

**RUBRICS: HSSC 1<sup>ST</sup> ANNUAL EXAMINATION 2023**  
**SUBJECT: BIOLOGY-II**

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)
2(i)	Mechanism of osmoregulation in marine and fresh water	Any three correct comparisons like: active release /intake of salts, drink or not drink water, concentrated/ diluted urine, presence or absence of rectal/nasal glands, presence or absence of ionocytes, examples, diagrams etc. (3)	Any two correct comparisons (2)	Any one correct comparison/properly labeled diagram (1)	Some relevant information (0.5)	Wrong answer (0)
2(ii)	Role of counter current multiplier in concentrating urine	Correct description mentioning any of the two like: opposite flow of blood/interstitial fluid and filtrate, movement of water and ions from filtrate, involvement of loop of Henle, concentrated interstitial fluid in medulla region, extra reabsorption of water etc. (1)	Correct description mentioning any one criterion. (0.5)	Wrong answer (0)		
	Role of hormones in concentrating urine	Correct role of both hormones i.e., ADH/Vasopressin and Aldosterone in concentrating urine (2)	Correct role of any one hormone (1)	Only names of hormones (0.5)	Wrong answer (0)	
2(iii)	Labelling of Sarcomere diagram	Four correct labelling i.e., A= Myosin/thick filament B= Actin/thin filament C= H-zone D= A-band/dark band (2)	Any three correct labelling (1.5)	Any two correct labelling (1)	Any one correct labelling (0.5)	Wrong answer (0)
	Changes in labelled parts C and D	Description of both correct changes i.e., H-zone disappear, A-band/dark band remain unchanged (1)	Description of any one correct change (0.5)	Wrong answer (0)		
2(iv)	Names of bone cells	Correct names of three bone cells i.e., Osteocyte, Osteoblast, Osteoclast (1.5)	Correct names of any two bone cells (1)	Correct names of any one bone cells (0.5)		
	Functions of bone cells	Correct functions of three bone cells i.e., Osteocyte= mature bone cells, Osteoblast= bone forming cells/ mineral depositing cells, Osteoclast= bone dissolving cells/ bone demineralizing cells (1.5)	Correct function of any two bone cells (1)	Correct function of any one bone cell (0.5)	Wrong answer (0)	

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)
2(v)	Difference between two types of neurotransmitters	Any two correct differences between excitatory and inhibitory neurotransmitters like propagation or inhibition of nerve impulse, increase/decrease Na <sup>+</sup> permeability at postsynaptic membrane, lower/raise threshold of the stimulus etc. (2)	Any one correct difference between excitatory and inhibitory neurotransmitters (1)	Some relevant information (0.5)	Wrong answer (0)	
	Examples of neurotransmitters	Mentioning any one example of <b>Excitatory</b> (Acetylcholine, Serotonin, Norepinephrine, Epinephrine, Dopamine etc.) and any one of <b>Inhibitory</b> (Glycine, Endorphins, GABA etc.) neurotransmitters (1)	Mentioning one example of any type (0.5)	Wrong answer (0)		
2(vi)	Parts of limbic system	Correct names of three parts of limbic system i.e., hypothalamus, hippocampus, amygdala (1.5)	Correct names of any two parts (1)	Correct names of anyone part (0.5)	Wrong answer (0)	
	Functions of limbic system	One correct function of each part of limbic system i.e., <b>hypothalamus</b> (osmoregulation/ thirst, thermoregulation, menstrual cycle, link between Nervous and endocrine system, sleep awake cycle etc.) <b>Hippocampus</b> (short term to long term memory) <b>Amygdala</b> (feelings, emotions, love, hate, anger etc.) (1.5)	One correct function of any two parts of limbic system (1)	One correct function of anyone part of limbic system (0.5)	Wrong answer (0)	
2(vii)	Cross of ABO blood group system	Correct cross showing genotypes of parents ( $I^A \times I^B$ ), gametes ( $I^A, i, I^B \& i$ ) and offspring ( $I^A i, I^B i, I^A I^B, ii$ ) (3)	Partially correct cross with any four correct genotypes <b>OR</b> correct description of all genotypes without cross (2)	Partially correct cross with any two correct genotypes (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)
