4)	Correct description of events of Neurulation any three; like neural plate, neural groove, neural tube, neurala, (3)	Correct description of events of Neurulation any two; like neural plate, neural groove, neural tube, neurala, (2)	Correct description of events of Neurulation any one; like neural plate, neural groove, neural tube, neurala, (1)	Some relevant information (0.5)	Wrong answer (0)	
	<b>Structures formed by neural crest cells</b>	Correct names of any two structures like medulla of adrenal gland, teeth, skull bones, peripheral nerves (1)	Correct name of any one structure (0.5)	Wrong answer (0)				
OR	<b>Recombinant DNA technology</b>	Correct description of Gene of interest (2)	Partially Correct description of Gene of interest (1)	Some relevant information (0.5)	Wrong answer (0)			

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		Correct description of Molecular scissors/restriction endonuclease (2)	Partially Correct description of molecular scissors (1)	Some relevant information (0.5)	Wrong answer (0)			
		Correct description of Molecular glue/DNA ligase (1)	Some relevant information (0.5)	Wrong answer (0)				
		Correct description of Molecular carrier/vector (1)	Some relevant information (0.5)	Wrong answer (0)				
		Correct description of Expression system (1)	Some relevant information (0.5)	Wrong answer (0)				
Q.5	<b>Multiple alleles produce different phenotypes</b>	Correct reason that Multiple alleles produce different phenotypes; refers to the existence of more than two alleles for a particular trait in a population ...etc.e.g ABO blood group (1)	Some relevant information (0.5)	Wrong answer (0)				
	<b>Description of ABO blood group system</b>	Correct description of any three criteria of ABO blood group system i.e antigen of ABO system, Genetic basis of ABO system, antibodies of ABO..system , transfusion principle (5)	Correct description of any two criteria of ABO blood group system (4)	Correct description of any one criteria of ABO blood group system OR table showing genotype and phenotype. (2)	Some relevant information (1)	Wrong answer (0)		

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OR	<b>Ecological succession</b>	Correct Definition of ecological succession (2)	Partially Correct Definition of ecological succession (1)	Wrong answer (0)				
	<b>Kinds of Ecological succession</b>	Correct description of both primary and secondary succession OR hydrarch and xerarch (4)	Partially Correct description of primary and secondary succession OR hydrarch and xerarch (3)	Correct description of primary OR secondary succession OR hydrarch OR xerarch (2)	Some relevant information (1)	Wrong answer (0)		
Q.6	<b>Mechanism of Breathing</b>	Correct description of both inspiration and expiration (5)	Partially Correct description of Inspiration and Expiration (4)	Correct description of inspiration OR expiration (3)	Partially correct description of inspiration OR expiration (2)	Some relevant information (1)	Wrong answer (0)	
	<b>Control of breathing</b>	Correct description of any two criteria of control of breathing i.e cerebral cortex, medulla, limbic system (2)	Correct description of any one criteria (1)	Some relevant information (0.5)	Wrong answer (0)			
OR	<b>Genetic drift</b>	Correct description of genetic drift i.e bottle neck and founder effect (3)	Partially Correct description of genetic drift (2)	Some relevant information (1)	Wrong answer (0)			
	<b>Speciation and modes of speciation</b>	Correct definition of speciation and explanation of any two modes of speciation i.e,allopatric, parapatric and sympatric speciation. (4)	Partially correct definition of speciation and partial explanation of any two modes of speciation i.e,allopatric, parapatric and sympatric speciation. (3)	Correct definition and description of any one modes of speciation (2)	Correct definition OR description of any one mode of speciation (1)	Some relevant information (0.5)	Wrong answer (0)	



