SHRI VIDHYABHARATHI MATRIC HR.SEC.SCHOOL

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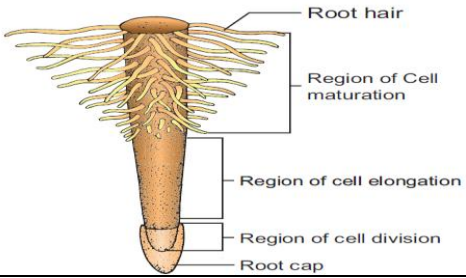
COMMON HALF YEARLY EXAMINATION - DEC- 2018

ANSWER KEY

STD: XI-PURE SCIENCE **DATE:19.12.2018**

SUBJECT: BOTANY **MARKS : 70**

Q. NO	ANSWER	MARKS
	SECTION -I	
1.	c) Apomixes	1
2.	b) A proteinaceous aleurone layer is present in maize grain	1
3.	d) Datura alone	1
4.	c) Palladium	1
5.	b) In Pisus sativam leaflets modified into tendrils	1
6.	b) Holoenzyme = Apoenzyme + Coenzyme	1
7.	b) Plerome	1
8.	b) i-d, ii-c, iii-a, iv-b	1
9.	a) Lipids can rarely flip-flop, proteins cannot	1
10.	3) a-iii, b-iv, c-i, d-ii	1
11.	a) Influx of K^+	1
12.	d) 15	1
13.	b) Closed and Scattered	1
14.	c) Acetyle CoA	1
15.	c) 3ATP+2NADPH	1
	SECTION -II **(Answer any 6 questions. Q.No. 22 is compulsory)**	**6x2=12**
16.	**Eustele**: The stele is split into distinct collateral vascular bundles around the pith. Example: Dicot stem.	1½ ½
17.	**Nucule:** The Nucule is located above the Globule. The antheridium is spherical, macroscopic and its wall is made up of eight cells called shield cells.	2
18.	Regions of Root:  (Diagram 1 + Parts 1)	2
19.	**Photophosphorylation:** The addition of phosphate here takes place with the help of light generated electron and so it is called as **photophosphorylation**. It takes place in both cyclic and non-cyclic electron transport.	2

20. **Polygamous**:
The condition in which bisexual and unisexual (staminate/pistillate) flowers occur in a same plant is called **polygamous**. It is of several types. 1 ½
Example: **Musa, *Mangifera*.** ½

21. **Capnophilic Bacteria**
Bacteria which require CO_2 for their growth are called as capnophilic bacteria. 2
Example: *Campylobacter.*

22. **Differences between Pinus and Morus**

Non porous wood or Soft wood, Example: *Pinus*	**Porous wood or Hard wood, Example: *Morus***	1
Common in gymnosperms	Common in angiosperms	1
Non-porous because it does not contain vessels	Porous because it contains vessels	

23. **Significance of Resting phase of the cell cycle**
Some cells exit G_1 and enters a quiescent stage called **G_0**, where the cells remain metabolically active without proliferation. Cells can exist for long periods in G_0 phase. In G_0 cells cease growth with reduced rate of RNA and protein synthesis. The G_0 phase is not permanent. Mature neuron and skeletal muscle cell remain permanently in G_0. Many cells in animals remains in G_0 unless called on to proliferate by appropriate growth factors or other extracellular signals. **G_0** cells are not dormant. 2

24. **Respiratory quotient of succulent plant**
In some succulent plants like O*puntia, Bryophyllum* carbohydrates are partially oxidised to organic acid, particularly malic acid without corresponding release of CO_2 but O_2 is consumed hence the RQ value will be zero. 1
$2C_6H_{12}O_6 + 3O_2 \rightarrow 3C_4H_6O_5 + 3H_2O$ + Energy
Glucose Malic acid
RQ of glucose in succulents = zero molecule of CO_2 / 3 molecules of O_2 1
= 0 (zero)

SECTION -III **6x3=18**
(Answer any six. Q.No. 27 is compulsory)

25. **Difference between Spike and Spadix:**

Spike	**Spadix**	**2**
Spike is an unbranched indeterminate inflorescence with **sessile flowers**.	An inflorescence with a fleshy or thickened central axis that possesses many unisexual sessile flowers in acropetal succession. Usually female flowers are found towards the base and male flowers are found at the apex. Entire inflorescence is covered by a brightly coloured or hard bract called a spathe.	
Example: *Achyranthes*, *Stachytapheta.*	Example: *Amorphophallus*, *Colocasia, Phoenix, Cocos.*	**1**

