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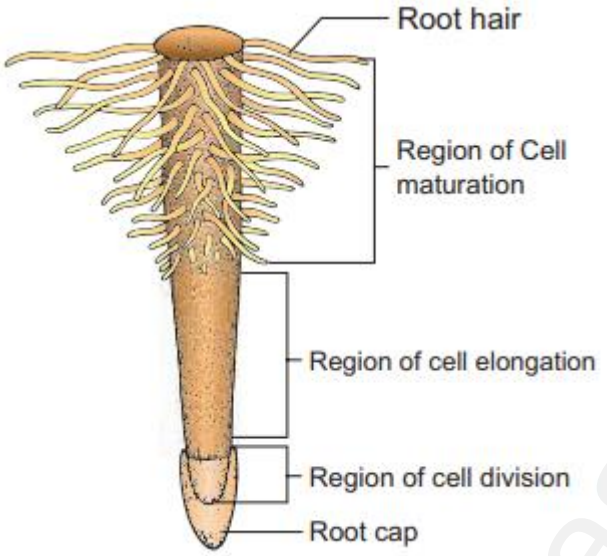
XI COMMON PUBLIC EXAMINATION, MARCH -2023 (24-03-2023)

TENTATIVE ANSWER KEY

Question type A

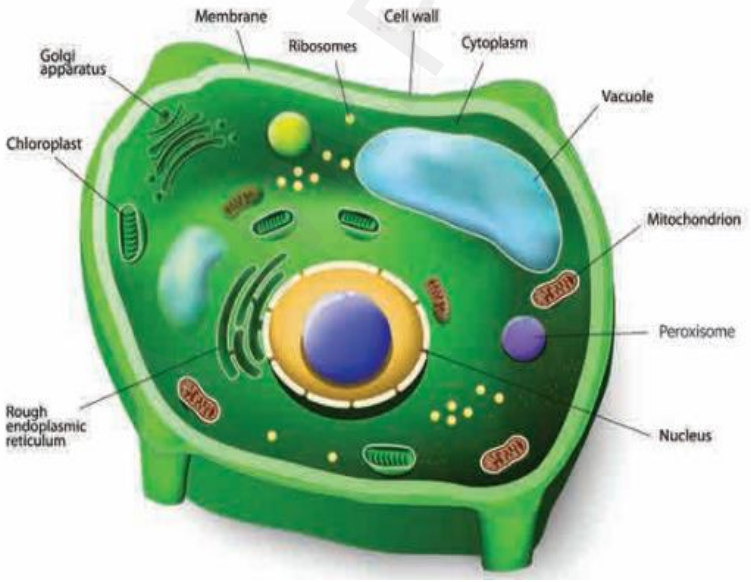
SUB: BOTANY MARKS: 70

Q.NO	CONTENT	MARKS	MODE OF QUESTION
I.	**PART -I** CHOOSE THE CORRECT ANSWER	15 X 1 =15	BOOK BACK / BOOK INSIDE/ CREATIVE
1	a. Phyllode - Acacia	1	BOOK INSIDE
2	d. All of the above	1	BOOK BACK
3	a. Arachis hypogea	1	BOOK INSIDE
4	b. Fabaceae	1	BOOK BACK
5	b. Mitchell	1	BOOK INSIDE
6	d. Watson and Crick	1	BOOK INSIDE
7	b. Prevent the uptake of Fe, Mg but not Ca	1	BOOK BACK
8	c. Synapsis	1	BOOK BACK
9	d. 2,4 – D and 2,4,5 -T	1	BOOK INSIDE
10	c. Methanobacterium	1	BOOK BACK
11	a. Cambium for secondary growth	1	BOOK BACK
12	a. (1)-(ii), (2)-(iv), (3)-(i), (4)-(iii)	1	BOOK INSIDE
13	b. Ernest Ruska	1	BOOK INSIDE
14	d. Tyloses	1	BOOK INSIDE
15	a. Pinites succinifera	1	BOOK INSIDE