2(viii)	XO-XX Sex determination	Correct description/diagram of XO-XX pattern of sex determination mentioning male heterogametic/ female homogametic, sex determination by male/sperm, male produces nullo gamete (2)	Correct description/diagram of XO-XX pattern of sex determination mentioning any two criteria (1)	Some relevant information (0.5)		
	Example of XO-XX Sex determination	Anyone correct example like grasshopper, moths, protenor bug (1)	Wrong answer (0)			
2(ix)	Cause of phenylketonuria	Any one correct cause like: Point mutation at autosomal recessive gene, defective enzyme phenylalanine hydroxylase, non-conversion of phenylalanine to tyrosine, accumulation of phenylalanine etc. (1)	Some relevant information (0.5)	Wrong answer (0)		
	Symptoms of phenylketonuria	Any four correct symptoms like: lighter skin, hairs, eyes color, skin rashes, delayed mental and social skills, small head size, hyperactive, jerking movements of limbs seizures/ tremors etc. (2)	Any three correct symptoms (1.5)	Any two correct symptoms (1)	Anyone correct symptom (0.5)	Wrong answer (0)
2(x)	Griffith's experiment	Mentioning both <b>correct name</b> of scientist (Fredrick Griffith) and <b>Reason for experiment</b> (to check virulence of Streptococcus pneumoniae/DNA as heredity material/Transformation) (1)	Mentioning only the name of the scientist or reason for experiment. (0.5)	Wrong answer (0)		
	Results of experiment A-D	Correct result of A-D A= Mice remained alive B= Mice died C= Mice remained alive D= Mice died/ Transformation occurred (2)	Correct result of any three (1.5)	Correct result of any two (1)	Correct result of one (0.5)	Wrong answer (0)

Q.# /Part #	Criteria	Level 1 (Marks)	Level 2(Marks)	Level 3 (Marks)	Level 4 (Marks)	Level 5 (Marks)
2(xi)	Characteristics of Genetic code	Correct description of any three characteristics like: Universality of the code, specificity of the code, code degeneracy, no punctuation, non-overlapping etc. (3)	Correct description of any two (2)	Correct description of anyone (1)	Some relevant information (0.5)	Wrong answer (0)
2(xii)	Speciation	Correct definition (1)	Some relevant information (0.5)	Wrong answer (0)		
	Sympatric speciation	Correct description of sympatric speciation mentioning same habitat, reproductively isolated and polyploidy, example. (2)	Correct description with any three criteria (1.5)	Partially correct description with anyone criteria/example (1)	Some relevant information (0.5)	Wrong answer (0)
2(xiii)	Divergent evolution	Correct description mentioning any two characters like common ancestry, homology, homologous organ/organs with similar structures but different function etc. (2)	Correct description mentioning anyone characters (1)	Some relevant information (0.5)	Wrong answer (0)	
	Example of divergent evolution	Any two examples of homologous structures for divergent evolution like forearm of man, wings of bats, front legs of horse, flippers of dolphins/whale etc. (1)	Anyone examples of homologous structures for divergent evolution (0.5)	Wrong answer (0)		
2(xiv)	Endosymbiotic hypothesis of evolution	Correct description/diagram mentioning ingestion and endosymbiosis of smaller autotrophic bacteria as <b>chloroplast</b> , aerobic bacteria as <b>mitochondria</b> and spirochete as <b>flagellum</b> by larger/ heterotrophic prokaryotes. (3)	Correct description/diagram mentioning any two criteria (2)	Correct description/diagram mentioning anyone criteria (1)	Some relevant information (0.5)	Wrong answer (0)
2(xv)	Characteristics of population	Correct description of any three characteristics like growth, density, distribution, carrying capacity etc. (3)	Correct description of any two characteristics (2)	Correct description of any one characteristics (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)
2(xvi)	Sources of chlorofluorocarbons	Mentioning any three correct sources like aerosols, air freshners, coolants, air conditioners, refrigerants, insulating materials/foam etc. (1.5)	Mentioning of any two correct sources (1)	Mentioning of any one correct source (0.5)	Wrong answer (0)	
	Causes of ozone layer depletion	Mentioning any three correct causes like: CFCs, UV radiations, Release of free chlorine and fluorine, certain stratospheric conditions etc. (1.5)	Mentioning any two correct causes (1)	Mentioning anyone correct causes (0.5)	Wrong answer (0)	
