2016 NOV

What is photosynthesis? G26 TB260 + SG61

- The conversion of light energy to chemical energy
- that is stored in sugars (glucose)
- or other organic compounds
- it occurs in plants , algae
- and certain prokaryotes
- It nourishes almost the entire living world directly/ indirectly
- It is not a single process but two processes
- Called light reactions (photo) and Calvin cycle (synthesis)
- It is the means by which energy in sunlight
- becomes usable to living things

Are plants more important to people or are people more important to plants. SG p 61

- We could argue that plants are more important to people
- because we subsist on plants
- We consume them
- and are higher up in the food chain
- Many plants have been domesticated by people
- and require people to be able to actually disseminate their seeds
- For example corn
- In the case of domesticated plants
- people are just as important
- to their survival as we are to theirs

****Distinguish between pollination and fertilisation G14&27 + TB 697& 1058 + SG73**

- *Pollination* –is the process whereby pollen grains
- move from the anther
- to the stigma on a flower's style
- it precedes **fertilisation**
- and depends on such media
- as wind, water and insects
- takes place externally

- *Fertilisation* –is the fusion of the male gametes
- and female egg cells
- to form a new plant seed`
- occurs in the inside of the flower
- and does not depend on external vectors.

*****Name the five characteristics that define land plants SG22-23**

- Common to all 4 groups but absent in charophyceans
- Apical meristem
- Alternation of generations
- Multicellular dependent embryos
- Spores produced in sporangia
- Multicellular gametangia

****Describe the binomial system of classification TB524**

- Part 1 is the name of the genus (plural, genera)
- to which the species belongs
- Part 2 is called the specific epithet
- and is unique for each species within the genus
- Example of a binomial is Panthera pardus (large cat)
- The first letter of the genus is capitalized
- and the entire binomial is italicized
- newly created scientific names are also Latinized

Are the following scientific names correct? Give reasons SG3

- *Acacia aerioloba - Yes because the scientific name is written correctly
- and the first letter of the genus is written in a capital letter
- both genus and specific are underlined

- *Panthera pardus – No
- The name is spelled correctly
- The first letter is written with a capital letter
- Both genus and specific epithet should be underlined or italicised
- **Ophisaurus ventralis* – Yes all rules have been followed

- *Homo sapie* – No
- The scientific name must be spelt correctly It must be *Homo sapiens*

Name the hormones of

******Anterior pituitary gland – TB964

• Follicle-stimulating hormone (FSH)	• Prolactin • stimulates mammary gland cells
• Luteinizing hormone (LH) • Stimulate ovaries & testes	• Growth hormone (GH) • stimulates growth & metabolic functions
• Thyroid- stimulating hormone (TSH) • Stimulates thyroid gland	
• Adrenocorticotropic hormone (ACTH) • stimulates adrenal cortex	

*****Gonads**

Ovaries (female)	- Testes (male)
• Estrogens – stimulate uterine lining growth • Progestins – promote uterine lining growth	• Androgens – support sperm formation

*******Adrenal glands – TB964**

- Adrenal medulla – Epinephrine & Norepinephrine
- Raise blood glucose level & increase metabolic activities
- Adrenal cortex – Glucocorticoids raise blood levels
- Mineralocorticoids promote retention of Na+

*****Pineal gland TB964**

- Melatonin – participates in regulation of biological rhythms

***Describe how the carbon dioxide is picked at the tissues and deposited in the lungs TB1026/1028**

- Co2 produced by the body tissue
- Co2 is carried in blood
- that is produce through cellular respiration
- converted 2 bicarbonate ions
- and protein in reaction catalysed by enzyme carbonic anydrase
- it is transported to the lungs
- in the lungs bicarbonate is reconverted to Co2 & xhaled

***Discuss the process of homeostasis SG97 & TB941**

- Homeostasis means "steady state,"

- referring to the maintenance of internal balance.
- In achieving homeostasis, animals maintain a relatively constant internal
- environment even when the external environment changes significantly.
- For example, the human body maintains a fairly constant temperature
- of about 37 (98.6)
- and a pH of the blood and interstitial fluid within 0.1 pH unit of 7.4.