Q.NO		MARKS	MODE OF QUESTION
II.	**PART -II** ANSWER ANY SIX OF THE FOLLOWING QUESTION NUMBER 24 IS COMPULSORY	6 X 2 = 12	BOOK BACK / BOOK INSIDE/ CREATIVE
16	Bacteria which require CO_2 for their growth are called as capnophilic bacteria. Example: Campylobacter	2	BOOK INSIDE
17		2	BOOK BACK
18	Xylem plates alternates with phloem plates. Example: Lycopodium clavatum.	2	BOOK BACK
19	• This maintains a definite constant number of chromosomes in organisms. • Crossing over takes place and exchange of genetic material leads to variations among species. These variations are the raw materials to evolution. Meiosis leads to genetic variability by partitioning different combinations of genes into gametes through independent assortment. • Adaptation of organisms to various environmental stress.	2	BOOK INSIDE
20	(i) Sclerenchyma and tracheids are cells which have nucleus initially but it soon degenerates. They become dead cells. (ii) Sclerenchyma functions to give mechanical strength to the plant. Tracheids are a part of xylem and help to conduct water. (iii) They have functions inspite of being dead cells.	2	BOOK BACK

21	<table><tr><th>Porous wood or Hard wood, Example: *Morus*</th><th>Non porous wood or Soft wood, Example: *Pinus*</th></tr><tr><td>Common in angiosperms</td><td>Common in gymnosperms</td></tr><tr><td>Porous because it contains vessels</td><td>Non-porous because it does not contain vessels</td></tr></table>	2	BOOK BACK
22	In some succulent plants like Opuntia, Bryophyllum carbohydrates are partially oxidised to organic acid, particularly malic acid without corresponding release of CO2 but O2 is consumed hence the RQ value will be zero.	2	BOOK BACK
23	Nitrosomonas bacterium. Nitrobacter bacterium	2	BOOK BACK
24	(a) Staminode (b) epipetalous stamen	2	BOOK INSIDE

Q.NO	CONTENT	MARK	MODE OF QUESTION
III.	**PART -III** ANSWER ANY SIX OF THE FOLLOWING QUESTION NUMBER 33 IS COMPULSORY	6 X 3 = 1	BOOK BACK / BOOK INSIDE/ CREATIVE
25	1. Yes. In Bryophytes sexual reproduction occurs in Gametophyte (dominant phase). 2. The antherozoids have flagella and swim in a thin film of water to reach the Archegonium. 3. They fuse with the egg and form the zygote which initiates the sporophyte. 4. Thus without water the life cycle of a Bryophyte cannot be completed.	3	BOOK BACK
26	• They promote cell elongation in stem and coleoptile. • At higher concentrations auxins inhibit the elongation of roots but induce more lateral roots. Promotes growth of root only at extremely low concentrations. • Suppression of growth in lateral bud by apical bud due to auxin produced by apical	3	BOOK INSIDE

	bud is termed as apical dominance. • Auxin prevents abscission. • It is responsible for initiation and promotion of cell division in cambium, which is responsible for the secondary growth and tumor. This property of induction of cell division has been exploited for tissue culture techniques and for the formation of callus. • Auxin stimulates respiration. • Auxin induces vascular differentiation **(ANY THREE POINT)**		
27	When deficiency symptoms appear first, we can notice the differences in old and younger leaves. It is mainly d to mobility of minerals. Based on this, they are classified into 1. Actively mobile minerals and 2. Relatively immobile minerals (a) Actively mobile minerals: Nitrogen,Phosphorus, Potassium, Magnesium, Chlorine,Sodium, Zinc and Molybdenum. Deficiency symptoms first appear on old and senescent leaves due to active movement of minerals to younger leaves. (b) Relatively immobile minerals: Calcium, Sulphur, Iron, Boron and Copper. Here, deficiency symptoms first appear on young leaves due to the immobile nature of minerals **(ANY THREE POINT)**	3	BOOK BACK
28		3	BOOK BACK
29	Class: Dicotyledonae (Dicots with two cotyledons) Sub class: Polypetalae (Free petals) Series: Calyciflorae (cup shaped thalamus)	3	BOOK BACK