2(xvii)	Role of CFTR gene	Mentioning correct role i.e., encodes protein for salt/chloride ion and water movement in and out of cell (1)	Some relevant information (0.5)	Wrong answer (0)		
	Symptoms of cystic fibrosis	Mentioning any two symptoms like production of thick, sticky mucous, obstruction of air passage and glands, recurrent infection in respiratory tract etc. (1)	Mentioning anyone symptom (0.5)	Wrong answer (0)		
	Gene therapy to cure cystic fibrosis	Correct description in-vivo gene therapy mentioning liposome formation, coating of liposomes by gene of interest and nasal spray of liposomes. (1)	Some relevant information (0.5)	Wrong answer (0)		
2(xviii)	Role of microbes in food processing	Correct description of any three microbes with their relevant role in food processing like: Streptococcus species Lactobacillus species Saccharomyces species etc. (3)	Correct description of any two (2)	Correct description of any one (1)	Some relevant information (0.5)	Wrong answer (0)
2(xix)	Techniques for animal cell culture	Correct description of <b>anchorage dependent</b> (mentioning any three; adherent cell, monolayer culture, limited generations/ finite cell line etc.) and <b>non-anchorage dependent</b> cell cultures (mentioning any three; suspension cells/ proliferation without attachment, unlimited generations/continuous	Correct mention of any two criteria of each type OR any three criteria of any one type (2)	Correct mention of any one criteria of each type OR any two criteria of any one type (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)
		cell lines/ infinite cell line, malignant cells etc.) (3)				
2(xx)	Acclimatization	Correct description of acclimatization mentioning growing plants in new climate etc. (1)	Some relevant information (0.5)	Wrong answer (0)		
	Selection	Correct description of selection mentioning any two criteria like picking better ones / favoring beneficial organisms /removing inferiors etc. (1)	Some relevant information (0.5)	Wrong answer (0)		
	Role of acclimatization and Selection in crop improvement	Correct description of roles like improved, better, beneficial, stable, new varieties of organisms. (1)	Some relevant information (0.5)	Wrong answer (0)		
3(a)	Stages of menstrual cycle	Correct description of <b>Menstrual phase</b> mentioning any four criteria like duration, contraction of uterine wall, rupturing of capillaries, shedding of thick/fatty lining of endometrium, menstrual flow etc. (2)	Correct description of any three criteria (1.5)	Correct description of any two criteria (1)	Some relevant information (0.5)	Wrong answer (0)
		Correct description of <b>Proliferative/ Follicular/ Pre-ovulatory phase</b> mentioning any four criteria like duration, follicle growth, level/role of FSH, Graafian follicle, estrogen level, vascularization/ thickening of endometrium, cervical mucous thickening etc. (2)	Correct description of any three criteria (1.5)	Correct description of any two criteria (1)	Some relevant information (0.5)	Wrong answer (0)
		Correct description of <b>Ovulatory phase</b> mentioning any two criteria like duration, level of LH, FSH & Estrogen, rupturing of Graafian follicle, ovulation, Corpus luteum formation etc. (1)	Correct description 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)
		Correct description of <b>Secretory/Luteal/ post-ovulatory phase</b> mentioning any four criteria like duration, level of Estrogen & Progesterone, thickening & vascularization of endometrium, release of nutritious glycogen etc. (2)	Correct description of any three criteria (1.5)	Correct description of any two criteria (1)	Some relevant information (0.5)	Wrong answer (0)
	Diagram of menstrual cycle	Correctly sketched & labelled diagram showing ovarian, uterine and hormonal changes in all phases of cycle. (2)	Partially sketched showing any two types changes in all phases of cycle. (1)	Some relevant information (0.5)	Wrong answer (0)	
3(b)	Latent Learning	Correct description like routine learning, no involvement of reward or punishment, recalling previous experience etc. (1)	Some relevant information (0.5)	Wrong answer (0)		