****By a means of a labelled diagram describe the life cycle of a fern, clearly distinguishing between the gametophyte and the sporophyte generations TB686**

1. Sporangia release spores
- most ferns produce a single type of spore
- that develops into bisexual photosynthetic gametophyte

2. gametophyte develops sperm-producing organs called antheridia
- and egg-producing organs archegonia
- egg from one gametophyte it fertilized by a sperm from another

(Fertilization)

3. Sperm use flagella to swim to eggs in archegonia
- Attractant by archegonia helps direct the sperm

4. A zygote develops into a new sporophyte
- Young plant grows out from an archegonium parent

5. Underside of sporophyte's reproductive leaves are spots called sori.
- Each sorus is a cluster of sporangia

******Environmental adaptations may result in roots being modified for a variety of functions. Name at least 5 different types of modified roots and their functions (Memo201/2016)**

Modified root name	Function
Prop roots	They support the tall, top-heavy tree
Storage roots	To store water and food
Strangling aerial roots	To anchor on other trees
Buttress roots	Give architectural support to the trunks of such trees
Pneumatophores	They enable the root system to obtain oxygen
Contractile roots	Pull the plant a little deeper into the soil
Parasitic roots	Penetrate the host plants and withdraw nutrients

2016 JUN

***List four advantages and four disadvantages of algae**

Advantages	Disadvantages
• Rich in proteins • rich in minerals & nutrients • can be used as fertilizers for better crops	• Sometimes block sunlight from reaching aquatic plants • resulting in their deaths
• Different kinds are used in medication & cosmetics • livestock feed & for poor pollution	• Hair algae cause deaths of aquatic animals • due to strangulation
• Aquatic animals benefit from algae • as it provides food • for micro-organism on which fishes can feed	• process of deriving bio fuel from algae • is expensive • and cannot be taken advantage of
• Provide shade to the aquatic animals • living in ponds • and also enriches water with oxygen	• Kills environmental beauty • as the ponds covered in algae look dirty and ugly

*******Compare the parenchyma and collenchyma with regards to: Memo 2016**

	Parenchyma Cells	Collenchyma Cells
Structure and composition of the cell wall	• Thin and flexible primary walls • Most lack secondary walls	• Elongated cells • Thicker primary walls • Walls are unevenly thickened
Functions	• Perform most of the metabolic functions • Store starch	• Provide flexible support without restraining growth • Help support young parts of the plants shoot
Positions in plants	Stems and roots	Young stems & petioles

*****Name the 5 differences between monocotyledonous and dicotyledonous plants**

monocotyledonous	dicotyledonous
One cotyledon	2 cotyledon
Stem vascular bundles are scattered	Stem vascular bundles are arranged in a ring
Leaf veins are parralell	Have net-veined leaves
Flowers of 3	Flowers of 4-5
Fibrous root system	Taproot system
1 Pollen opening	3 pollen openings

******Distinguish between open and closed circulatory systems and give an example of an animal in which each occurs. Also name the three basic components common to both systems. Memo 2016**

- **Open circulatory system** in this system the circulatory fluid bathes the organs directly.
- In these animals, the circulatory fluid called hemolymph,
- is also the interstitial fluid
- that bathes body cells.
- Contraction of one or more hearts pump
- the hemolymph through the circulatory vessels interconnected sinuses,
- spaces surrounding the organs.
- Arthropods and most molluscs are examples of this system.