**RUBRICS: HSSC 1<sup>st</sup> ANNUAL EXAMINATION 2024**  
**SUBJECT: BIOLOGY-II (LOCAL AREA) (B)**

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
2(i)	Structure of rib cage , 12 pairs of ribs, true ribs, false ribs ,floating ribs etc	Correct description of any four criteria(2)	Correct description of any three criteria(1.5 )	Correct description of any two criteria(1)	Correct description of any one criteria(0.5)	Wrong answer(0)	
	Advantages of ribs not attached directly with sternum i.e support or protection etc	Correct advantage (1)	Some relevant information(0.5)	Wrong answer(0)			
OR	Function of nephron i.e urine formation, clearing of waste ,ultrafiltration, reabsorption, secretion etc	Correct function of nephron (2)	Partially correct function(1)	Some relevant information(0.5)	Wrong answer(0)		
	Effect of low blood pressure in afferent arteriole on filtration i.e filtration of water and small molecules effected OR composition of glomerular filtrate effected OR less urine formation etc	Correct description of effect of low blood pressure (1)	Partially correct description of effect of low blood pressure (0.5)	Wrong answer(0)			

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2(ii)	Effects of type I diabetes on cells and metabolism i.e prevents energy storage, attacks beta cells, damage blood vessels, nerves organs and leads to stroke, heart attack , kidney failure etc	Correct explanation of any two effects(3)	Correct explanation of any one effect(2)	Some relevant information(1)	Wrong answer(0)		
OR	Three processes of embryonic development i.e correct names and brief introduction like cleavage, gastrulation, organogenesis and growth OR fertilization, zygote formation, foetus formation, adult formation etc	Correct identification of three processes with brief description (3)	Correct identification of two processes with brief description (2)	Correct identification of one process with brief description (1)	Some relevant information (0.5)	Wrong answer (0)	
2(iii)	Pedigree analysis and conclusion i.e pedigree shows X-linked dominant trait, male or female children of an affected mother show 50% inheritance , all females of effected father show they are effected, no male of	Correct explanation of any three criteria (3)	Correct explanation of any two criteria (2)	Correct explanation of one criteria (1)	Some relevant information (0.5)	Wrong answer (0)	

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	affected father show effect of trait etc						
OR	Chromosomes and genes i.e chromosomes are thread like structures , genes are short segment of DNA with coded information etc	Correct definition of both (2)	Correct definition of any one / partially correct definition of both (1)	Some relevant information (0.5)	Wrong answer (0)		
	Relation between chromosomes and genes i.e genes are located on chromosomes, gene locus etc	Correct description of gene locus (1)	Some relevant information (0.5)	Wrong answer (0)			
2(iv)	Effect of heat on bacterial DNA i.e heat kills bacteria not its DNA , heat destroys polysaccharide coat , <b>OR</b> transformation depends on DNA , effect of S-strain, effect of R-strain, effect of heat killed S-strain etc	Correct explanation of any two criteria (3)	Correct explanation of any one criteria (2)	Some relevant information (1)	Wrong answer (0)		
OR	Convergent evolution i.e different species at common habitat, organs with different structure but same function , examples like wings of bird and butterfly	Any three correct differences (3)	Any two correct differences (2)	Any one correct difference (1)	Some relevant information (0.5)	Wrong answer (0)	



Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	etc Divergent evolution i.e same species at different habitat, organs with same structure but different function, examples pentadactyl limbs etc						
2(v)	Advantages of nasal breathing , i.e warming, moistening, filtration	Correct explanation of any two advantages (1)	Correct explanation of any one advantage (0.5)	Wrong answer (0)			
	Sequence of muscle contraction during inhalation i.e external intercostal muscles contract <b>OR</b> internal relax etc	Correct sequence (1)	Some relevant information (0.5)	Wrong answer(0)			
	Sequence of muscle contraction during exhalation i.e external intercostal muscles relax <b>OR</b> internal contract etc	Correct sequence (1)	Some relevant information (0.5)	Wrong answer(0)			
OR	Karyotype , causes and symptoms of klinefelter syndrome i.e 2n+1, 44+XXY, OR diagram, non-disjunction of sex chromosome, sparse body hair, enlarged breasts,	Correct explanation of all three karyotype, cause and one symptom (1.5)	Correct explanation of any two of karyotype, cause and one symptom (1)	Correct explanation of any one of karyotype, cause and one symptom (0.5)	Wrong answer (0)		