26. **Technical Terms for the following:**
a) A sterils stamen - **Staminodes** 1
b) Stamens are united in one bunch - **Monadelphous** 1
c) Stamens are attached to the petals - **Epipetalous** 1

27.	**Significance of pentose phosphate pathway (Any 3 points)** ❖ HMP shunt is associated with the generation of two important products, NADPH and pentose sugars, which play a vital role in anabolic reactions. ❖ Coenzyme NADPH generated is used for reductive biosynthesis and counter damaging the effects of oxygen free radicals ❖ Ribose-5-phosphate and its derivatives are used in the synthesis of DNA, RNA, ATP, NAD^+, FAD and Coenzyme A. ❖ Erythrose is used for synthesis of anthocyanin, lignin and other aromatic compounds.	3
28.	**Significance of Mitosis (Any 3 points)** Exact copy of the parent cell is produced by mitosis (genetically identical). ❖ **Genetic stability** – daughter cells are genetically identical to parent cells. ❖ **Growth** – as multicellular organisms grow, the number of cells making up their tissue increases. The new cells must be identical to the existing ones. ❖ **Repair of tissues** - damaged cells must be replaced by identical new cells by mitosis. ❖ **Asexual reproduction** – asexual reproduction results in offspring that are identical to the parent. Example Yeast and Amoeba. ❖ In flowering plants, structure such as bulbs, corms, tubers, rhizomes and runners are produced by mitotic division. When they separate from the parent, they form a new individual. ❖ The production of large numbers of offsprings in a short period of time, is possible only by mitosis. In genetic engineering and biotechnology, tissues are grown by mitosis (i.e. in tissue culture). ❖ **Regeneration** – Arms of star fish	3
29.	**Farmers plant leguminous crops in crop rotations/mixed cropping*:*** ***(any 3 points)*** ❖ Legume plants secretes phenolics which attracts *Rhizobium*. ❖ *Rhizobium* reaches the rhizosphere and enters into the root hair, infects the root hair and leads to curling of root hairs. ❖ Infection thread grows inwards and separates the infected tissue from normal tissue. ❖ A membrane bound bacterium is formed inside the nodule and is called bacteroid. ❖ Cytokinin from bacteria and auxin from host plant promotes cell division and leads to nodule formation	3
30.	**Difference between Sclereids and Fibres: (Any 3 points)** **Sclereids**: • Short cells • Usually short and broad • Occurs individually or in small groups • Maybe branched • Develops from secondary sclerosis parenchyma cells **Fibre**: • Long cells • Narrow, Elongated pointed ends • Occurs in bundles • Commonly unbranched • Derived directly from meristematic tissue	3
31.	**Lateral meristem** Occurs along the longitudinal axis of stem and root. It is responsible for secondary tissues and thickening of stem and root. **Example**: vascular cambium and cork cambium.	2 1

32. **Uses of Enzyme: (Any 3 points)** — 3

Enzyme	Source	Application
Bacterial protease	Bacillus	Biological detergents
Bacterial glucose isomerase	Bacillus	Fructose syrup manufacture
Fungal lactase	Kluyveromyces	Breaking down of lactose to glucose and galactose
Amylases	Aspergillus	Removal of starch in woven cloth production

33. **Compensate photorespiratory losses:** — 1½

- ❖ The photo respiratory losses are checked by certain grasses by having physiological adaptation. The process of photosynthesis occurs in mesophyll cells and bundles sheath cells.

Mesophyll cells:

- ❖ Initially CO_2 is taken up by phosphoenol pyruvate (3C) and changed to oxaloacetate (4C) in the presence of PEP Carboxylase.
- ❖ Oxaloacetate is reduced to Malate / Aspartate. The product formed reached the bundle sheath.

Bundle sheath: — 1½

- ❖ The oxidation of Malate and Aspartate occurs with release of carbon di oxide and formation of pyruvate (3C)
- ❖ The photosynthetic losses are prevented.
- ❖ RUBP operates now under calvin cycle and pyruvate transported back to mesophyll cells is changed into phosphoenol pyruvate to keep the cycle going.

Section-IV — **5x5=25**

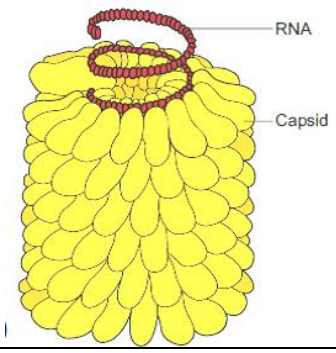
(Answer the following questions)

34. **Tobacco Mosaic Virus (TMV)** — 1

Tobacco mosaic virus was discovered in 1892 by Dimitry Ivanowsky from the Tobacco plant. Viruses infect healthy plants through vectors like aphids, locusts etc. The first visible symptom of TMV is discoloration of leaf colour along the veins and show typical yellow and green mottling which is the mosaic symptom. The downward curling and distortion of young apical leaves occurs, plant becomes stunted and yield is affected.

