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HSSC-I NATIONAL BOOK FOUNDATION FBISE

BIOLOGY TEST - CHAPTER 4: BIOENERGETICS

Name:		Roll No.		Section:

Total Time: 2:30 Hour
Time Allowed: 150 Minutes

Total Marks: 150

PAPER OBJECTIVE
SECTION-A (MARKS 150)

NOTE: Section-A is compulsory. All parts of this section are to be answered on these pages and handed over to the center superintendent. Deleting / overwriting is not allowed. Do not use lead pencil.

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

Questions	A	B	C	D	A B C D
1. The quantitative study of energy conversions and energy relationships in biological systems is called:	bioinformatics	biotechnology	bioenergetics	biogeography	○○●○
2. The two most fundamental bioenergetic processes are photosynthesis and:	digestion	excretion	respiration	transpiration	○○●○
3. Chemically, photosynthesis is a:	hydrolysis process	redox process	decay process	neutralisation process	○●○○
4. In photosynthesis, water acts as the reducing agent and is oxidised to:	oxygen	carbon dioxide	ozone	hydrogen peroxide	●○○○
5. Photosynthesis converts energy-poor molecules CO_2 and H_2O into an energy-rich molecule such as:	glucose	ATP only	oxygen	starch only	●○○○
6. The full range of electromagnetic radiation in the universe is called the:	action spectrum	emission spectrum	electromagnetic spectrum	absorption spectrum	○○●○
7. A graph that shows the effectiveness of different wavelengths of light for photosynthesis is called the:	electromagnetic spectrum	action spectrum	absorption spectrum	emission spectrum	○●○○
8. The wavelengths of light most effective for photosynthesis are:	orange and violet	green and yellow	blue (430 nm) and red (670 nm)	infrared and ultraviolet	○○●○
9. Carbon dioxide is utilised in the:	light-independent reaction (Calvin cycle)	glycolysis	light reaction	Krebs cycle	●○○○
10. The air contains about what percentage of carbon dioxide?	1%	21%	78%	0.03–0.04%	○○○●
11. When the CO_2 concentration rises above 1%, the rate of photosynthesis rapidly slows down due to:	stomatal closing	water loss	chlorophyll breakdown	excess light	●○○○
12. Aquatic photosynthetic organisms use dissolved CO_2, bicarbonates and:	sulphates	chlorides	carbonates	nitrates	○○●○
13. Van Niel's observation was based on photosynthetic bacteria that make carbohydrates from CO_2 but do not release:	water	nitrogen	oxygen	hydrogen	○○●○
14. Van Niel's hypothesis was confirmed in 1940 by the use of the isotope:	^{32}P	^{14}C	^{18}O	^{15}N	○○●○

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Questions	A	B	C	D	A B C D
15. When water tagged with ^{18}O was added to an alga suspension, the evolved oxygen was:	absent	radioactive (labelled)	unlabelled	converted to CO_2	○●○○
16. These experiments proved that the source of evolved oxygen is:	carbon dioxide	water	chlorophyll	glucose	○●○○
17. Any substance that absorbs light energy for use in food synthesis is called a:	hormone	pigment	vitamin	coenzyme	○●○○
18. In photosynthetic bacteria, pigments are present in the:	nucleus	cytoplasm	chloroplast envelope	thylakoids	○●○○
19. The two general kinds of photosynthetic pigments are chlorophylls and:	carotenoids	melanins	phycocyanins only	anthocyanins	●○○○
20. The two major types of chlorophyll in plants are:	chlorophyll a and b	bacteriochlorophyll and chlorophyll e	chlorophyll d and e	chlorophyll c and d	●○○○
21. A chlorophyll molecule consists of a head and:	three tails	one tail	two tails	no tail	○○●○
22. The porphyrin ring consists of how many pyrrole rings?	6	3	2	4	○○○●
23. Each pyrrole ring contains how many carbons and nitrogens?	four carbons and four nitrogens	four carbons and one nitrogen	five carbons and no nitrogen	three carbons and two nitrogens	○●○○
24. The nitrogen atoms of the pyrrole rings interact with the central:	Fe atom	Ca atom	Mg atom	Zn atom	○○●○
25. Chlorophyll b has which group on the second pyrrole ring?	methyl ($-CH_3$)	aldehyde (–CHO)	phosphate	amino ($-NH_2$)	○●○○
26. The head of chlorophyll is:	non-polar and inert	hydrophobic and anchoring	hydrophilic and light absorbing	absent in thylakoids	○○●○
27. The tails of chlorophyll are:	hydrophilic and exposed	hydrophobic and embedded in the thylakoid membrane	light absorbing	made of porphyrin	○●○○
28. The synthesis of chlorophyll in plants requires sunlight, nitrogen, Mg and:	darkness	freezing temperatures	high CO_2	warm temperatures	○○○●
29. Deficiency of chlorophyll in leaves is called:	abscission	necrosis	etiolation	chlorosis	○○○●
30. Carotenoids are:	terpenoid lipids	polysaccharides	proteins	nucleic acids	●○○○
31. Carotenoids absorb light strongly in the:	red range only	blue-violet range	infrared range	green range only	○●○○