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	wide hips etc						
	Karyotype, cause and symptoms of turners syndrome i.e 2n-1 ,44+XO, OR diagram, one x chromosome missing, short height, infertility, webbed neck etc	Correct explanation of karyotype, cause and one symptom (1.5)	Correct explanation of any two of karyotype, cause and one symptom (1)	Correct explanation of any one of karyotype, cause and one symptom (0.5)	Wrong answer (0)		
2(vi)	Functions of FSH and LH/ICSH in female and male. i.e gonadotrophic hormones, act upon reproductive system, control secretion of other hormones, spermatogenesis ,oogenesis etc	Correct description of any three criteria (3)	Correct explanation of any two criteria (2)	Correct explanation of any one criteria (1)	Some relevant information (0.5)	Wrong answer (0)	
OR	Darwin theory of natural selection i.e descent with modification, natural selection and adaptation, over production, variation, struggle for existence, survival of fittest etc.	Correct explanation of any two criteria (3)	Partially correct explanation of any two criteria (2)	Correct explanation of any one criteria (1.5)	Partially correct explanation of any one criteria OR Some relevant information (1)	Wrong answer (0)	
2(vii)	Differentiate between ammonification and denitrification i.e production of	correct explanation of any two criteria (1.5)	correct explanation of any one criteria (1)	Some relevant information (0.5)	Wrong answer (0)		

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	ammonia and ammonium compounds i.e ammonification occurs in soil, aerobic environment while breaking nitrates to release nitrogen in atmosphere called denitrification, absence of oxygen etc						
	Differentiate between xerarch and hydrarch i.e succession on bared rocks, sand dunes, rocky slopes is xerarch, succession on pond, lake, marshy area called hydrarch etc	correct explanation of any two criteria (1.5)	correct explanation of any one criteria (1)	Some relevant information(0.5)	Wrong answer (0)		
<i>OR</i>	Integrated disease management i.e definition, procedure and objective etc	Correct explanation of any two criteria (3)	Correct explanation of any one criteria (2)	Some relevant information (1)	Wrong answer (0)		
2(viii)	Procedure for construction of genomic library i.e construction of recombinant DNA , transformation of expression system, identification of transformed gene OR gene library , gene bank , probe	Correct explanation of any two criteria (3)	Correct explanation of any one criteria (2)	Some relevant information (1)	Wrong answer (0)		

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	etc						
OR	Differentiate between sympathetic and para sympathetic nervous system i.e sympathetic involves autonomic functions, fight and flight, spinal nerves while parasympathetic returns to normal, violent activity ,cranial and vagus nerve	Any three correct differences (3)	Any two correct differences (2)	Any one correct difference (1)	Some relevant information (0.5)	Wrong answer (0)	
2(ix)	A. Genetic marker i.e land marks of genetic maps, RFLPs, tandem repeats, single nucleotide polymorphs etc	Correct explanation of any one criteria (1)	Partially correct explanation (0.5)	Wrong answer(0)			
	B. Genomics i.e deals with exploration and analysis ,DNA sequences, genome of organism etc	Correct explanation of any one criteria (1)	Partially correct explanation (0.5)	Wrong answer (0)			
	C. Genome maps i.e shows sequence of gene loci, sequence of nucleotide, genetic maps,	Correct explanation of any one criteria (1)	Partially correct explanation (0.5)	Wrong answer (0)			

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	physical maps etc						
OR	Local anesthesia and transmission of pain impulses i.e decreases sodium ion permeability, interrupts nerve transmission, cause euphoria, unconscious etc	Any related reason (3)	Partially correct explanation (2)	Some relevant information (1)	Wrong answer (0)		
2(x)	Decrease of biomass at higher trophic levels i.e energy loss, 10% transferred to next level, number of individuals share food energy, OR sketch of pyramid etc	Correct explanation of any related reason (3)	Partially correct explanation of any related reason (2)	Some relevant information (1)	Wrong answer (0)		
OR	Child with blood group O with parents of blood group A and B i.e cross showing genotypes , phenotypes etc	Correct explanation through cross (3)	Partially correct explanation with or without cross (2)	Only cross or description only (1)	Some relevant information (0.5)	Wrong answer (0)	
2(xi)	Applications of DNA analysis i.e identify potential suspects, identify crime and catastrophe victims, establish paternity, detect bacteria, match organ donors	Any three correct applications (3)	Any two correct applications (2)	Any one correct application (1)	Some relevant information (0.5)	Wrong answer (0)	