- **Closed circulatory system** is the system in which a circulatory fluid called blood
- is confined to vessels
- and is distinct from interstitial fluid.
- One or more hearts pump blood into large vessels
- that branch into smaller ones that infiltrate the organs.
- These animals include annelids, cephalopods and all vertebrates

Common to both:

- Circulatory fluid/blood
- Set of tubes/blood vessels
- Muscular pump/heart

*******Distinguish between regulators and conformers in terms of homeostasis TB941**

- An animal is a *regulator* for an environmental variable
- if it uses internal mechanisms
- to control internal change in the face of external fluctuation
- For example the otter

- keeps its body at a temperature that is independent of the water

- An animal is a *conformer* for a particular variable
- if it allows its internal condition to change
- in accordance with external changes in the variable
- For example the bass
- It conforms to the temperature of the lake
- Regulating & conforming represent extremes on a continuum
- In order to achieve homeostasis animals maintain
- a relatively constant internal environment
- even when external environments changes

*********Describe the process of conduction, convection, radiation, and evaporation**

- **Conduction** is the direct transfer of thermal motion (heat)
- between molecules of objects
- in contact with each other,
- as when a lizard sits on a hot rock.

- **Convention** is the transfer of heat
- by the movement of air or liquid past a surface,
- as when a breeze contributes to heat loss from a lizard's dry skin
- or when blood moves heat from the body core to the extremities.

- **Radiation** is the emission of electromagnetic waves
- by all objects warmer than absolute zero.
- For example, a lizard absorbs heat radiating from the distant sun
- and radiates a smaller amount of energy to the surrounding air.

- **Evaporation** is the removal of heat from the surface of a liquid that is losing some of its molecules as gas.

*******Describe what an apicomplexan is. Explain the two-host life history of Plasmodium which causes malaria G3, TB660-661**

- **Apicomplexans –** are parasites of animals
- which cause serious human diseases
- they spread via a host- cell
- as tiny infectious cells called sporozoites
- they are named Apicomplexan because on one end (apex)
- of the sporozoite cell
- and it contains organelles specialised for penetrating host cells & tissues
- it retain a modified plastid
- they aren't photosynthetic
- they have complex life cycles with both asexual and sexual stages of reproduction
- it lives hidden from the hosts immune system

2 Host

- Infected Anopheles mosquito bites a person
- injecting Plasmodium sporozoites in its saliva

- Sporozoites enter the person's liver cells
- after several days it undergoes multiple divisions
- and become merozoites
- which use their apical complex to penetrate red blood cells

- The merozoites divide asexually inside the red blood cells
- at intervals of 48/ 72 hours depending on the species
- large numbers of merozoites break out of the blood cells
- causing periodic chills and fever

- they also infect other red blood cells
- some merozoites form gametocytes

- Another mosquito bites the infected person
- and picks up plasmodium gametocytes along with blood
- Gametes form from gametocytes
- each male produces several slender male gametes

- Fertilization occurs in the mosquito's digestive tract (zygote forms)
- Oocyst develops from the zygote
- in the wall of the mosquito's gut
- it releases thousands of sporozoites
- which migrate to the mosquito's salivary gland

2015 NOV – Repeat of 2016 NOV

2015 JUN

****Posterior pituitary glands TB964**

Oxytocin – stimulates contraction of smooth muscle cells in uterus
Vasopressin – (antidiuretic hormone ADH) – promotes retention of water by kidneys

Distinguish between abiotic and biotic pollinating agents and give two examples of each (Read page 884-889)

- Abiotically pollinated species 98% rely on wind and 2% on water
- 20% of angiosperm species are wind-pollinated (Hazel staminate flowers)
- 65% of all flowering plants require insects for pollination. (Bees are most important)
- Plants use biotic agents and abiotic agents such as water and wind
- Water – buoyant seeds and fruits

***Write explanatory notes on the structure and functions of the following SG45/52**

- *Dermal tissues* – outer covering
- In non-woody plants it is a single layer of tightly packed cells
- it covers & protects all young parts of the plant
- root hairs are extensions of epidermal cells
- near the tips of the root
- epidermis of leaves and most stems secretes
- a waxy coating the cuticle
- that helps aerial parts of the plant retain water

- *Vascular tissues* – involved in transport of materials between roots & shoots
- Xylem conveys water & dissolved minerals upward
- Phloem transports food made in mature leaves
- to the roots and non-photosynthetic parts of the shoot system