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Questions	A	B	C	D	A B C D
32. Pigments appear green because they:	reflect green light	transmit all light	absorb green light	emit green light	●○○○
33. The instrument used to measure the relative abilities of pigments to absorb light is the:	colorimeter	spectrophotometer	polarimeter	microscope	○●○○
34. The primary role of photosynthetic pigments is to absorb electromagnetic radiation and transmit the energy to the:	reaction centre	nucleus	cell wall	vacuole	●○○○
35. The chief component of a photosystem is:	carotene	xanthophyll	chlorophyll a	chlorophyll b	○○●○
36. Chlorophyll b, xanthophyll and carotenes are called:	reaction centres	coenzymes	primary pigments	accessory pigments	○○○●
37. Some carotenoids protect chlorophyll from intense light by:	reflecting all green light	absorbing and dispersing excessive energy	increasing CO_2	producing ATP	○●○○
38. Clusters of pigments embedded in the thylakoid membrane are called:	photosystems	plastids	stroma	grana	●○○○
39. The peripheral part of a photosystem is called the:	antenna complex	lumen	stroma	reaction centre	●○○○
40. The chlorophyll a of PS-I absorbs a maximum wavelength of:	660 nm	430 nm	680 nm	700 nm	○○○●
41. The chlorophyll a of PS-II absorbs a maximum wavelength of:	700 nm	680 nm	450 nm	660 nm	○●○○
42. The reaction centre of PS-I is called:	P660	P430	P680	P700	○○○●
43. The photosystems are named in the order in which they were:	used in the Calvin cycle	discovered	evolved	occur in the thylakoid	○●○○
44. Photosynthesis consists of two phases: the light-dependent phase and the:	dark respiration phase	light-independent phase	photorespiration phase	cyclic phase	○●○○
45. The production of ATP during the light reaction is called:	oxidative phosphorylation	glycolysis	substrate level phosphorylation	photophosphorylation	○○○●
46. In non-cyclic electron flow, the excited electrons:	enter the nucleus	do not return to their photosystem	are lost to the air	return to their photosystem	○●○○
47. In cyclic electron flow, the excited electrons:	combine with oxygen	are accepted by NADP	are lost	return to their photosystem	○○○●
48. The predominant pathway of the light reaction in higher plants is:	cyclic photophosphorylation	glycolysis	non-cyclic photophosphorylation	fermentation	○○●○