30	<table><tr><th>Sympodial Branching</th><th>Monopodial Branching</th></tr><tr><td>The terminal bud caese to grow after a period of growth and the further growth is taken care by successive or several lateral meristem or buds.</td><td>The terminal bud grows uninterrupted and produce several lateral branches.</td></tr><tr><td>This type of growth is also known is also known as Determinate growth. Eg: Cycas</td><td>This type of growth is also known as Indeterminate growth Eg: Polyalthia</td></tr></table>	3	BOOK BACK
31	<table><tr><th>S.No</th><th>Deoxyribonucleic Acid (DND)</th><th>Ribonucleic Acid (RNA)</th></tr><tr><td>1</td><td>Found in chromosomes of the nucleus.</td><td>Found in the cytoplasm, in nucleolus and Ribosomes</td></tr><tr><td>2</td><td>Double stranded structure. Two strands coiled spirally in opposite direction</td><td>Single - stranded polynucleotide chains. Strand in RNA coiled on itself and may be united by hydrogen bonds</td></tr><tr><td>3</td><td>The sugar is deoxyribose.</td><td>The sugar is ribose</td></tr><tr><td>4</td><td>Four nitrogenous bases in it are: 1) Adenine, 2) Guanine, 3) Cytosine, 4) Thymine.</td><td>Four nitrogenous bases in it are: 1) Adenine, 2) Guanine, 3) Cytosine, 4) Uracil (i.e) In RNA, thymine is replace by uracil.</td></tr><tr><td>5</td><td>Purines and pyrimidines occur in equal proportion.</td><td>Not occur in equal proportion/ratio.</td></tr><tr><td>6</td><td>DNA is the hereditary material.</td><td>It takes part in protein synthesis</td></tr><tr><td>7</td><td>Base composition is AfT = G/C = 1.</td><td>Do not like DNA.</td></tr><tr><td>8</td><td>Can replicate and makes it copy.</td><td>Cannot replicate, it is made from DNA.</td></tr><tr><td>9</td><td>Controls structure, metabolism, differentiation and inheritance</td><td>Helps in protein synthesis, functions as a messenger and translates message coded in DNA into protein.</td></tr><tr><td>10</td><td>Very long molecule, with very high molecular weight.</td><td>Relatively short molecule with low molecular weight</td></tr><tr><td>11</td><td>Genetic material in all prokaryotic and eukaryotic cells.</td><td>Genetic material only in some viruses</td></tr><tr><td>12</td><td>It is linear/circular.</td><td>It occurs in 3 different forms 1. m-RNA, 2. t-RNA, 3. r-RNA.</td></tr></table> **(ANY THREE POINT)**	3	BOOK INSIDE
32	This is the most commonly used electron microscope which provides two dimensional image. A beam of electron passes through the specimen to form an image on fluorescent screen. The magnification is 1–3 lakhs times and resolving	3	BOOK BACK

	power is 2–10 Å. It is used for studying detailed structrue of viruses, mycoplasma, cellular organelles.		
33	Water will move from low DPD to high DPD (hypodermis 2 atm to cortex 5 atm)	3	CREATIVE

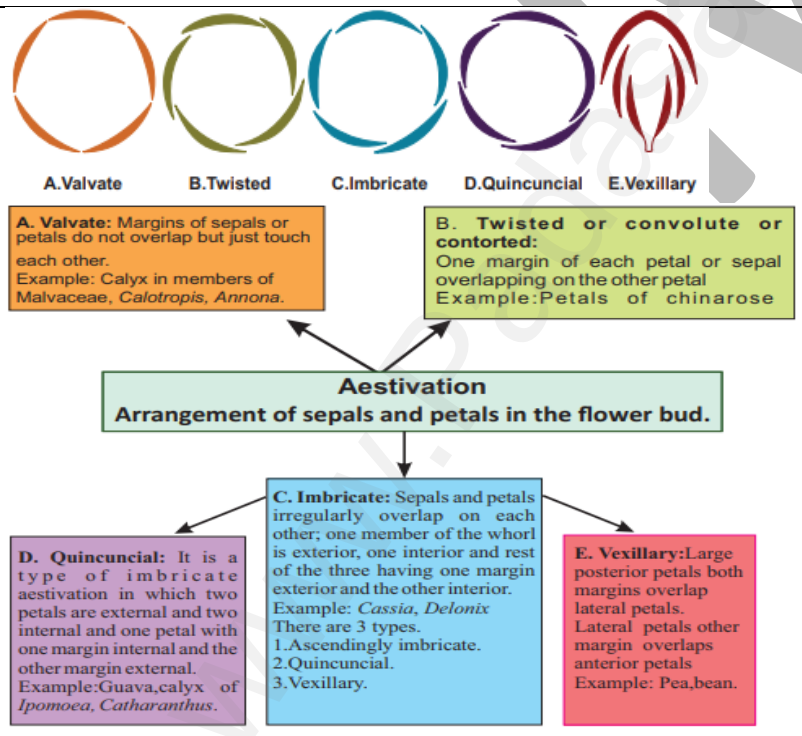
Q.NO	CONTENT	MARKS	MODE OF QUESTION
IV.	**PART –IV** ANSWER ALL THE QUESTION	5 X 5 = 2	BOOK BACK / BOOK INSIDE/ CREATIVE
34 (a)	**(ANY FIVE POINT)** S.No | Characteristics | Gram positive Bacteria | Gram negative Bacteria 1. | Cell wall | Single layered with 0.015µm-0.02µm | Triple layered with 0.0075µm–0.012µm thick 2. | Rigidity of cell wall | Rigid due to presence of Peptidoglycans | Elastic due to presence of lipoprotein-polysaccharide mixture 3. | Chemical composition | Peptidoglycans-80% Polysaccharide-20% Teichoic acid present | Peptidoglycans-3 to 12% rest is polysaccharides and lipoproteins. Teichoic acid absent 4. | Outer membrane | Absent | Present 5. | Periplasmic space | Absent | Present 6. | Susceptibility to penicillin | Highly susceptible | Low susceptible 7. | Nutritional requirements | Relatively complex | Relatively simple 8. | Flagella | Contain 2 basal body rings | Contain 4 basal body rings 9. | Lipid and lipoproteins | Low | High 10. | Lipopolysaccharides | Absent | Present	5	BOOK BACK
34 (b)	Habit: Large, erect and stout herb. Root: Branched tap root system. Stem: Stem is hollow, green and herbaceous with strong odour. Leaf: Simple, alternate, petiolate, entire or deeply lobed, glabrous exstipulate showing unicostate	5	BOOK INSIDE

