K.C.S.E BIOLOGY PAPER 231/1
MARKING SCHEME 2001

SECTION A (20 marks)

Answer all questions in this section in the space provided

1. Other than having many features in common, state the other characteristics of a species.
   - **Interbreed to produce fertile/viable offspring** (1 mark)

2. Why are green plants referred to as primary producers in an ecosystem?
   - **Utilise energy from the sun to manufacture food/photosynthesis; for the subsequent tropic level/consumers/other organisms** (2 marks)

3. A person whose blood group is AB requires a blood transfusion. Name the blood groups of the donors
   - A, B, AB, O (1 mark)

4. Name the parts of the flower that are responsible for production of gametes
   Ovary (acc. ovules) anthers (2 marks)

5. State two functions of muscles found in the alimentary canal of mammals
   - **Act as valves for regulation of food movement/to close or open various parts of the canal**
   - **Churning (acc mixing food with enzymes)/pushing food along /peristals** (2 marks)

6. Adult elephants flap their ears twice as much as their calves in order to cool their bodies when it is hot. Explain
   - **The surface area to volume ratio is higher in calves than in adult; hence adults retain more heat than the young.**
   - **The surface area to volume ratio is lower in adults than in calves; hence calves loose more heat than adults** (2 marks)

7. Name the organelle in which protein synthesis takes place in a cell
   - **Ribosomes** (1 mark)

8. (a) The type of circulatory system found in members of the class insecta is
   Open/lacuna (1 mark)

   (b) Name the blood vessel that transport blood from
   i) Small intestines to the liver
   Heptic portal vein (Rej H.P.V)

   ii) Lungs to the heart
   Pulmonary vein (1 mark)

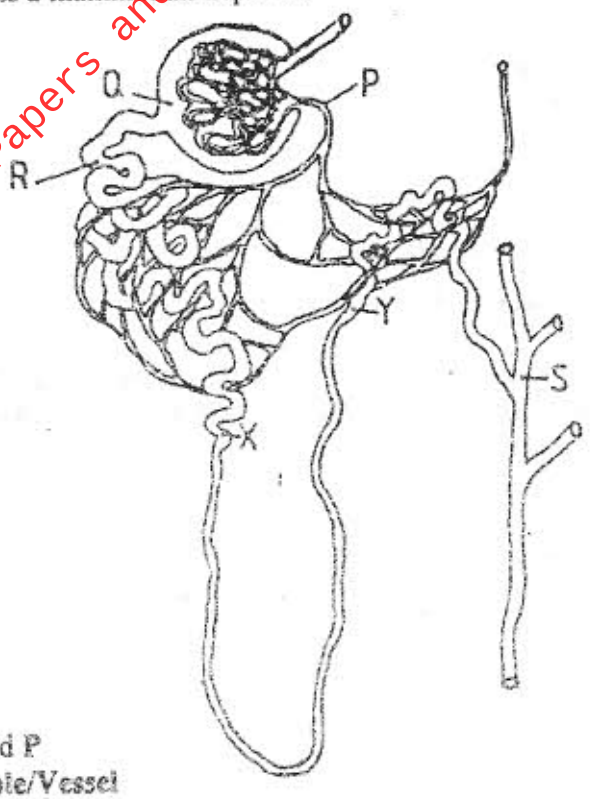
9. Name three types of chromosoal mutations
   - **Inversions, Duplication, Deletion, Translocation, Non disjunction** (3 marks)

10. Name three sites where gaseous exchange takes place in terrestrial plants
    - **Mesophyll cells/Spongy mesophyll/Palisade mesophyll/Stomata/substomatal chambers; lenticels; cuticles** (3 marks)

SECTION B (20 marks)

Answer all questions in this section in the space provided

11. The diagram below represents a mammalian nephron



a) Name the:

i) Structure labelled P
Efferent arteriole/Vessel (1 mark)

ii) Portion of the nephron between point X and Y
Loop of Henle (1 mark)

b) Name the process that takes place at point Q
Ultra-filtration (acc. Pressure filtration) ref. filtration (1 mark)

c) Name one substance present at point R but absent a point S in healthy mammal
Glucose (acc Blood sugar) (1 mark)

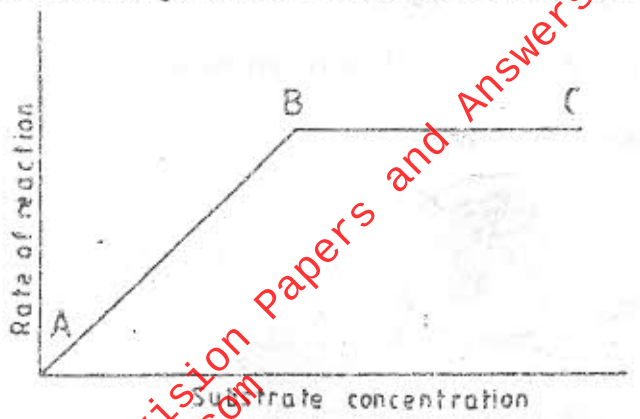
d) The appearance of the substance you have named in (c) above is a symptom of a certain disease caused by a hormone deficiency. Name the:

i) Disease
Diabetes mellitus (acc. Sugar diabetes)

ii) Hormone
Insulin

e) State the structural modifications of nephrons found in desert mammals
- **Small Bowman's Capsule/Gromeruli; Ref few o. of Bowman's Capsule**
- **Long loop of Henle** (2 marks)

