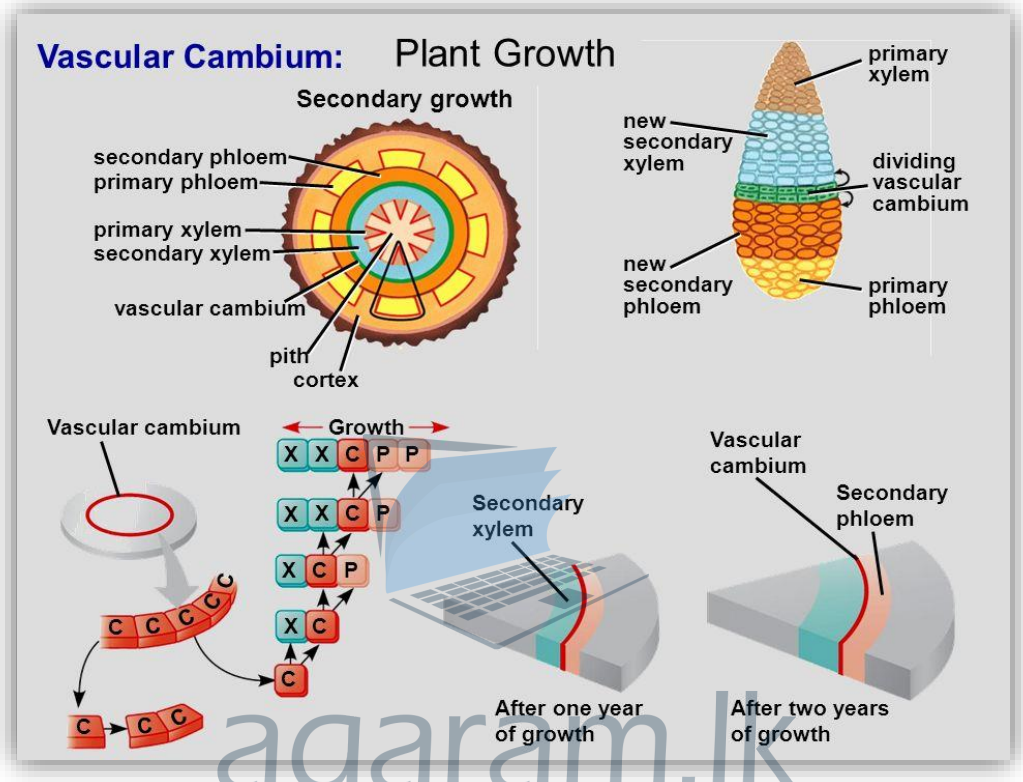
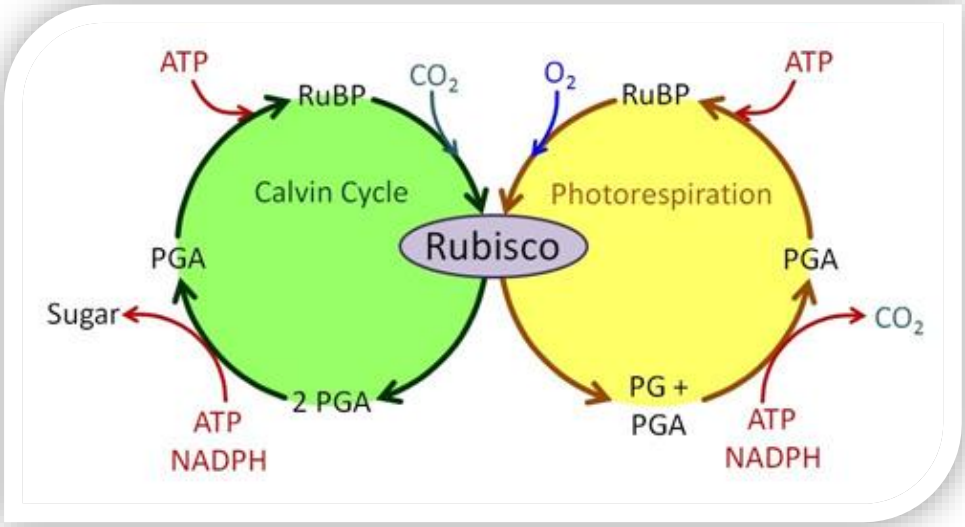
Field Work Centre

