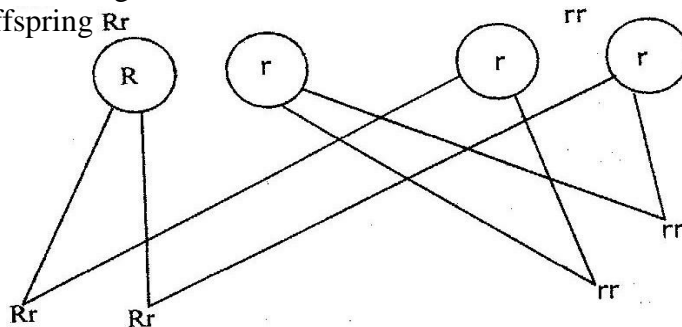


K.C.S.E 2005 BIOLOGY PAPER 1(THEORY)
MARKING SCHEME

1. Maintain balance and posture of the body
2. a) X – Chloroplast
Y – Cell vacuole / sap vacuoles
b) To receive maximum amount of light.
3. Xylem vessels transport water and mineral salts from the roots to the leaves. Phloem tissues transport manufactured food/soluble Organic products of photosynthesis within the plant.
4. a) It is the process through which ancient simpler forms of life underwent gradual series of small changes for many million years, to give rise to the modern species of life // accepts as a theory formed one large single land mass, which later broke up into parts which drifted from one another forming the present day continents.
5. Arachnida
6. Lactic acid
7. -Absorption of water to the soil
- Support in seedlings, leaves and herbaceous plants.
-Opening and closing of Stomata
-Distribution of water from cell to cell
8. -Embryo may not yet be fully developed
-Presence of chemical inhibitors e.g. abscisic acid, inhibit germination.
-Low hormone and enzyme concentrations e.g. gibberellins
-Hard and impermeable seed coats, preventing air and water entry.
-Low temperatures which inactivate the enzymes.
9. It does not easily dissociate and therefore reduces the capacity of hemoglobin to transport oxygen to the tissues.
10. Entamoeba histolytica
11. a) W – Spinal column / vertebral column
Y – Sternum
Z – Intercostal muscles.
b) The external intercostal muscles contract while the internal intercostals relax. Muscles relax. This movement pulls the ribs upwards and outwards. The diaphragm muscles contract (flattens). The thoracic volume increases while the pressure reduces, leading to atmospheric air rushing into the lungs through the nose and trachea hence inflating the lungs.

12. a) 3:1

- b) (i) Parent gametes
f₂ generation offspring Rr
(ii) 1:1



c) Apart of Genes with contrasting characteristics

13. a) E – Malpighian layer
F – Nerve cell
G – Erector pili muscle
- b)i) H – Excretion of waste products of metabolism from the body e.g. excess.
-Water, mineral salts traces of urea, lactic acid etc.
-Temperature regulation in the body brings a cooling effect through
- Loss of excess heat by evaporation of water.
-Keeps the hair and epidermis flexible and water proof
-Contains antiseptic substances for protection against bacteria.
14. a)Transpiration
b)i)The leafy shoot should be from herbaceous plant
- Cut off the last few centimeters of the stalk under water
-All the air in the capillary tubule should be expelled
-Jelly should be applied around the stem around the rubber bung.
-The end of the capillary fusing should rest in beaker of water.
ii) Avoid air bubbles.
-For continuity of the flow of water
-Jelly should not touch the xylem vessels because it might block they xylem.
-To avoid introduction of air bubbles in the xylem.
-For continuity of water uptake.
- c) –Temperature
-Humidity
-Wind
-Atmospheric pressure
-Light intensity
-Availability of water
15. a)i)A flower whose ovary is situated below the other floral parts.
ii) A flower with only the male reproductive parts parts (male flower)
b) Larger anthers.
-Anther loosely attached
- Flexible filament
-Small, smooth and light pollen grains
16. a) - Fungus
-Bacteria
- b) Refrigeration
-It inactivates disease causing organisms/micro-organisms.
Irridation –The radiation kills/destroys the micro-organism.
Pasteurization (for milk only)
Canning-Kills the micro – organisms.
17. a)Photosynthesis
b)Heterotrophic – holozoic
c) Small fish pond / dam, rain forests.
d) Algae → Zoo plankton → small fish → bird → large bird.
e)-Snails would increase in number
-Bird M would increase in number.
-Green plants would decrease in number