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	etc						
OR	Home gardening i.e farming system that combines physical ,social and economic functions on area of land etc	Correct explanation (1)	Partially correct explanation(0.5)	Wrong answer(0)			
	Benefits of home gardening i.e Fuel for cooking, food, herbs, spices nutritious food, sale from home garden, large amount of food etc	Any four correct benefits (2)	Any three correct benefits (1.5)	Any two correct benefits (1)	Any one correct benefit (0.5)	Wrong answer (0)	
2(xii)	Law of Segregation	Correct statement of law (1)	Partially correct statement (0.5)	Wrong answer (0)			
	Cross between round and wrinkled seed i.e drawing, labeling of genotypes, phenotypes etc	Correct cross showing genotypes and phenotypes (2)	Partially correct cross with genotypes and phenotypes (1)	Only cross with no genotypes and phenotypes (0.5)	Wrong answer (0)		
OR	Steps in sequencing of DNA i.e generate piece of DNA, separation of pieces of DNA, reading of sequence	Correct explanations of any three steps (3)	Correct explanations of any two steps (2)	Correct explanations of any one step (1)	Some relevant information (0.5)	Wrong answer (0)	

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	from gel etc						
2(xiii)	Epistasis i.e effect caused by one gene at one locus hides effect at other locus etc	Correct explanation of epistasis (1)	Partially correct explanation(0.5)	Wrong answer(0)			
	Difference between epistasis and dominance i.e single gene pair verses two pairs of allele, suppresses expression of own allele verses allele of another gene, recessive allele suppressed verses both recessive and dominant, etc	Any two correct differences (2)	Any one correct difference (1)	Some relevant information (0.5)	Wrong answer (0)		
OR	Growth i.e number of individuals, lag phase, exponential phase etc	Correct explanation of any two criteria (1)	Correct explanation of any one criteria (0.5)	Wrong answer (0)			
	Distribution i.e Dispersion of individuals, clumped , random, uniform etc	Correct explanation of any two criteria (1)	Correct explanation of any one criteria (0.5)	Wrong answer (0)			

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	Carrying capacity i.e limit to number of individuals, space , resources etc	Correct explanation of any two criteria (1)	Correct explanation of any one criteria (0.5)	Wrong answer (0)			
2(xiv)	Role of vaccination i.e vaccination against polio, measles, hepatitis, tetanus, covid etc	Correct explanation of any two criteria (3)	Correct explanation of any one criteria (2)	Some relevant information (1)	Wrong answer (0)		
OR	Inheritance pattern of yellow flower with red flower i.e incomplete dominance, cross showing P 1, F1 , F 2 generations etc	Correct explanation through cross (3)	Partially correct explanation with or without cross (2)	Only cross or description only (1)	Some relevant information(0.5)	Wrong answer(0)	
Q.3	Identification of extraembryonic layers in first trimester A-----chorion B__amnion C__villi of chorion/umbilical blood vessels D__yolk sac	Correct identification of four parts (2)	Correct identification of any three parts (1.5)	Correct identification of any two parts (1)	Correct identification of any one part (0.5)	Wrong answer(0)	
	Correlation of chorion, amnion, villi of chorion,/ umbilical	Correct correlation of all four parts (4)	Correct correlation of any three parts (3)	Correct correlation of any two parts (2)	Correct correlation of any one part(1)	Some relevant information (0.5)	Wrong answer (0)



Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	blood vessels and yolk sac						
OR	Identification of parts E ___ LH F ___ FSH G ___ Progesterone H ___ Estrogen	Correct identification of all four parts (2)	Correct identification of any three parts (1.5)	Correct identification of any two parts (1)	Correct identification of any one part (0.5)	Wrong answer (0)	
	Major events of menstrual cycle i.e menstrual phase, proliferative phase, secretory phase	Correct explanation of any three events(4)	Correct explanation of any two events(3)	Correct explanation of any one event(2)	Some relevant information (1)	Wrong answer (0)	
Q.4	Habituation	Correct explanation with example (1.5)	Correct explanation without example (1)	Some relevant information (0.5)	Wrong answer (0)		
	Conditioning classical OR instrumental	Correct explanation with example (2.5)	Correct explanation without example (2)	Some relevant information (1)	Wrong answer (0)		
	Latent learning	Correct explanation with example (1.5)	Correct explanation without example (1)	Some relevant information (0.5)	Wrong answer (0)		
	Insight learning	Correct explanation with example (1.5)	Correct explanation without example (1)	Some relevant information (0.5)	Wrong answer (0)		
OR	Initiation phase of transcription	Correct explanation (2)	Partially correct explanation (1)	Some relevant information (0.5)	Wrong answer (0)		
	Elongation phase of transcription	Correct explanation (2)	Partially correct explanation (1)	Some relevant information (0.5)	Wrong answer(0)		
	Termination phase of transcription	Correct explanation (1)	Partially correct explanation (0.5)	Wrong answer (0)			
	Post-transcriptional	Any two correct events (2)	Any one correct event (1)	Some relevant	Wrong answer		

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)	Level 6 (Marks)
	events of mRNA OR flow chart showing events etc			information (0.5)	(0)		
Q.5	Methods of gene therapy i.e in-vivo, ex-vivo	Correct explanation of both methods (2)	Correct explanation of any one method (1)	Some relevant information (0.5)	Wrong answer (0)		
	Role of gene therapy for cystic fibrosis	Correct explanation of role of gene therapy for cystic fibrosis with a proper sketch (4)	Correct explanation of role of therapy without sketch (3)	Partially correct explanation of therapy or explanation through labeled sketch only (2)	Some relevant information (1)	Wrong answer (0)	
OR	Anterior lobe of pituitary as master gland i.e regulates activity of other glands etc	Correct reason (1)	Partially correct reason (0.5)	Wrong answer (0)			
	Names of hormones of anterior lobe i.e GH/STH, TSH,ACTH,FSH, LH, ICSH,LTH	Names of any four hormones (2)	Names of any three hormones (1.5)	Names of any two hormones (1)	Names of any one hormone (0.5)	Wrong answer (0)	
	Functions of hormones	Correct functions of any three hormones (3)	Correct functions of any two hormones (2)	Correct functions of any one hormone (1)	Some relevant information (0.5)	Wrong answer (0)	
Q.6	Transport of oxygen	Correct description (2)	Partially correct description (1)	Some relevant information (0.5)	Wrong answer (0)		
	Transport of carbon dioxide as bicarbonate ions	Correct description (3)	Partially correct description OR diagram of transport (2)	Some relevant information (1)	Wrong answer (0)		

<b>Q.# /Part #</b>	<b>Criteria</b>	<b>Level 1 (Marks)</b>	<b>Level 2(Marks)</b>	<b>Level 3 (Marks)</b>	<b>Level 4 (Marks)</b>	<b>Level 5 (Marks)</b>	<b>Level 6 (Marks)</b>
	Transport of carbon dioxide as carboxyhaemoglobin	Correct description (1)	Partially correct description(0.5)	Wrong answer(0)			
	Transport of carbon dioxide dissolved in plasma	Correct description (1)	Partially correct description (0.5)	Wrong answer(0)			
OR	Sliding filament model i.e events of model , control of cross bridges etc	Correct description of both criteria (4)	Correct description of any one criteria (3)	Partially correct description(2)	Some relevant information(1)	Wrong answer(0)	
	Diagram of sliding filament model	Correct labeled diagram(3)	Partially labeled diagram(2)	Diagram with no labels (1)	Wrong answer(0)		