	Example of latent learning	Correct description of example of Rat learning in Maze, experiment of Lashley, outcome of experiment/example. (3)	Partially correct description (1.5)	Some relevant information (1)	Wrong answer (0)	
4 (a)	Names of Thyroid hormones	Correct names of any two thyroid hormones T3, T4/thyroxin & Calcitonin (1)	Correct names of any one thyroid hormones (0.5)	Wrong answer (0)		
	Functions of <b>T3 &amp; T4/Thyroxin</b>	Any four correct functions of <b>T3&amp;T4</b> (increased basal metabolism, glucose catabolism, cholesterol synthesis, embryonic development, mental, skeletal & muscular development, growth, peristaltic movements etc.) (2)	Any three correct functions of <b>T3&amp;T4</b> (1.5)	Any two correct functions of <b>T3&amp;T4</b> (1)	Any one correct functions of <b>T3&amp;T4</b> (0.5)	Wrong answer (0)
	Functions of <b>Calcitonin</b>	Any four correct functions of <b>Calcitonin</b> (released when high Ca <sup>++</sup> , lowers blood Ca <sup>++</sup> , increased Ca <sup>++</sup> deposition in bones, inhibit intestinal Ca <sup>++</sup> absorption, low Ca <sup>++</sup> reabsorption by kidneys etc.) (2)	Any three correct functions of <b>Calcitonin</b> (1.5)	Any two correct functions of <b>Calcitonin</b> (1)	Any one correct function of <b>Calcitonin</b> (0.5)	Wrong answer (0)
	Problems in abnormal secretion of thyroid hormones	Correct description of any two problems of hyper/hypothyroidism like	Correct description of any one problem (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)		
		<b>Grave's disease myxedema, cretinism, goiter</b> with relevant symptoms etc. (2)						
4 (b)	Events of Gastrulation in Human	Gastrulation correctly explaining formation of any four structures trophoblast, inner cell mass, embryonic disc, amnion/amniotic fluid, yolk sac, epiblast, hypoblast, ectoderm, mesoderm & endoderm. (4)	Gastrulation correctly explaining formation of any three structures (3)	Gastrulation correctly explaining formation of any two structures (2)	Gastrulation correctly explaining formation of any one structure (1)	Some relevant information (0.5)	Wrong answer (0)	
	Diagrams of Gastrulation	Correctly drawn diagrams with four labeling (2)	Correctly drawn diagrams with three labeling (1.5)	Correctly drawn diagrams with two labeling (1)	Correctly drawn diagrams with one labeling (0.5)	Wrong answer (0)		
5 (a)	Mechanism of DNA analysis/ RFLP	Correct definition and description of DNA analysis using RFLP explaining any five steps like collection DNA, formation of RFLPs, placement & separation of RFLPs, denaturation of RFLPs, Blotting, Labelling RFLPs, Autoradiography (7)	Correct definition and description of DNA analysis using RFLP explaining any four steps (6)	Correct definition and description of DNA analysis using RFLP explaining any three steps (5)	Correct definition and description of DNA analysis using RFLP explaining any two steps (4)	Correct definition and description of DNA analysis using RFLP explaining any one steps (3)	Correct definition only (2) Some relevant information (1)	Wrong answer (0)
5 (b)	Transport of CO <sub>2</sub> as Bicarbonate ion from body tissue to blood	Correct description of CO <sub>2</sub> transport mentioning formation of H <sub>2</sub> CO <sub>3</sub> , HCO <sup>-</sup> ion, water and CO <sub>2</sub> , role of enzyme carbonic anhydrase, chloride shift, Hamburger's phenomenon diagram/equation etc.(3)	Partially correct description of CO <sub>2</sub> transport with diagram (2)	Partially correct description of CO <sub>2</sub> transport without diagram (1.5)	Some relevant information (1)	Wrong answer (0)		
	Transport of CO <sub>2</sub> as Bicarbonate ion from blood to Alveoli	Correct description of CO <sub>2</sub> release/reverse mentioning formation of H <sub>2</sub> CO <sub>3</sub> , HCO <sup>-</sup> ion, water and CO <sub>2</sub> , role of enzyme carbonic anhydrase, chloride shift, Hamburger's phenomenon diagram/equation etc. (3)	Partially correct description of CO <sub>2</sub> transport with diagram (2)	Partially correct description of CO <sub>2</sub> transport without diagram (1.5)	Some relevant information (1)	Wrong answer (0)		

**Note:** All the markers must know the solutions of all the question items of the question paper before starting marking.