- f) The energy to be passed on from one trophic level to the next is contained in food materials. Most of the food taken in by consumers passed on from one trophic level to the next is consumers passes through the digestive track as undigested matter that is removed as faeces. The digested materials are absorbed in to the bloodstream and conveyed to various tissues of the body. Most of the absorbed food materials are used in respiration, to Produce is lost as heat during sweating, evaporation and transpiration in plants.
- g)i) Scavengers e.g. vultures
Decomposers e.g. bacteria
- ii) Scavengers feed on dead bodies of herbivores and carnivore // the consumers.
-Decomposers act upon the remains of the producers, consumers, & Scavengers causing decay, to release inorganic materials, which are later re-used by producers to make new organic compounds.
- h) i) -Deforestation
-Overgrazing
-Soil erosion
-Hunting, poaching
-Over fishing
-Poor waste disposal // Environmental pollution
- ii) **Deforestation**
Lack of trees leads to reduced number producers in an ecosystem.
- Overgrazing**
Many animals eat away and trample the vegetation hence reducing / depleting the number of producers.
-Lead to gully erosion hence carrying away some of the underground and crawling animals (Consumers)

18. Gaseous exchange in terrestrial plants.

Gaseous exchange in plants involves two main respiratory gases: carbon IV oxide and oxygen.

During daytime green plants take in carbon IV oxide for photosynthesis and oxygen for respiration. During photosynthesis oxygen is given out as a by product and released to the atmosphere. In plants such as the flowering plants stomata in the leaves and lenticels in the woody stems and pneumatophores/breathing roots in aquatic woody plants provide the surface for gaseous exchange. Gaseous exchange taken place by diffusion across the respiratory surface.

Stomata

These are located mainly in the leaves and in younger parts of the stem. The opening and closing of stomata is controlled. Mainly by the intensity of light. They are normally open during the day and closed during the night. Several theories explaining the mechanism of stomata opening and closing have been put forward.

1. **Photosynthetic theory**

Guard cells have chloroplasts. During daylight, they carry out photosynthesis producing sugars. The sugars increase the osmotic pressure of the cell sap. This causes water to move into guard cells from the neighboring epidermal cells by osmosis.

The result is an expansion and increase in turgidity of the guard cells causing the stomata to open.

In darkness photosynthesis stops. The sugar in the guard cells is converted to starch. This lowers the osmotic pressure of guard cells causing them to lose water to neighboring cells by osmosis.

The guard cells become flaccid and the stomata close.

The guard cells become flaccid and the stomata close.

2. **Starch – sugar interconversion:**

The enzymatic conversion of starch to sugar proceeds more readily in an alkaline environment (high pH). The conversion of sugar to starch occurs more readily in an acidic environment (low pH). During the night, when photosynthesis is not taking place, carbon dioxide accumulates in leaf cells it combines with water to form carbonic acid. This lowers the pH in the guard cells leading to conversion of sugar to starch this decreases the osmotic pressure in the guard cells causing them to lose water to the neighboring epidermal cells. The guard cells become flaccid and the stomata close.

During daylight, when photosynthesis is taking place, the concentration of carbon dioxide in the leaf cells, raises their pH, and favors the conversion of starch to sugar. This increases the osmotic pressure in the guard cells causing them to take in is an expansion and increase in turgidity of the guard cells causing the stomata to open.

3. **Potassium Ion (K⁺) mechanism**

When guard cells are exposed to light, their chloroplasts manufacture ATP. The ATP drives a K⁺ pump in the cell membrane of the guard cells. This causes an active uptake of K⁺ into the guard cells from surrounding epidermal cells.