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Questions	A	B	C	D	A B C D
49. When PS-II absorbs light, its excited electrons are transferred to:	PS-I	the Calvin cycle	oxygen	NADP directly	●○○○
50. Electrons from PS-I are finally accepted by:	oxygen	water	$NADP^+$	ATP	○○●○
51. The splitting of water by light is called:	photorespiration	hydrolysis	photolysis	glycolysis	○○●○
52. The electrons released from water are used to fill the electron holes of:	PS-I	the mitochondrion	PS-II	the Calvin cycle	○○●○
53. After PS-II, the electrons move from the primary electron acceptor to:	ferredoxin	NADP reductase	plastoquinone (PQ)	cytochrome oxidase	○○●○
54. The cytochrome complex in the chloroplast consists of Cyt-b_6 and:	Cyt-c	Cyt-a	Cyt-a_3	Cyt-f	○○○●
55. The cytochrome complex pumps protons from the stroma into the:	nucleus	intermembrane space	thylakoid lumen	cytoplasm	○○●○
56. The protein that accepts electrons from PS-I is:	cytochrome c	ferredoxin (Fd)	ubiquinone	plastocyanin	○●○○
57. Ferredoxin is an:	copper-containing protein	iron-containing protein	sugar	magnesium-containing lipid	○●○○
58. The enzyme NADP reductase is a:	flavoprotein enzyme	lipid	hormone	carotenoid	●○○○
59. The zigzag path of electrons through the two photosystems is called the:	Z-scheme	Hatch–Slack cycle	Calvin cycle	Krebs cycle	●○○○
60. In cyclic photophosphorylation, only which photosystem is utilised?	PS-II	neither	both PS-I and PS-II	PS-I	○○○●
61. Cyclic photophosphorylation produces no NADPH and no:	proton gradient	ATP	release of oxygen	electron flow	○○●○
62. A temporary shift from non-cyclic to cyclic flow may occur when there is a rise in NADPH and a deficit of:	ATP	oxygen	water	glucose	●○○○
63. The light-independent phase requires NADPH, ATP and:	O_2	H_2O	CO_2	light directly	○○●○
64. The metabolic pathway of the dark reaction is called the:	Z-scheme	Calvin cycle	Hatch–Slack cycle	Krebs cycle	○●○○
65. Plants in which only the Calvin cycle occurs in the dark reaction are called:	CAM plants	C_2 plants	C_4 plants	C_3 plants	○○○●

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Questions	A	B	C	D	A B C D
66. The Calvin cycle was explored by:	Peter Mitchell	Melvin Calvin	Van Niel	Hatch and Slack	○●○○
67. The three phases of the Calvin cycle are carbon fixation, reduction and:	glycolysis	oxidation	photolysis	regeneration	○○○●
68. The CO_2 acceptor in the Calvin cycle is:	oxaloacetate	phosphoenol pyruvate	acetyl CoA	ribulose bisphosphate (RuBP)	○○○●
69. Ribulose bisphosphate is a:	four-carbon acid	three-carbon sugar	five-carbon sugar	six-carbon sugar	○○●○
70. When CO_2 combines with RuBP, intermediate molecules of how many carbons are formed?	6	4	3	5	●○○○
71. Each six-carbon intermediate breaks down into two molecules of:	3-phosphoglycerate (3-PGA)	oxaloacetate	pyruvate	G3P	●○○○
72. The process in which inorganic CO_2 becomes part of an organic compound is called:	deamination	carbon fixation	glycolysis	photolysis	○●○○
73. In the regeneration phase, five molecules of G3P are used to regenerate:	glucose	NADPH	ATP	RuBP	○○○●
74. In the regeneration phase, three molecules of ribulose phosphate react with three molecules of:	NADPH	CO_2	ATP	water	○○●○
75. To release one molecule of G3P from the Calvin cycle, the number of CO_2, NADPH and ATP molecules used are respectively:	9, 6 and 3	3, 6 and 9	6, 3 and 9	3, 9 and 6	○●○○
76. The two kinds of cellular respiration are aerobic and:	aphotic	anabolic	anaerobic	photic	○○●○
77. Aerobic respiration occurs in the presence of:	abundant atmospheric oxygen	light only	methane	nitrogen	●○○○
78. The organic molecule that generally undergoes breakdown in cellular respiration is:	glucose	ATP	starch	DNA	●○○○
79. Glycolysis breaks one glucose into how many molecules of pyruvate?	3	4	1	2	○○○●
80. The total ATP released in aerobic respiration in eukaryotes is:	2	4	38	36	○○○●
81. The total ATP released in aerobic respiration in prokaryotes is:	38	2	36	4	●○○○
82. Anaerobic respiration is also known as:	fermentation	photosynthesis	chemiosmosis	photolysis	●○○○