reticulate venation.
Inflorescence: Solitary and axillary cyme.
Flower: Flowers are large, greenish white, bracteate, ebracteolate, pedicellate, complete, heterochlamydeous, pentamerous, regular, actinomorphic, bisexual and hypogynous.
Calyx: Sepals 5, green synsepalous showing valvate aestivation. Calyx is mostly persistant, odd sepal is posterior in position.
Corolla: petals 5, greenish white, sympetalous, plicate (folded like a fan) showing twisted aestivation, funnel shaped with wide mouth and 10 lobed.
Androecium: Stamens 5, free from one another, epipetalous, alternipetalous and are inserted in the middle of the corolla tube. Anthers are basifixed, dithecous, with long filament, introse and longitudinally dehiscent.
Gynoecium: Ovary bicarpellary, syncarpous superior ovary, basically biloculear but tetralocular due to the formation of false septum. Carpels are obliquely placed and ovules on swollen axile placentation. Style simple long and filiform, stigma two lobed.
Fruit: Spinescent capsule opening by four apical valves with persistent calyx.
Seed: Endospermous.

Floral Formula:

$Br.,Ebrl.,\oplus,\varphi,K_{(5)},\overset{\frown}{C_{(5)}},A_5,\underline{G_{(2)}}$

35 (a)	1. Protostele: In protostele phloem surrounds xylem. The type includes Haplostele, Actinostele, Plectostele, and Mixed protostele. (i) Haplostele: Xylem surrounded by phloem is known as haplostele. Example: Selaginella. (ii) Actinostele: Star shaped xylem core is surrounded phloem is known as actinostele. Example: Lycopodium serratum. (iii) Plectostele: Xylem plates alternates with phloem plates. Example: Lycopodium clavatum. (iv) Mixed prototostele: Xylem groups uniformly scattered in the phloem. Example: Lycopodium cernuum.  	5	BOOK BACK

<table>
<tr>
<td>35 (b)</td>
<td>
<table>
<tr><th>S. No</th><th>Plant cell</th><th>Animal Cell</th></tr>
<tr><td>1</td><td>Usually they are larger than animal cells</td><td>Usually smaller than plant cells</td></tr>
<tr><td>2</td><td>Cell wall present in addition to plasma membrane and consists of middle lamellae, primary and secondary walls</td><td>Cell wall absent</td></tr>
<tr><td>3</td><td>Plasmodesmata present</td><td>Plasmodesmata absent</td></tr>
<tr><td>4</td><td>Chloroplast present</td><td>Chloroplast absent</td></tr>
<tr><td>5</td><td>Vacuole large and permanent</td><td>Vacuole small and temporary</td></tr>
<tr><td>6</td><td>Tonoplast present around vacuole</td><td>Tonoplast absent</td></tr>
<tr><td>7</td><td>Centrioles absent except motile cells of lower plants</td><td>Centrioles present</td></tr>
<tr><td>8</td><td>Nucleus present along the periphery of the cell</td><td>Nucleus at the centre of the cell</td></tr>
<tr><td>9</td><td>Lysosomes are rare</td><td>Lysosomes present</td></tr>
<tr><td>10</td><td>Storage material is starch grains</td><td>Storage material is a glycogen granules</td></tr>
</table>
(ANY FIVE POINT)
</td>
<td>5</td>
<td>BOOK BACK</td>
</tr>
<tr>
<td>36 (a)</td>
<td>