Term Examination March -2018

Grade: - 12 (2019)	Biology	Marking Scheme





Part – I

1.	2	6. 5	11. 3	16. 1	21. 1	26. 3
2.	4	7. 4	12. 2	17. 5	22. 5	27. 1
3.	3	8. 5	13. 4	18. 4	23. 3	28. 4
4.	2	9. 4	14. 3	19. 4	24. 5	29. 2
5.	2	10. 3	15. 3	20. 5	25. 3	30. 5

Part II

A. Structured Essay

1. A. i). a. Adaptation is a peculiarity of structure, physiology and behavior of an organism that promotes the like hood of organisms' survival and reproduction 2x

b. Viviparous 1x

ii). High specific heat, high latent heat of vaporization 2x

iii). Lactose glucose, galactose
Sucrose glucose, fructose (2+2)x

iv). Food reserve as energy source
Maintain the fluidity of the plasma membrane (phospholipid, cholesterol)
Signaling- molecules hormones
Component of plasma membrane of animals (cholesterol). 4x

B. i). a. Tertiary b. Quaternary 2x

ii). Reactants ATP and water
under go hydrolysis (with the involvement of enzymes)
giving ADP and P_i
yields energy as an exergonic reaction 4x

iii). Cytosine (No abbreviation accepted). 1x

iv). NAD, NADP, FAD any 2x

v). **Magnification**
is the ratio of an object's size
to its actual size 3x

Resolution power
is the minimum distance between two points
that can be distinguished as separate points. 3x

C. i). Phospholipid, protein, carbohydrate and cholesterol 4x

ii). Store and transport genetic information
Control all cellular activities
Synthesis DNA to produce new nuclei for cell divisions
Synthesis mRNA and tRNA according to the information present
on the DNA any 3x

iii). Synthesis/Produce ATP/ Energy
Photorespiration in plants 2x

iv). Collagen/glycoproteins
Proteoglycans/carbohydrates 2x

40 x 2.5 =100 Marks

2. A. i). Meiosis is a type of nuclear division which gives rise to four haploid, genetically non identical daughter nuclei, from a diploid mother cell. 2x

ii). Condensation of chromosomes
Synapsis
Chiasma / crossing over take place in homologous chromosomes 3x

iii). In anaphase I separation of homologous and reach the opposite poles
In anaphase II separation of (sister) chromatids and reach the opposite poles 2x

iv). Neuron/ cardiac muscle cell 1x

v). **In animal cell**
a cleavage furrow forms,
at the old metaphase plane with the aid of actin filaments and myosin molecules. 2x
In plant cell
Cell plate with pectin forms as a result of vesicles produced by Golgi apparatus. 2x

vi). Centrosomes, asters, spindle microtubules 3x

B. i). a. smooth endoplasmic reticulum
b. Glyoxisome
c. rough endoplasmic reticulum
d. central vacuole 4x

ii). smooth endoplasmic reticulum 1x

iii). a. Cell junctions are structures at which neighboring plasma membranes are joined. 1x

b.

Tight junctions	connect the plasma membranes of adjacent cell tightly bound/ prevent leakage of extra cellular fluids through intra cellular spaces	
Desmosomes/ Anchor junctions	mechanically attach the cytoskeletons of adjoining cells by intermediate filaments	
Gap/communication junctions	provide cytoplasmic channels from one cell to allow material and signals	(3+3)x

C	i).	Cellular respiration		1x
	ii).	a. carbohydrate	b. glucose	
		c. Lipid	d. amino acid	
		e. fatty acid	f. glyceraldehyde-3-phosphate	
		g. acetyl co enzyme A.		7x
	iii).	X. Krebs cycle	Y. Electron transfer chain	2x
	iv).	CO_2 , NADH		2x
	v).	ATP, H_2O, NAD^+ , FAD		4x
				40x2.5=100 marks.