12. The graph below shows the effect of substance concentration on the rate of enzyme reaction



(a) Account for the shape of the graph between

i) A and B

More active sites of enzymes available, for a large number of molecules of substrate; hence increase in the rate of reaction (Rapid or fast increase in the rate of reaction) (3 marks)

ii) B and C

Enzyme/substrate are in equilibrium/All active sites are occupied; hence rate of reaction is constant (2 marks)

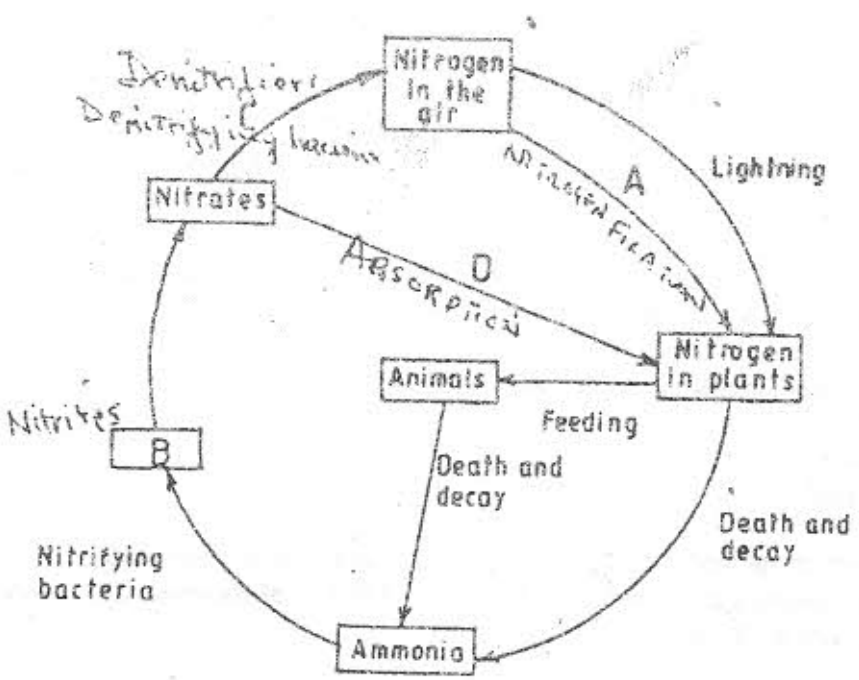
(b) How can the rate of reaction be increased after point B

- Raising concentration of enzymes (1 mark)

(c) State two other factors that affect the rate of enzyme reaction.

- pH, temperature, inhibitors/cofactors (2 marks)

13. The diagram below represents the nitrogen cycle



a) State the process labelled

A – Nitrogen fixation

D – Absorption (2 marks)

b) Name the compound represented by B

Nitrite/Nitrites/NO_2 (1 mark)

c) Name the group of organisms labelled C

Denitrifying bacteria/Denitrifiers (1 mark)

d) (i) Name the group of plans which promote process A

Leguminous plants, (acc. Legume/acc examples e.g. beans, peas) (1 mark)

(ii) State the part of the plant where process A takes place

Root nodules; Rej. Root or nodules alone; Acc. Root (1 mark)

e) How would excess pesticides in the soil interfere with process A?

Killing/reduction of decomposers

Killing/Reduction of Nitrogen fixing bacteria/Nitrogen fixing micro-organ

Destruction of leguminous plants (2 marks)

14. Tallness in pea plants is due to a dominant gene

Two tall pea plants were crossed and their F1 generation were in the ratio of 3 all: 1 short.

Using letter T to represent the gene for tallness and t for shortness give the

a) i) Genotypes of the parents

Tt, Tt

ii) Gametes of the parents

T t and T t

iii) Genotypic ratio of the F^1 generation

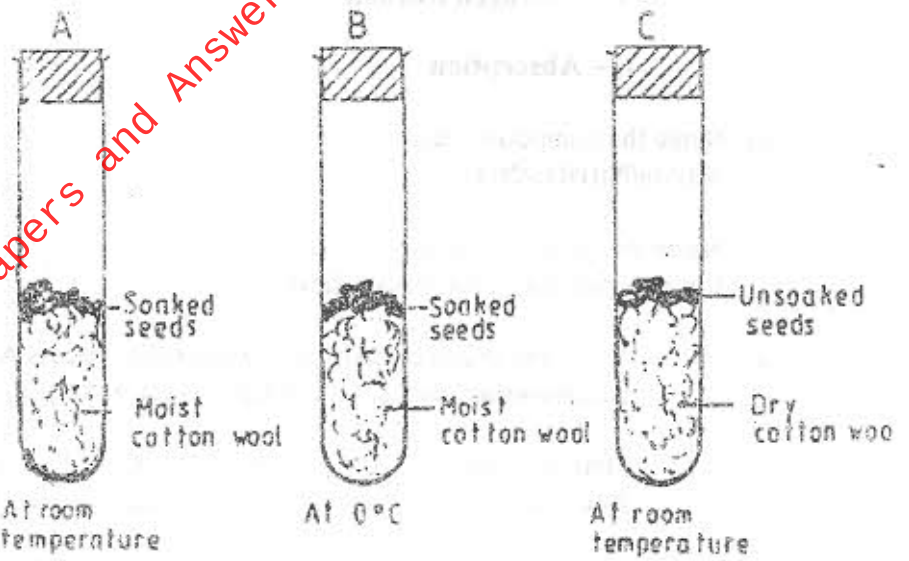
1TT; 2Tt; 1tt; /1 tall homozygous; 2 Tall heterozygous; 1 short homozygous