Accumulation of K⁺ in guard cells increases the osmotic pressure of their cell sap. This causes water to move into the guard cells from neighboring epidermal cells by osmosis. The result is an expansion and increase in turgidity of the guard cells causing the stomata to open.

-At the onset of darkness, chloroplasts stop making ATP and its concentration in guard cells falls rapidly stopping K⁺ pump, K⁺ migrate from the guard cells causing them to lose water to the neighboring cells by osmosis. The guard cells become flaccid and the stomata close.

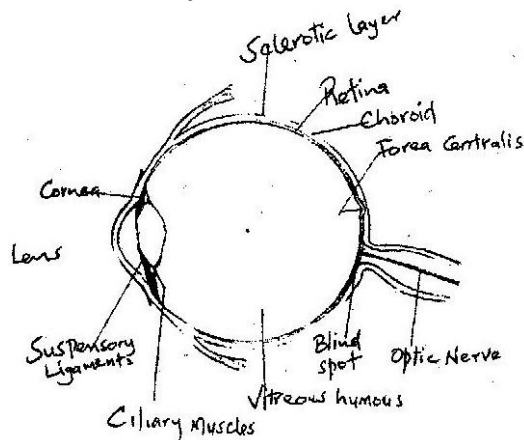
-Water molecules are pumped into the guard cells from adjacent epidermal cells.

-A small extent of gaseous exchange takes place in the stem through structures called lenticels.

These are small gaps in the bark usually circular or oval & slightly raked on the bark surface.

The cells in these areas are thin walled and loosely packed leaving air space which communicates with air spaces in the cortex. Hence O₂ for respiration is taken up & CO₂ is given out.

19. Adaptations of the eye.



The presence of:-

-The **sclerotic** layer which contains tough connective tissue fibres which helps it to support and protect the other parts of the eye ball.

-The **choroids** which contain many blood capillaries which supply oxygen and nutrients of the retina and removes metabolic wastes from eye.

-Its highly pigmented, to prevent reflection of light within the posterior chamber of the eye ball.

-The **retina** which contains photoreceptor cells called cones and rods. It is said to be the light sensitive part of the eye. Cones are adapted for light and colour vision while rods are adapted for dim light vision.

-The **vitreous humour**-Which is under pressure. It helps to maintain the shape of the posterior chamber of the eye ball. It also plays an important part in the refraction of light rays enabling them to be focused on the retina.

-**The cornea**, transparent and curved which helps to play an important role in focusing of the image on the retina. It accounts for the largest refraction of light rays.

-**The aqueous humour** –Contains oxygen and nutrients, which nourish the cornea and the lens. It is under pressure thus helping to maintain the shape of the anterior chambers of the eye. It also plays a part in the refraction of light rays enabling them to be focused on the retina.

-**The Iris is heavily** is heavily pigment, to prevent entry of light into the eye except through its central aperture called the pupil. It contains circular and radial muscles which constrict or dilate the pupil depending on the intensity of light.

-**The lens** is elastic, therefore allows changes in its shape depending on the tension exerted through the suspensory ligaments. This enables it to bring light rays causing from either near or far objects into sharp focus on the retina.

-The ciliary's body Contains the ciliary muscles whose contraction and relaxation alters the tension exerted on the suspensory ligaments.

This in turn alters the shape of the lens enabling it to focus for both near and distant objects.

-**The eyelids** which are movable and opaque structures can be closed through a reflex action to protect the eye from too much light or from foreign objects.

- **The eye muscles** help to move the eye ball within the orbit. The lateral rectus muscles move the eye up and down while the oblique muscles the eyeball in its up and down movement.

- The lachrymal gland** which continuously secretes a watery, saline and antiseptic fluid called tears. The tears moisten the cornea and wash foreign particles out of the eye.
- The eyelashes**, which are many hairs, protect the eye from the entry of small foreign particles.
- The eyebrows** raised portion of the skin above the eye, thickly covered with hair, whose functions are to prevent sweat and dust from entering the eye.