3. A.	i).	a. 4	g. 7	
		b. 5	h. 1	
		c. 12	i. 10	
		d. 3	j. 9	
		e. 8	k. 6	
		f. 2	l. 11	12x
B.	i).	The taxonomic unit at any level/ rank of the hierarchy is known a taxon each taxon has a rank and a name		2x
	ii).	(Kingdom) Monera		1x
	iii).	Domain Bacteria Domain Achaea	(**If Domain not mentioned don't give marks**)	2x

iv).	**Domain Bacteria**	**Domain Achaea**	
	No branched lipid in plasma membrane	present	
	One type of RNA polymerase	many type of RNA polymerase	
	Protein synthesis starts with formyl methionine	Protein synthesis starts with methionine	(3+3)x

v).	An organism is named by two names first generic name second specific epithet generic name is usually a noun and specific epithet is an adjective describing a particular feature.	5x

C.	i).	RNA, Proteins	2x
	ii). a.	Cyanobacteria	1x
	b.	Eon- Achaean	1x
	iii).	Use and disuse, inheritance of acquired characteristics	2x

iv). Escape from predators (defense)
Tolerating physical conditions (stress conditions)
Obtaining food
Resistance against diseases
Fertilizing probability
Number of off spring produced

Any 5x

Any 40x2.5=100

4. A. i). Undifferentiated group of cells which constantly divide and produce new cells under suitable conditions provided. 1x

ii). living cells
are isodiametric(roughly spherical).
are structurally and functionally undifferentiated
have central nucleus
have dense cytoplasm
have ability to multiply any 5x

iii).

Shoot apex	**Root apex**
Found at the tips of shoot	found at the tip of the root
Protected by leaf primordial	protected by root cap
Produces new cells only inwards	produces new cells both inwards And outwards

3x

iv). Stamata, trichomes, root hairs 3x

v). a. The arrangement of leaves on the stem 1x
b. helps the plant to capture maximum sunlight 1x

B. i). ABA is produced in roots
in response to water deficiency
closure of stomata by accumulation of K^+ in guard cells.
This prevents the wilting of the plant 4x

ii). lost their protoplasm during maturation 1x

iii).a. Elements which are required for plants to complete its life cycle and produce another generation 2x

b. $H_2PO_4^-$ / HPO_4^{2-} component of ATP/nucleic acid/phospholipid
$H_2BO_3^-$ Cofactor in chlorophyll synthesis/ role in cell wall function/pollen tube growth 4x

iv). Symbiotic relationship between two different species which both participants are benefited 2x

v). In commensalism, one species gets the benefit and the other not affected
in parasitism, beneficial to parasite and harmful to host 2x

C. i). 1. b
2. a
3. d
4. e
5. c 5x

ii). Cross pollination- (mature) pollen reaches the (mature) stigma of another flower of the same species
Self-pollination- (mature) pollen reaches the (mature) stigma of the same (stigma of the) flower. 2x

iii). Heterostyly, unisexuality, self-infertility, dichogamy any 3x

40x2.5=100 marks.

Part II

B. Essay

5.a.

1) Calvin cycle takes place in the stroma of the chloroplast.
Can be described in three steps
2) Carboxylation/carbon fixation
3) Reduction
4) Regeneration of CO_2 acceptor
Carbon fixation
5) Ribulose bisphosphate/ RuBP
6) A five carbon sugar
7) Accept atmospheric CO_2
8) the addition of CO_2 to a RuBP is called carboxylation
9) An enzyme is involved in this reaction is RuBP carboxylase-oxygenase/Rubisco
10) The first product of RuBP carboxylation is an unstable 6C molecule
11) which break downs/split(immediately) into two molecules of
12) 3-phosphoglycerate/3-PGA
13) This is the first stable product of photosynthesis.

Reduction

14) Each molecule of 3-PGA (receives an additional phosphate group from ATP) become 1,3 Bis phosphoglycerate.
15) 1,3 Bis phosphoglycerate will be reduced to glyceraldehyde -3- phosphate/PGAL through step by step
16) enzyme catalyzed reactions
17) utilizing (whole) NADPH
18) and (a part of) ATP
19) from light reactions.
20) G3P/PGAL will act as a precursor for carbohydrate synthesis.