Structure — 3

Electron microscopic studies have revealed that TMV is a rod shaped helical virus measuring about 280x150µm with a molecular weight of 39x106 Daltons. The virion is made up of two constituents, a protein coat called **capsid** and a core called **nucleic acid**. The protein coat is made up of approximately 2130 identical protein subunits called **capsomeres** which are present around a central single stranded RNA molecule. The genetic information necessary for the formation of a complete TMV particle is contained in its RNA. The RNA consists of 6,500 nucleotides.



1

(OR)

Difference between Angiosperms and Gymnosperms (Any 5 points)			
S.No	**Angiosperms**	**Gymnosperms**	5
1.	Vessels are present	Vessels are absent [except Gnetales]	
2.	Companion cells are present	Phloem lacks companion cells	
3.	Ovules are enclosed within the ovary	Ovules are naked	
4.	Insects, wind, water, animals etc., act as pollinating agents	Wind pollination only	
5.	Double fertilization is present	Double fertilization is absent	
6.	Endosperm is triploid	Endosperm is haploid	
7.	Fruit formation is present	Fruit formation is absent	
8.	Flowers present	Flowers absent	

35. **Phyllotaxy**

The mode of arrangement of leaves on the stem is known as **phyllotaxy (Gk. Phyllon** = **leaf ; taxis** = **arrangement**). Phyllotaxy is to avoid overcrowding of leaves and expose the leaves maximum to the sunlight for photosynthesis. The four main types of phyllotaxy are (1) Alternate (2) Opposite (3) Ternate (4) Whorled.

1. Alternate phyllotaxy

In this type there is only one leaf per node and the leaves on the successive nodes are arranged alternate to each other. Spiral arrangement of leaves show vertical rows are called orthostichies. They are two types. 2

a) **Alternate spiral:** In which the leaves are arranged alternatively in a spiral manner. Example: ***Hibiscus, Ficus*.**

b) **Alternate distichous** or **Bifarious**: In which the leaves are organized alternatively in two rows on either side of the stem. Example: ***Monoon longifolium* (*Polyalthia longifolia*).**

2. Opposite phyllotaxy

In this type each node possess two leaves opposite to each other. They are organized in two different types.

i. **Opposite superposed:** The pair of leaves arranged in succession are in the same direction, that is two opposite leaves at a node lie exactly above those at the lower node. Example: ***Psidium* (Guava), *Eugenia jambolana* (Jamun), *Quisqualis* (Rangoon creeper)**. 1

ii. **Opposite decussate:** In this type of phyllotaxy one pair of leaves is placed at right angles to the next upper or lower pair of leaves. Example: ***Calotropis*, *Zinnia, Ocimum***

3. Ternate phyllotaxy

In this type there are three leaves attached at each node. Example: ***Nerium*** 1

4. Whorled (verticillate) type of phyllotaxy In this type more than three leaves are present in a whorl at each node forming a circle or whorl. 1

Example: ***Allamanda, Alstonia scholaris*.**

(OR)

Difference between Plant cell and Animal cell :

S. No	Plant cell	Animal Cell
1	Usually they are larger than animal cells	Usually smaller than plant cells
2	Cell wall present in addition to plasma membrane and consists of middle lamellae, primary and secondary walls	Cell wall absent
3	Plasmodesmata present	Plasmodesmata absent
4	Chloroplast present	Chloroplast absent
5	Vacuole large and permanent	Vacuole small and temporary
6	Tonoplast present around vacuole	Tonoplast absent
7	Centrioles absent except motile cells of lower plants	Centrioles present
8	Nucleus present along the periphery of the cell	Nucleus at the centre of the cell
9	Lysosomes are rare	Lysosomes present
10	Storage material is starch grains	Storage material is a glycogen granules

10x½ =5

36. **Floral Characters of Clitoria ternatea**

Inflorescence: Solitary and axillary ½

Flower: Bracteate, bracteolate, bracteoles usually large, pedicellate, heterochlamydeous, complete, bisexual, pentamerous, zygomorphic and hypogynous. ½

Calyx: Sepals 5, synsepalous, green showing valvate aestivation. Odd sepal is anterior in position. ½

Corolla: Petals 5, white or blue apopetalous, irregular papilionaceous corolla showing descendingly imbricate aestivation. ½

Androecium: Stamens 10, diadelphous (9)+1 nine stamens fused to form a bundle and the tenth stamen is free. Anthers are dithecous, basifixed, introse and dechiscing by longitudinal slits. 1½

Gynoecium: Monocarpellary, unilocular, with many ovules on mariginal placentation, ovary superior, style simple and incurved with feathery stigma.