</td>
<td>5</td>
<td>BOOK INSIDE</td>
</tr>
<tr>
<td>36 (b)</td>
<td>Mitosis is divided into four stages prophase, metaphase, anaphase and telophase.
Prophase
Prophase is the longest phase in mitosis.
Chromosomes. become visible as long thin thread</td>
<td>5</td>
<td>BOOK INSIDE</td>
</tr>
</table>

	like structure, condenses to form compact mitotic chromosomes. In plant: cells initiation of spindle fibres takes place, nucleolus disappears. Nuclear envelope breaks down. Golgi apparatus and endoplasmic reticulum are not seen. In animal cell the centrioles extend a radial array of rnicrotubules towards the plasma membrane when they reach the poles of the cell. Th is arrangement of micrdtubules is called an aster. Plant cells do not form asters. Metaphase Chromosomes (two sister chromatids) are attached to the spindle ·fibres by- kinetochore of the centromere. The spindle fibres is made up of tubulin. The alignment of chromosome into compact group at the equator of the cell is known as metaphase plate. This is the stage where the chromosome morphology can be easily studied. Kinetochore is a DNA-Protein complex present in the centromere DNAwhere the microtubules are attached. It is a trilaminar disc like plate. The spindle assembly checkpoint which decides the cell to enter anaphase Anaphase Each chromosome split simultaneously and two daughter chromatids begins to migrate towards two opposite poles of a cell. Each centromere splits longitudinally into two, freeing the two sister chromatids from each other. Shortening of spindle fibre and longitudinal splitting of centromere creates a pull which divides chromosome into two halves. Eachhalf receive two chromatids (that is sister chromatids are separated). When the sister chromatids separate the actual partitioning of the replicated genome is complete. A ubiquitine ligase is activated called as the napha e-promotlng complex cyclosome (APC/C) leads to degradation of the key regulatory proteins at the transition of metaphase to anaphase. APC is a cluster of proteins that induces the breaking down of cohesion proteins which leads to the separation of chromatids during mitosis		

	Telophase Two sets of daughter chromosomes reach opposite poles of the cell, mitotic spindle disappears. Division of genetic material is com leted after this karyokinesis cytokinesis (division of cytoplasm) is completed, nucleolus and nuclear membranes reforms. Nuclear membranes form around each set of sister chromatids now called chromosomes, each has its own centromere. Now the chromosomes decondense. In plants, phragmoplast are formed between the daughter cells. Cell plate is formed between the two daughter cells, reconstruction of cell wall takes place. Finally the cells are separated by the distribution of organelles, macromolecules into two newly formed daughter cells		
37 (a)	Biosynthetic phase of photosynthesis utilises assimilatory powers(ATP and NADPH 1 H1) produced during light reaction are used to fix and reduce carbon dioxide into carbohydrates. This reaction does not require light. Therefore, it is named Dark reaction. Ribulose 1,5 bisphosphate (RUBP) act acceptor molecule of carbon dioxide and fix the CO2 by RUBISCO enzyme. The first product of the pathway is a 3- carbon compound (Phospho Glyceric Acid) and so it is also called as C3 Cycle. It takes place in the stroma of the chloroplast. M. Melvin Calvin, A.A. Benson and their co-workers in the year 1957 found this path way of carbon fixation. Melvin Calvin was awarded Nobel Prize for this in 1961 and this pathway named after the discoverers as Calvin-Benson Cycle. Dark reaction is temperature dependent and so it is also called thermo-chemical reaction. Dark reaction consists of three phases: 1. Carboxylation (fixation) 2. Reduction (Glycolytic Reversal) 3. Regeneration Phase 1- Carboxylation (Fixation) The acceptor molecule Ribulose 1,5 Bisphosphate (RUBP) a 5 carbon compound with the help of RUBP carboxylase oxygenase (RUBISCO) enzyme accepts one molecule of carbon dioxide to form an unstable 6 carbon compound. This 6C compound is broken down into two molecules of 3-	5	BOOK INSIDE