Regeneration

21) RuBP /CO_2 acceptor is regenerated by undergoing a series of complex reactions.
22) A part of G3P/PGAL
23) using (a part of) ATP
24) by producing RuMP
25) The remaining PGAL/G3P
26) through a series of reactions
27) to produce hexose sugars/Glucose/ other carbohydrates.

b.

28) Rubisco is capable of catalyzing two distinct reactions
29) acting as both a carboxylase and as an oxygenase
30) In the oxygenase reaction of Rubisco uses the same substrate, RuBP
31) but reacts with O_2
32) The reaction is catalyzed on the same site as the carboxylation reaction
33) Thus CO_2 and O_2 are competitive inhibitors.
34) Therefore, CO_2 inhibits the oxygenase reaction and
35) O_2 inhibits the carboxylase reaction
36) The oxygenase reaction forms just one molecule of 3-PGA and
37) 2C product 2-phosphogylcerate.
38) which is of no immediate use in the Calvin cycle.
39) and in higher concentrations it is toxic for the plants.
40) It is therefore has to be processed in a metabolic path way called Photorespiration.
41) The photo respiratory path way involves enzymes in
42) chloroplasts, peroxisomes and mitochondria.
43) Photo respiration is not only energy demanding
44) but further more leads to a net loss of CO_2
45) If Rubisco reacts with O_2 instead of CO_2 plants make 50% less than of CO_2 has been used.
46) This potentially eliminates the net gain in photosynthetic carbon and loose the productivity.
47) The loss of carbon through photorespiration depend on the relative rate reactions of Rubisco.
48) Affinity of Rubisco for O_2 less sensitive to temperature than CO_2
49) Solubility of CO_2 decreases with increasing temperature than O_2

50) On a hot dry day most of the plants close their stomata
51) in order to conserve water.
52) At the same time O_2 is released in light reactions beginning to increase.
53) This conditions within leaf favor a waste full process photorespiration
54) under high temperature, dryness and high light intensities

Any 50x3= 150 Marks.

6.a.

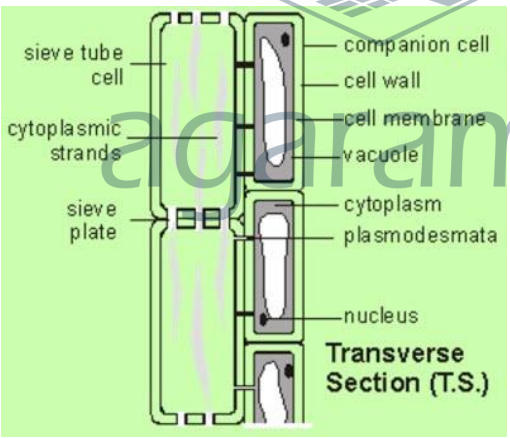
Phloem consists of

1) Sieve tube elements
2) Companion cells
3) Parenchyma cells and
4) Fibers
5) Except fibers, phloem has living cells
6) Sieve tube elements lack nucleus, ribosomes, a distinct vacuole and cytoskeletal elements.
7) Cytoplasm reduced into a thin peripheral layer
8) Chains of sieve tube elements are aligned to form sieve tube.
9) The end wall between sieve tube elements contain porous plate/sieve plate.
10) Companion cells are non-conducting cells
11) found alone side in each sieve tube element
12) and connects with sieve tube element by numerous plasmodesmata.
13) Nucleus and ribosomes of these cells
14) also serve to adjacent sieve tube element.
15) Some companion cells are modified into transferring cells
16) help in phloem loading and unloading

b.