- *Ground tissues* – neither dermal or nor vascular tissue
- In eudicot stems ground tissue is divided into pith
- Internal to the vascular tissue and cortext external to the vascular tissue
- It includes photosynthesis, storage and support
- Cortex of a eudicot stem consists of both fleshy storage cells

2014 JUN

****Give a schematic and labelled representation of the life cycle of a moss. Include blocks of information to explain each stage. TB681**

1. Spores develop into threadlike protonemata
2. Haploid protonemata produce "buds"
- that divide by mitosis
- and grow into gametophores
3. Sperm must swim through a film of moisture to reach the egg

(Fertilization)

4. The zygote develops into a sporophyte embryo
5. Sporophyte grows a long stalk (seta) that emerges from archegonium
6. Attached by its foot the sporophyte remains
- Nutritionally dependent on the gametophyte

(Meiosis)

7. Meiosis occurs & haploid spores develop in the capsule
- Capsule is mature its lid pops off and spores are released

Write a brief report on ecological importance of fungi

Habitat – are diverse & wide spread
- found in any and every kind of aquatic & terrestrial habitat
- are essential for well-being of most ecosystems

Importance – they breakdown organic material
- and recycle nutrients
- allowing other organisms to absorb essential chemical elements
- used as food (mushrooms, applications for agriculture, bread to antibiotics)
- pine seedlings with mycorhizae fungal associations when planted in soil
- survive better in absorbing nutrients & protects the seedling
- some do cause diseases in food, plants & animals

Decomposers – feed off dead organic material like fallen logs, animals
Parasitic – pathogenic so they absorb nutrients for cells of living hosts
Mutualistic fungi – live off host cells but reciprocate with some benefits

Name the four characteristics common to land plants and charophycean algae
Share traits SG22
- Rosette cellulose – synthesising complexes
- They both possess a rosette shape array of proteins
- Peroxisome enzymes – both have enzymes in their peroxisomes
- That minimise the loss of carbohydrate
- Structure of the flagellate sperm – resemble in land plants
- Cell plate formation during cytokinesis – cell division is complex
- DNA & RNA sequences support their close relation to the charophytes (Chara & Coleochaete)

Apical meristem, Alternation of generations, Multicellular embryos, spores produced in sporangia, gametagia are absent n charophyceans

2013 NOV
Compare the cell structure of a prokaryotic cell with a eukaryotic cell (Memo2016)

	Eukaryotic cell	Prokaryotic cell
Nucleus	Present	Absent
Number of chromosomes	More than one	One, but not true chromosome
Cell type	Usually multicellular	Usually unicellular
Mitochondria	Present	Absent
Chloroplasts	Present (in plants)	Absent
Cell size	Large (10- 100 um)	Small (1- 10 um)
Structural complexity	complex	Much simpler

Name the similarities between plants and green alga (Memo2016)
- They both possess eukaryotic cells.
- They both carry out photosynthesis.
- Cell wall made of cellulose.
- Chloroplasts with chlorophylls *a* and *b*.
- 1) Rings of cellulose-synthesis;

- 2) Peroxisome enzymes;
- 3) Structure of flagellated sperm;
- 4) Formation of a phragmoplast

Explain how a photosystem harvests light

- A photosystem is composed of a reaction centre
- surrounded by a light- harvesting complex
- Each light-harvesting complex consist of pigment molecules
- includes chlorophyll a and b
- and carotenoid molecules bound to a particular proteins
- the light-harvesting complexes act like antenna complexes
- then they absorb a photon it is transmitted
- from molecule to molecule
- until it reaches a particular chlorophyll a molecule
- the reaction centre
- at the centre is a primary electron acceptor
- which accepts an excited electron from the reaction centre

Read rest of the page

By means of a diagram explain the process of double fertilization flowering plants SG33,