Fruit: Legume

Seed: Non-endospermous, reniform.

Floral Formula: $Br.,Brl.,\%,\male\ K_{(5)},C_5,A_{(9)+1},\underline{G}_1$ ½

Floral diagram 1

(OR)

Anatomical differences between dicot stem and monocot stem			
S.No	**Characters**	**Dicot Stem**	**Monocot Stem**
1.	Hypodermis	Collenchymatous	Sclerenchymatous
2.	Ground tissue	Differentiated into cortex, endodermis and pericycle and pith	Not differentiated, but it is a continuous mass of parenchyma.
3.	Starch Sheath	Present	Absent
4.	Medullary rays	Present	Absent
5.	Vascular bundles	(a) Collateral and open	(a) Collateral and closed
		(b) Arranged in a ring	(b) Scattered in ground tissue
		(c) Secondary growth occurs	(c) Secondary growth usually does not occur.

5

37. **Potato Osmoscope**

i. Take a peeled potato tuber and make a cavity inside with the help of a knife.

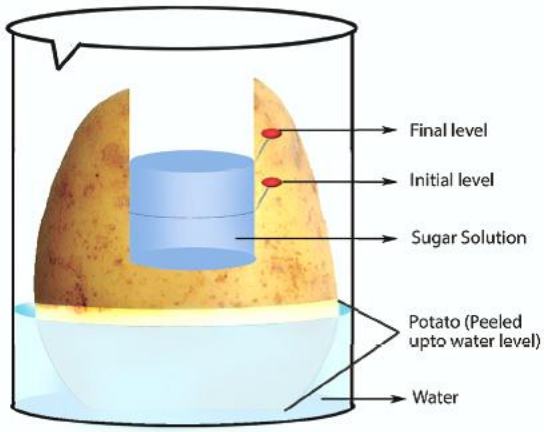
ii. Fill the cavity with concentrated sugar solution and mark the initial level.

iii. Place this setup in a beaker of pure water.

iv. After 10 minutes observe the sugar solution level and record your findings

v. With the help of your teacher discuss the results.

3



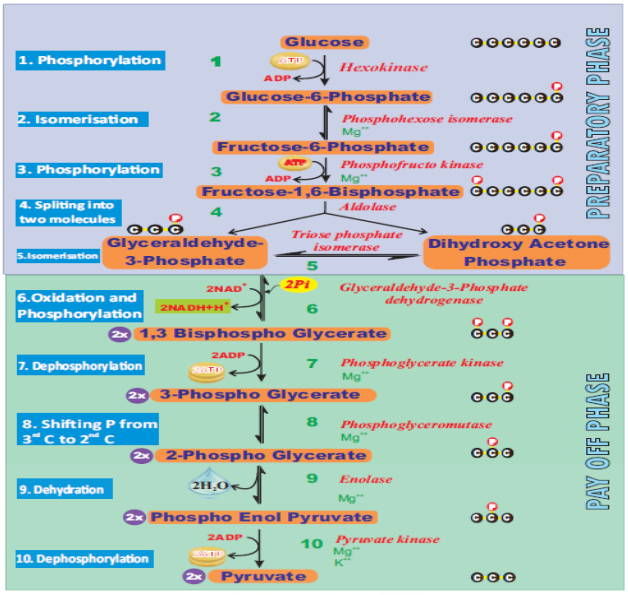
2

(OR)

Flow Chart of Glycolysis

Definition:

Glycolysis is a linear series of reactions in which 6-carbon glucose is split into two molecules of 3-carbon pyruvic acid.



5

(OR)

Explanation of Glycolysis:

It is the first and common stage for both aerobic and anaerobic respiration. It is divided into two phases.

1. **Preparatory phase** or endergonic phase or hexose phase (steps 1-5).
2. **Pay off phase** or oxidative phase or exergonic phase or triose phase (steps 6-10).