17) In angiosperms, sieve tube elements of the phloem are specialized cells for translocation.
18) Sucrose(as 30% weight) is the major organic substance transported through phloem tissue and also
19) Amino acids
20) Vitamins
21) Plant growth regulators/substances/hormones
22) Inorganic ions/PO_4^{3-}/K^+
23) Transport can take place in both directions/bidirectional
24) Amount of material transport is very high
25) Rate of transport is also very high
26) Distance of transport can be high in some plants
27) The tissue from which translocation is begins is called the source/mesophyll cells.
28) The tissue of destination is called the sink/ root cells
29) Transfer cells/ some modified companion cells

30) actively/ using ATP/metabolic energy transport sucrose
31) into sieve tubes at the source
32) against concentration gradient.
33) This process is called phloem loading.
34) This increases the solute potential of sieve tubes
35) decrease the water potential of the sieve tubes
36) by osmosis
37) from adjacent xylem
38) resulting in a building of hydrostatic pressure in sieve tubes.
39) Sucrose actively removed from the sieve tubes at the sink
40) through transfer cells
41) This is called phloem unloading.
42) This reduces solute potential in sieve tubes
43) increases water potential in sieve tubes
44) moving of water to adjacent xylem by osmosis
45) resulting decrease in hydrostatic pressure in sieve tubes
46) establishing a pressure potential gradient from source to sink
47) This allows sucrose solution to be transported along sieve tubes
48) passively by bulk flow driven by positive pressure (Pressure flow)
49) This mechanism is explained by pressure flow hypothesis.



Any 46x3= 138
Diagram 12

150 Marks.

7.

a. **Regulation mechanisms of enzymatic activities of cells**.

1) Allosteric regulations of enzymes
2) is behave like reversible non-competitive inhibitors
3) Regulatory molecules either activates/inhibits
4) Most enzymes regulated by allosteric regulation made for two/more sub units.
5) Each sub unit composed of a polypeptide chain with its own active site.
6) The entire complex oscillates between two different shapes
7) one is catalyzing active and
8) other inactive.
9) in this two forms regulatory molecule bind to a regulatory site/ allosteric site
10) When activator bunds with this regulatory site stabilizes the shape with functional active sites.
11) Whereas inhibitor binds with the regulatory site, it stabilizes the inactive form of enzymes.
12) Sub units of enzymes arranged in a way through which they transmit the signal quickly other sub units.
13) A single activator / inhibitor that bind to one regulatory site will affect the active site of all sub units.
14) e.g. allosteric activator ADP
15) allosteric inhibitor ATP (exceeded)
16) Co-operative inhibition
17) Binding of one substrate molecule can stimulate binding /activity at other active sites.
18) E.g. Haemoglobin is made up of four sub units. Binding of one molecule or O_2 increases the affinity for O_2 of the remaining sites.
19) Feedback inhibition
20) Metabolic path way is stopped by the inhibitory binding of its end product
21) Thereby limit the production of more end products than required and thus wasting chemical resources.

b. **Present system of classification and its basis**

1) Three domain systems of classification
2) Domain Bacteria, Archaea and Eukarya
3) are taxonomic ranks higher than the kingdoms
4) Carl Woese introduced this (present) system of classification
5) It is mainly based on the (rapid)advancements of molecular biology
6) and new information on the evolutionary relationships of organisms.
7) The sequence of bases of DNA of important genes.
8) Sequences of bases of DNA of mitochondria and chloroplasts.
9) The base sequence of ribosomal RNA.
10) The sequence of amino acids in common proteins.
11) Molecular structure of cellular components.

c. **Ground tissue**

1) There are three main types of cells are found in ground tissues
2) Parenchyma cells
3) Collenchyma cells
4) Sclerenchyma cells

Parenchyma

5) Living even at functional maturity
6) Mature cells are primary cell walls which are relatively thin, flexible
7) and most of the cells lack secondary walls
8) They have a large central vacuole.
9) E.g. mesophyll cell/any suitable example
10) Functions: photosynthesis/ synthesis of various organic products
11) Storage

Collenchyma

12) Elongated
13) walls unevenly thickened/ thickened at corners
14) found in stems just below the epidermis
15) petioles
16) Function: mechanical support

Sclerenchyma

17) Secondary cell walls are produced after cell elongation
18) Lignin is deposited in large amount
19) Dead at maturity

Two types

20) Sclereids: Shells/seed coat
21) Fibers: Coconut husk/hemp fibers
22) Function: Support and strength.

21+11+22=54

Any 50x3= 150

Part I	**30x1=30**
Part II	**400+300=700/10=70**
	Total= 100