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BIOLOGY  
PAPER 2  
MARKING SCHEME  
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**THE KENYA NATIONAL EXAMINATION COUNCIL**  
**KENYA CERTIFICATE OF SECONDARY EDUCATION**  
**BIOLOGY**  
**PAPER 2**

**MARKING SCHEME**  
**(CONFIDENTIAL)**

1.
  - a)
    - (i) Uric acid
    - (ii) Uric acid requires less water to eliminate / Removal of uric acid conserves water/ less poisoned/less toxic;
  - b) The organism is an exothermal /poikilothermic / its body temperature changes with environment;
  - c)
    - (i) Organism F;
    - (ii) Organism F occupies a lower trophic level / biomass/ energy decreases up the trophic level.
  - d)
    - It is dorsal – ventrally flattened hence able to move through penetrate the crevices. (in Search of food, maths, for safety)
    - Has exoskeleton /cuticle for protection /conserving
    - Has a pair of wings to fly (for food and safety)
    - Has a pair of antennae for sensory purposes
    - Has legs to move.
2.
  - a) Klinefelters
  - b) Chromosomal mutation result in the addition of a whole chromosome; it occurs during Meiosis where the homologous chromosomes fail to segregate; and so move to the same gamete cell; if gamete with XX fuses with gamete Y, the offspring becomes XXY;
  - c)
    - (i) It prevents the spindle formation during cell division thus leading to a cell with extra set of chromosomes.

- (ii) Resistant to drought / pests/ diseases/  
High yields  
Early maturing.

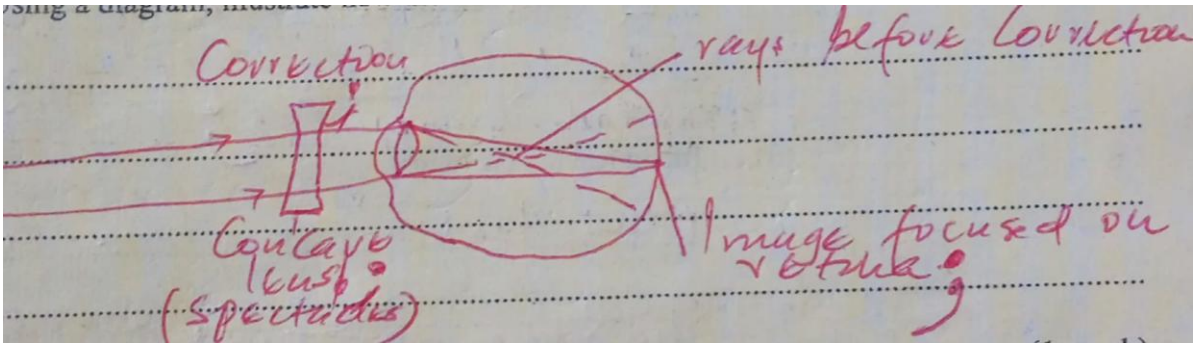
- 3. a) (i) No germination; since this low temp; which inactivated enzymes;  
(ii) Percentage germination was highest; since temp was optimum; enzymes worked at their best / activated ;

- b) Embryo;  
Seedcoat;  
Growth hormones;  
Enzyme inhibitors;  
Viability;

- 4. a) Short sightedness/ myopia/near sightedness/short sight Rej short sighted.

- b) Has a long eyeball/ thick lens; resulting in the light rays from the student who is 12M away being focused at a point in front of the retina; light rays from the book are focused on the retina

c)



- d) Vitamin A/Retinol

- 5. a) i) Blood entering the lungs has a lower conc of  $O_2$  and high Conc of  $CO_2$  ; since most of the  $CO_2$  had been used during respiration ; yield more  $CO_2$   
ii) Blood leaving the lungs has a lower conc of  $CO_2$  and a higher Conc  $O_2$  ; since it has been purified; the volume of nitrogen remains unchanged as it is more used up in tissue respiration.

- b) Pulmonary artery

- c) High altitude areas have low  $O_2$  Conc ; the body produces more RBC ; which carry more  $O_2$  to the body tissues for respiratory; producing more energy for the athlete;

- 6. a) On graph paper

- b) i) Decrease in the number of ticks; chemical was poisonous / killed the ticks had not adapted to the chemical/ had not developed resistance.