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Questions	A	B	C	D	A B C D
83. The two pathways of anaerobic respiration are lactic acid fermentation and:	citric acid fermentation	acetic acid fermentation	alcoholic fermentation	butyric fermentation	○○●○
84. Alcoholic fermentation is found in:	human muscles	viruses	plants only	yeast	○○○●
85. In alcoholic fermentation, acetaldehyde is reduced by NADH to:	pyruvate	acetic acid	ethanol	lactic acid	○○●○
86. In fermentation, NADH transfers its electrons so that it can return to pick up more electrons during:	photolysis	the Calvin cycle	the Krebs cycle	glycolysis	○○○●
87. The final products of lactic acid fermentation are:	CO_2 and water	glucose	lactic acid only	ethanol and CO_2	○○●○
88. The preparatory phase of glycolysis is an:	investment phase	pay-off phase	release phase	waste phase	●○○○
89. In the preparatory phase of glycolysis, how many ATPs are consumed?	2	0	1	4	●○○○
90. The end products of the preparatory phase are two molecules of:	G3P	citrate	acetyl CoA	pyruvate	●○○○
91. In glycolysis, four ATP are produced by substrate-level phosphorylation, but the net is:	4 ATP	2 ATP	0 ATP	6 ATP	○●○○
92. In glycolysis, the enzyme that converts phosphoenol pyruvate to pyruvate is:	enolase	aldolase	hexokinase	pyruvate kinase	○○○●
93. In glycolysis, 2-phosphoglycerate is dehydrated to phosphoenol pyruvate by:	pyruvate kinase	enolase	hexokinase	aldolase	○●○○
94. The oxidation of pyruvate is also called the:	Z-scheme	link reaction	Calvin cycle	Hatch–Slack cycle	○●○○
95. The link reaction connects:	the ETC with fermentation	glycolysis with the Krebs cycle	photosynthesis with respiration	the Calvin cycle with glycolysis	○●○○
96. During the link reaction, pyruvate is converted into:	oxaloacetate	lactic acid	acetyl CoA	citrate	○○●○
97. The first product of the Krebs cycle is:	oxaloacetate	citrate (citric acid)	fumarate	malate	○●○○
98. The enzyme that forms citrate from acetyl CoA and oxaloacetate is:	citrate synthetase	malate dehydrogenase	succinate dehydrogenase	aconitase	●○○○
99. Acetyl CoA (2C) combines with oxaloacetate (4C) to form a:	6-carbon compound	3-carbon compound	8-carbon compound	5-carbon compound	●○○○

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100. The intermediate compound between citrate and isocitrate is:	fumarate	malate	succinate	cis-aconitate	○○○●
101. Isocitrate is oxidised and decarboxylated to form:	alpha-ketoglutarate	malate	succinate	fumarate	●○○○
102. Succinate is oxidised to fumarate by:	malate dehydrogenase	aconitase	fumarase	succinate dehydrogenase	○○○●
103. Fumarate gains a water molecule to form:	succinate	citrate	malate	oxaloacetate	○○●○
104. Malate is dehydrogenated to produce:	oxaloacetate	fumarate	citrate	succinate	●○○○
105. The Krebs cycle is also called the:	citric acid or TCA cycle	Z-scheme	Calvin cycle	Hatch–Slack cycle	●○○○
106. In the Krebs cycle, substrate-level phosphorylation occurs when succinyl CoA is converted to:	fumarate	malate	succinate	citrate	○○●○
107. After the Krebs cycle, most of the energy of glucose is in the form of NADH and:	G3P	ATP	NADPH	$FADH_2$	○○○●
108. In the respiratory electron transport chain, the final electron acceptor is:	water	NAD^+	carbon dioxide	molecular oxygen	○○○●
109. The prosthetic groups of NADH dehydrogenase are FMN and:	Cyt-b	Fe-S complex	copper	Cyt-c	○●○○
110. Coenzyme Q is also known as:	ferredoxin	ubiquinone	plastocyanin	cytochrome c	○●○○
111. Ubiquinone is a small molecule soluble in:	lipids	water only	alkalis only	acids only	●○○○
112. Cytochrome reductase complex (III) is composed of Cyt-b, Fe-S and:	Cyt-a	$Cyt\text{-}c_1$	$Cyt\text{-}a_3$	FMN	○●○○
113. The mobile electron carriers of the respiratory chain are coenzyme Q and:	cytochrome c	Fe-S	cytochrome oxidase	FMN	●○○○
114. Cytochrome oxidase complex (IV) is composed of Cyt-a, $Cyt\text{-}a_3$ and:	manganese	zinc	copper	magnesium	○○●○
115. The accumulation of H^+ in the intermembrane space creates a:	water gradient	enzyme gradient	light gradient	proton gradient	○○○●
116. The electron transport chain makes no ATP directly; its function is to:	ease the fall of electrons from food to oxygen releasing energy in small steps	fix carbon dioxide	split water	synthesise glucose	●○○○