- When a pollen grain lands on suitable stigma it absorbs water
- and germinates by producing a pollen tube
- the tube grows between the cells of the style towards the ovary
- the nucleus divided by mitosis for 2 sperm
- the tip of the pollen tube enters the ovule
- through they micropyle
- and discharges the 2 or in the embryo sac
- the sperm reaches the female gametophyte
- one fertilises the egg to form a zygote
- the other sperm combines with the 2 polar nuclei
- to form a triploid nucleus in the middle of the large central cell
- the large cell produce endosperm
- which stores food in the seed
- the union of 2 sperm cells with different nuclei
- of the female gametophyte is termed double fertilization

****Distinguish between radial and bilateral symmetry**

- **Radial symmetry** refers to any imaginary slice through the central axis
- divides the animal into mirror images.
- For example, sea anemone d
- oes not have a left side and a right side.

- **Bilateral symmetry** it is when only one imaginary cut divides the animal
- into mirror-image halves.
- E.g. lobster, has a left and a right side.

Name the three subphyla of the phylum Chordata and give an example of each

Subphylum (tunicakes/ sea squires)

Subphylum (amphioxus)

Subbylum vertebrate

2013 JUN

Distinguish between antigens and antibodies

- An antigen is a macromolecule
- that elicits an immune response
- by binding to receptors of B cells or T cells.

- And an antibody is a protein secreted
- by plasma cells (differentiated Bcells)
- that binds to a particular antigen;
- also called immunoglobulin.
- All antibody molecules have the same Y-shaped structure
- and in their monomer form consist
- of two identical heavy chains and two identical light chains.

Give the function of each of the following:

Distal tubule – regulates the K+ and NaG concentration of body fluids
Collecting duct- carries the filtrate through the medulla to the renal pelvi
Proximal tubule - Conveys and help refine filtrate
Descending limb of the loop of Henle - re-absorption of water
Ascending limb of Henle - movement of Nacl out of the filtrate

2017 JUN

Discuss the economic importance of yeast which belongs to the kingdom Fungi

- Plays an important role in the brewing & baking industry & wine making
- It forms alcoholic beverages under anaerobic conditions
- A specific species forms Co2 & alcohol
- It can be used as a vitamin rich food
- Plays a vital role in formation of silk
- Some fungi's produce antibiotics

Discuss the two groups of the defence mechanisms of the body against harmful agents

- Specific mechanisms – part of the immune system
- Consist of the humoral immune response
- And the cellular immune response
- That produce antibodies and defence cells against specific antigens
- Non-specific mechanisms – fight in a general manner
- Against any type of antigen
- A series of defence mechanisms are included
- Such as the skin barrier against foreign agents
- The mucus and ciliated epithelium of the airway

2012 NOV

Explain the structure of different zones of primary growth in a root tip

Primary Growth – apical meristem is responsible for primary root & stem growth

- concentrated near the tip
- roots are underground structures to anchor the plant
- and provide a means to absorb nutrients
- roots are used as storage organs for the food materials produced by the shoot

1. Root cap – mass of parenchyma cells that covers the tip of the root

- meristem adds new cap cells as old ones are lost
- cap is unique feauture of roots
- function is to protect the cell under it from abrasion
- and penetrating in the soil

2. Zone of cell division – apical meristem under and behind the root cap

- Producing cells that give rise to the primary body of the plant
- Division occur along the edges
- Protoderm – gives rises to the epidermis
- Procambium – produces xylem & phloem
- Ground meristem – produces cortex present in most stems

3. Zone of elongation – cells stretch as small valuoles with cytoplasm merge
- Cellular expansion is responsible for pushing the root cap forward through the soil

4. Zone of maturation – elongating cells complete their specialization into tissues
- They become recognizable due to the root hairs

Describe asexual reproduction of fungi

- a generation of offspring from a single parent
- that occurs without fusion of gametes
- by budding or division of a single- cell or entire organism into 2 or more parts
- reproduce asexually by growing
- as filamentous fungi that produce haploid spores by mitosis
- reproduce asexually by growing single-celled yeast
- by cell division or pinching of small 'bud cells' of parent cells