- ii) The number of ticks per animal increased; ticks had adapted to the chemical / developed resistance ; Resistant ticks produced enzymes that made the chemical harmless to them.
- c)  $28 \pm 2$  ( 26 , 27, 28, 29 , 30)
- d) Grass;  $\longrightarrow$  Animal  $\longrightarrow$  tick;  $\longrightarrow$  bird  $\longrightarrow$  Vulture;  
Energy flow
- e)
  - Estimation by marking based on the various parts of the animals body;
  - Physical counting / total counts / census
  - Sampling the animals

7.

- a) **The Role of the Liver in blood sugar regulation**  
When the blood sugar level is high, insulin hormone is produced by the pancreas stimulating liver cells to convert excess glucose to glycogen;  
  
When the blood sugar level in low, the glycogen hormone is secreted by the pancreas; stimulating the liver cells to convert glycogen /fats to glucose;
- b) **How human blood is adapted to its functions**  
Plasma is the fluid part of blood, consisting of dissolved and undissolved substances; the plasma acts as a medium in which substance are transported in the body;  
  
It acts as medium in which various metabolic reactions occur; plays a role in thermoregulation/distributed heat;  
  
Platelets; contains proteins that help in blood clotting,; preventing loss of blood/anaemia; also prevent entry of the pathogens;  
  
WBC; are irregular /amoeboid; they protect the body against attack by pathogens; by engulfing them and releasing antibodies against the pathogens; they are numerous; to enhance the body defense mechanism.  
  
RBC; are bi concave in shape; to increase the SA for diffusion of gases / squeeze through blood capillaries; They lack nucleus to allow for packing of more hameoglobin; they are also numerous to increase the S.A to r=transport more oxygen ;  
  
Has carbonic anhydrase; for loading and offloading carobdioxide  
  
Have haemoglobin; that have a high affinity for oxygen.

8.

- a) **How the presence of chloroplasts in guard cells affect the opening of stomata**
  - Chloroplasts are sites of photosynthesis; During the day photosynthesis takes place; Glucose being osmotically active increases the internal conc. of guard cells; Water is drawn into the guard cells; Guard cells become turgid bulging outwards; Unequal expansion of the guard cells result in the opening of the stomata;
- OR
  - Chloroplasts are sites of photosynthesis during the day; Photosynthesis takes place; using CO<sub>2</sub> making the pH to rise in the Guard cells favoring the conversion of starch into glucose; Glucose being osmotically active increase the internal conc; of guard cells. Water is drawn into the guard cells; Guard cells become turgid; bulging outwardly

OR

Chloroplasts are sites of photosynthesis; During the day photosynthesis takes place; ATP accumulates in the guard cells to draw potassium ions; Osmotic pressure increases in the Guard cells; Water is drawn into the guard cells; Guard cell become turgid bulging outward; Unusual expansion of guard cells resulting in the opening of the stomata

b) **How the various environmental factors affect the rate of photosynthesis**

- Carbon (iv) Oxide concentration;  $\text{CO}_2$  is a raw material for photosynthesis; An increase of  $\text{CO}_2$  leads to an increase in the rate of photosynthesis, upto a given optimum. Beyond the optimum, the rate of photosynthesis remains constant ; due to other limiting factors
- Light intensity /quality of light; Light provides the energy required for photosynthesis/photolysis/light stage;
- The rate of photosynthesis increases as light intensity increases ; upto optimum level; Beyond the optimum ; the rate of photosynthesis remains constant; due to other limiting factors;
- At very high light intensity chlorophyll is damaged /bleached ; and the rate of photosynthesis drops;
- Temperature; very low temp inactivate enzymes thus reducing the rate of photosynthesis;
- As temp increases, the rate of photosynthesis increases; upto optimum;
- Temperature above optimum denature enzymes; reducing the rate of photosynthesis;
- Water; is a raw material for photosynthesis. It influences opening and closing of stomata ; which in turn affect the diffusion of  $\text{CO}_2$  into the leaf;