carbon compound phospho glyceric acid (PGA)

$$RUBP + CO_2 \xrightarrow{Rubisco} 2 \text{ molecules PGA}$$

Phase 2 – Glycolytic Reversal / Reduction Phospho glyceric acid is phosphorylated by ATP and produces 1,3 bis phospho glyceric acid by PGA kinase. 1,3 bis phospho glyceric acid is reduced to glyceraldehyde 3 Phosphate (G-3-P) by using the reducing power NADPH 1 H1. Glyceraldehyde 3 phosphate is converted into its isomeric form di hydroxy acetone phosphate (DHAP).

$$PGA \xrightarrow[ATP \rightarrow ADP]{PGA\ Kinase} 1,3\ bisphosphoglyceric\ acid$$

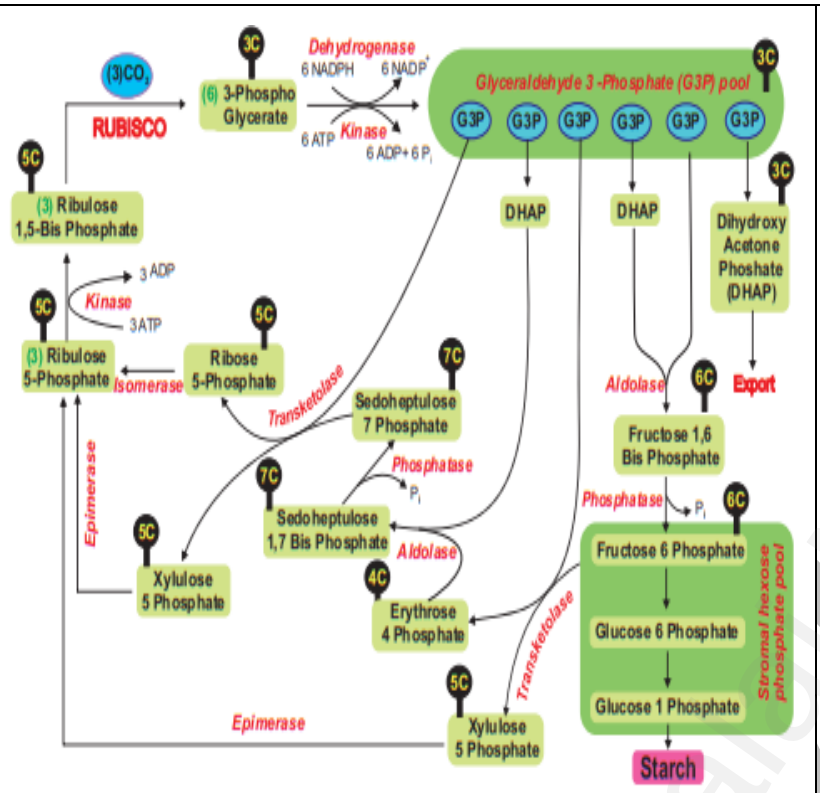
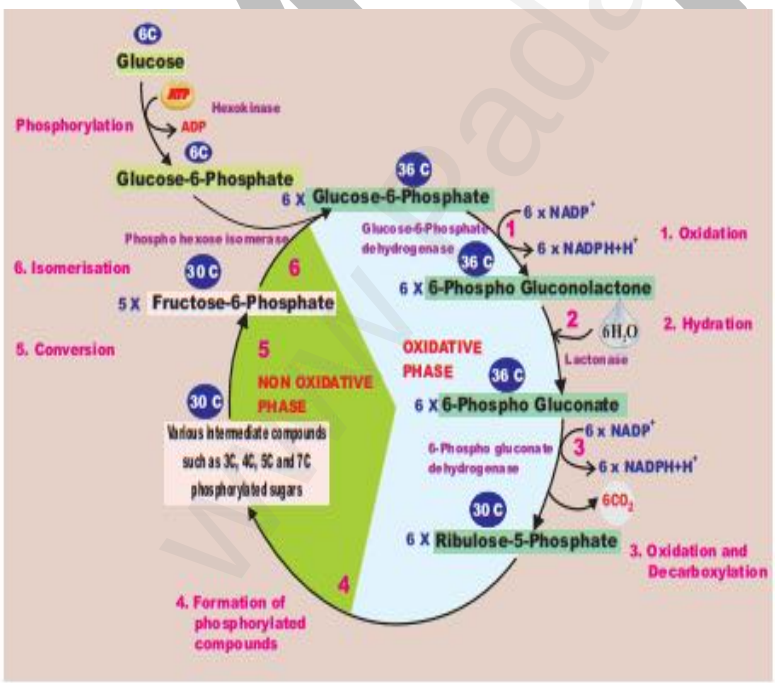
$$1,3\ bisphosphoglceric\ acid \xrightarrow{NADPH + H^+ \rightarrow NADP^+} Glyceraldehyde\text{-}3\text{-}Phosphate$$