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117. The word cytochrome literally means:	cell wall	cell colour	cell energy	cell fluid	○●○○
118. The enzyme that synthesises ATP in respiration is:	ATPase hydrolase	pyruvate kinase	ATP synthetase	aconitase	○○●○
119. ATP synthetase is located in the:	matrix only	outer mitochondrial membrane	cytoplasm	inner mitochondrial membrane	○○○●
120. ATP synthetase has two parts:	alpha and beta only	head and tail only	F_o and F_1	A and B	○○●○
121. The F_1 part (elementary particle) of ATP synthetase:	is a cofactor	is embedded in the membrane	moves protons only	catalyses ATP synthesis from ADP and Pi	○○○●
122. Out of 36 ATP of aerobic respiration, how many result from substrate-level phosphorylation?	32	36	4	2	○○●○
123. Out of 36 ATP of aerobic respiration, how many are produced by chemiosmosis through the ETC?	36	4	2	32	○○○●
124. Endergonic reactions are those which:	produce water	release energy	release heat only	store energy	○○○●
125. An example of an endergonic process is:	protein synthesis	cellular respiration	combustion	glycolysis	●○○○
126. G3P is an important intermediate of both respiration and:	digestion	photosynthesis	fermentation only	excretion	○●○○
127. G3P plays a role in the inter-conversion of carbohydrates, lipids and:	minerals	water	vitamins	proteins (amino acids)	○○○●
128. When a fat is used for energy, it breaks down into glycerol and:	three amino acids	three fatty acids	three sugars	three nucleotides	○●○○
129. Glycerol from fats is converted to:	acetyl CoA	oxaloacetate	pyruvate	G3P	○○○●
130. The removal of the amino group from an amino acid in the liver is called:	deamination	hydrolysis	dehydration	decarboxylation	●○○○
131. The amino group removed from amino acids becomes ammonia, which enters the:	Calvin cycle	urea cycle	Krebs cycle	glycolysis	○●○○
132. Respiratory activity in green cells in the presence of light that releases CO_2 is called:	photolysis	glycolysis	fermentation	photorespiration	○○○●
133. Photorespiration begins when the CO_2 level inside the leaf drops to about:	5000 ppm	500 ppm	50 ppm	0.03%	○○●○

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134. In photorespiration, RuBisCO combines RuBP with:	H_2O	O_2	CO_2	N_2	○●○○
135. In photorespiration, the toxic two-carbon compound produced is:	glycolate only	pyruvate	serine	phosphoglycolate	○○○●
136. The glycolate is transported to the:	peroxisome	lysosome	Golgi body	ribosome	●○○○
137. In the peroxisome, glycolate is converted to glyoxylate and then to:	alanine	valine	serine	glycine	○○○●
138. Glycine is transported into the mitochondria and converted into:	pyruvate	citrate	glucose	serine	○○○●
139. Photorespiration is more likely to occur when the stomata are:	wide open at night	closed	absent	open	○●○○
140. When stomata are closed, the ratio of O_2 to CO_2 in the leaf:	becomes zero	decreases	remains constant	increases	○○○●
141. Some tropical plants avoid photorespiration through the:	link reaction	Z-scheme	fermentation	C_4 pathway	○○○●
142. In the C_4 pathway, CO_2 is fixed to phosphoenol pyruvate by:	PEP carboxylase	pyruvate kinase	RuBisCO	aconitase	●○○○
143. The first product of CO_2 fixation in C_4 plants is:	3-PGA	pyruvate	oxaloacetate	malate	○○●○
144. Oxaloacetate in C_4 plants is a:	six-carbon compound	five-carbon compound	four-carbon compound	three-carbon compound	○○●○
145. Examples of C_4 plants are:	potato, tomato and bean	maize, sugarcane and sorghum	pea, gram and lentil	wheat, rice and barley	○●○○
146. In C_4 plants, malate is transported to the chloroplasts of the:	bundle sheath cells	root cells	guard cells	epidermal cells	●○○○
147. In bundle sheath cells, malate is converted to pyruvate with the release of:	O_2	H_2	CO_2	N_2	○○●○
148. In C_4 plants, pyruvate regenerates PEP by consuming:	one water	one NADPH	one ATP	one CO_2	○○●○
149. The products of the light reactions of photosynthesis are:	glucose and oxygen	ATP and NADP only	ATP, PGA and oxygen	ATP, NADPH and oxygen	○○○●
150. ATP synthesis during the light reactions is called:	photophosphorylation	oxidative phosphorylation	substrate phosphorylation	glycolysis	●○○○

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