1. Preparatory phase

Glucose enters the glycolysis from sucrose which is the end product of photosynthesis. Glucose is phosphorylated into glucose-6-phosphate by the enzyme hexokinase, and subsequent reactions are carried out by different enzymes. At the end of this phase fructose-1, 6 - bisphosphate is cleaved into glyceraldehyde-3-phosphate and dihydroxy acetone phosphate by the enzyme aldolase. These two are isomers. Dihydroxy acetone phosphate is isomerised into glyceraldehyde-3-phosphate by the enzyme triose phosphate isomerase, now two molecules of glyceraldehyde 3 phosphate enter into pay off phase. During preparatory phase two ATP molecules are consumed in step-1 and step-3

2

2. Pay off phase

Two molecules of glyceraldehyde-3-phosphate oxidatively phosphorylated into two molecules of 1,3 - bisphospho glycerate. During this reaction 2NAD1 is reduced to 2NADH 1 H1 by glyceraldehyde- 3- phosphate dehydrogenase at step 6. Further reactions are carried out by different enzymes and at the end two molecules of pyruvate are produced. In this phase, 2ATPs are produced at step 7 and 2 ATPs at step10 Direct transfer of phosphate moiety from substrate molecule to ADP and is converted into ATP is called **substrate phosphorylation** or **direct phosphorylation** or **trans phosphorylation**. During the reaction at step 9, 2phospho glycerate dehydrated into Phospho enol pyruvate a water molecule is removed by the enzyme enolase. As a result, enol group is formed within the molecule. This process is called **Enolation.**

2

3. Energy Budget

In the pay off phase totally 4ATP and 2NADH 1 H1 molecules are produced. Since 2ATP molecules are already consumed in the preparatory phase, the net products in glycolysis are 2ATPs and 2NADH 1 H1.

1

38

Differences between Cyclic and Non-Cyclic Photophosphorylation (Any 5 points)

Cyclic Photophosphorylation	Non-Cyclic Photophosphorylation
1. PS I only involved	1. PS I and PS II involved
2. Reaction centre is P700	2. Reaction centre is P680
3. Electrons released are cycled back	3. Electron released are not cycled back
4. Photolysis of water does not take place	4. Photolysis of water takes place
5. Only ATP synthesized	5. ATP and NADPH + H^+ are synthesized
6. Phosphorylation takes place at two places	6. Phosphorylation takes place at only one place
7. It does not require an external electron donor	7. Requires external electron donor like H_2O or H_2S
8. It is not sensitive to di chloro di methyl urea (DCMI)	8. It is sensitive to DCMI and inhibits electron flow

5

(OR)

Nitrogen cycle

This cycle consists of following stages:

1. Fixation of atmospheric nitrogen

Di-nitrogen molecule from the atmosphere progressively gets reduced by addition of a pair of hydrogen atoms. Triple bond between two nitrogen atoms (N≡N) are cleaved to produce ammonia nitrogen fixation process requires Nitrogenase enzyme complex, Minerals (Mo, Fe and S), anaerobic condition, ATP, electron and glucose 6 phosphate as H1 donor. Nitrogenase enzyme is active only in anaerobic condition. To create this anaerobic condition a pigment known as **leghaemoglobin** is synthesized in the nodules which acts as oxygen scavenger and removes the oxygen. Nitrogen fixing bacteria in root nodules appears pinkish due to the presence of this leghaemoglobin pigment.

1

Overall equation:

$$N_2 + 8e^- + 8H^+ + 16ATP \longrightarrow 2NH_3^+ + H_2 + 16ADP + 16\ Pi$$

2. Nitrification

Ammonia (NH31) is converted into Nitrite (NO22) by *Nitrosomonas* bacterium. Nitrite is then converted into Nitrate (NO32) by *Nitrobacter* bacterium.

Plants are more adapted to absorb nitrate (NO32) than ammonium ions from the soil.

1

$$2\ NH_3^+ + 3\ O_2 \xrightarrow{Nitrosomonas} 2\ NO_2^- + 2\ H^+ + 2H_2O$$

$$2\ NO_2^- + O_2 \xrightarrow{Nitrobacter} 2\ NO_3^-$$

3. Nitrate Assimilation

The process by which nitrate is reduced to ammonia is called **nitrate assimilation** and occurs during nitrogen cycle.

1

$$NO_3^- \xrightarrow[Mo]{\text{Nitrate reductase}} NO_2^-$$

$$NO_2^- \xrightarrow[Cu,\ Fe]{\text{Nitrite reductase}} NH_3^+$$

4. Ammonification

Decomposition of organic nitrogen (proteins and amino acids) from dead plants and animals into ammonia is called **ammonification**. Organisim involved in this process are *Bacillus ramosus* and *Bacillus vulgaris*. 1

5. Denitrification

Nitrates in the soil are converted back into atmospheric nitrogen by a process called **denitrification**. Bacteria involved in this process are *Pseudomonas, Thiobacillus* and *Bacillus subtilis*. 1

$$\underset{(NO_3^-)}{\text{Nitrate}} \xrightarrow{Pseudomonas} \underset{(N_2)}{\text{Molecular Nitrogen}}$$

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