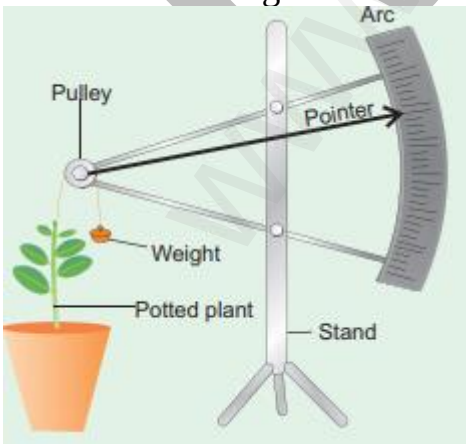
Phase 3 – Regeneration Regeneration of RUBP involves the formation of several intermediate compounds of 6-carbon, 5-carbon,4-carbon and 7-carbon skeleton. Fixation of one carbon dioxide requires 3 ATPs and 2 NADPH 1 H1, and for the fixation of 6 CO2 requires 18 ATPs and 12 NADPH 1 H1 during C3 cycle. One 6 carbon compound is the net gain to form hexose sugar.

$$RU5P \xrightarrow{ATP \rightarrow ADP} RUBP$$

Overall equation for dark reaction:

$$6CO_2 + 18ATP + 12NADPH + H^+ \longrightarrow C_6H_{12}O_6 + 6H_2O + 18ADP + 18Pi + 12NADP^+$$

			
37 (b)	Pentose Phosphate Pathway (Phospho Gluconate Pathway) 	5	BOOK BACK
38 (a)	The sclerenchyma is dead cell and lacks protoplasm. The cells are long or short, narrow thick walled and lignified secondary walls. The cell walls of these cells	5	BOOK BACK

	are uniformly and strongly thickened. The sclerenchymatous cells are of two types: 1. Sclereids 2. Fibres **1. Branchysclereids or Stone cells:** Isodiametric sclereids, with hard cell wall. It is found in bark, pith cortex, hard endosperm and fleshy portion of some fruits. Example: - Pulp of *Pyrus*. **2. Macrosclereids:** Elongated and rod shaped cells, found in the outer seed coat of leguminous plants. Example: *Crotalaria and Pisum sativum*. **3. Osteosclereids (Bone cells):** Rod shaped with dilated ends. They occur in leaves and seed coats. Example: seed coat of *Pisum and Hakea* **4. Astrosclereids:** Star cells with lobes or arms diverging form a central body. They occur in petioles and leaves. Example: *Tea, Nymphae and Trochodendron*. **5. Trichosclereids:** Hair like thin walled sclereids. Numerous small angular crystals are embedded in the wall of these sclereids, present in stems and leaves of hydrophytes. Example: *Nymphaea leaf* and Aerial roots of *Monstera*.		
38 (b)	The increase in the length of the stem tip can easily be measured by an arc auxanometer which consists of small pulley to the axis of which is attached a long pointer sliding over a graduated arc. A thread one end which is tied to the stem tip and another end to a weight passes over the pulley tightly. As soon as the stem tip increases in length, the pulley moves and the pointer slide over the graduated arc (Figure 15.8). The reading is taken. The actual increase in the length the stem is then calculated by knowing the length of the pointer and the radius of the pulley. If the radius of the pulley is 4 inches and the length of pointer 20 inches the actual growth is measured as follows:  	5	BOOK INSIDE

	Actual growth in length = $\frac{\text{Distance travelled by the pointer} \times \text{radius of the pulley}}{\text{Length of the pointer}}$ For example, actual growth in length = $\frac{10 \times 4 \text{ inches}}{20 \text{ inches}}$ = 2 inches		

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