1:2:1

b) What is meant by the term test cross in genetic studies

Crossing a homozygous recessive organism with an organism which shows dominant characteristics

15. The diagrams below represent a set up to investigate the conditions necessary for seed germination.



The set was left for 7 days

a) What conditions were being investigated in the experiment?
Water, temperature, moisture (Acc. warmth) (2 marks)

b) State three reasons for soaking seeds in set ups A and B
Mobilise/hydrolyse stored food/activate enzymes/breaking of dormancy
Softening the testa/seed coat(Act as a solvent/transport media) (3 marks)

c) What were the expected results after seven days?
Setup A
Those in set up A will germinate

Setup B
Those in set up B will not germinate

Setup C
Those in set up C will not germinate (3 marks)

SECTION C (40 marks)

Answer questions 16 (compulsory) and either question 17 and 18 in the spaces provided for question 18

16. An experiment was carried out to investigate the nutritional value of two dry powder animal feeds X and Y over a period of 6 months. 25 months old castrated goats were used. The goats were divided into two equal groups A and B.
The animals in group A were fed on feed X through the experiments while those of group B were fed on feed Y.
The feeds were suppiemented with dry hay and water. The average body weight of each group of goats and the weight of the dry powder feeds were determined and recorded each month. The faeces produced by each group was dried and weighed and the average dry faecal output per month was also recorded.

The results are shown below

Months since commencement of the experiment	GROUP A			GROUP B		
	Average total weight of goats (kg)	Average weight of total feed (kg)	Average monthly dry faecal output (kg)	Average total weight of goats (kg)	Average weight of total feed (kg)	Average monthly dry faecal output (kg)
0	20.4	26.7	10.5	20.5	35.4	16.5
1	22.5	27.5	10.7	19.4	34.3	17.7
2	24.5	25.8	10.3	19.0	35.2	17.2
3	26.3	18.5	8.8	18.5	36.1	17.5
4	28.0	16.6	7.2	17.1	36.0	16.9
5	29.4	16.3	6.0	16.3	35.8	16.8
6	29.5	16.1	5.6	15.6	35.5	16.6

a) i) What is the relationship between the amount of feed and the faecal output?
The more the feed the more the feacal output
The less the feed the less the feacal output (1 mark)

ii) Work out the average increase in weight for the animals in group A during the first four months

$$\frac{2.1+2.0+1.8+1.7}{4}; \left| \frac{28.0-20.4}{4} \right|; \frac{7.6}{4}; \quad = 1.9(\text{kg}) \qquad (2 \text{ marks})$$

the last two months

$$\frac{1.4+0.1}{2}; \left| \frac{29.5-28.0}{2} \right|; \frac{1.5}{2} \quad = 0.75\text{kg} \qquad (2 \text{ marks})$$

iii) Account for the average increase in weight for the goats in group A during the first four months
Fast/Rapid/Active growth hence increase in weight (1 mark)

the last two months
Slow growth, reached maturity (2 marks)

iii) Which of the two feeds is more nutritious?
Feed X (1 mark)

Give reasons for your answer
Group A gained (more)weight, on less food while group B lost weight on more food (3 marks)

b) State four uses of digested food in the bodies of animals
Growth, repair, protection, energy production (4 marks)

c) State four uses of water in the bodies of animals
As a solven, transport medium. Hydrolyses of food, maintenance of temperature (acc. cooling) (4 marks)

17. a) State the functions of the following parts of the mammalian ear:

i) Tympanic Membrane
Receives sound waves (from the air); and vibrates/transforms sound waves into vibrations; to transmit them to the ear ossicles/malleus; acc. hammer for malleus (3 marks)

ii) Eustachian tube
Equalises the air pressure in the (middle) ear to that in the outer ear (1 mark)

iii) Ear Ossicles
Amplify/transmits vibrations from the tymphanic membrane in the inner ear/fenestra ovalis/oval window (2 marks)

b) Describe how semicircular canals perform their functions.
There are three semi-circular canals; arranged in planes; at right angels to each other; at the end of each canal is a swelling called ampulla which contains receptors. The movement of the head cause movement of the fluid in at least one canal, the fluid movement deflects/displaces the coperta and thus stimulating the receptors/ sensory hairs, this way the impulse/ nerve sensory inpise is transmitted/conducted to the brain; by auditory nerve, about the movement of the head/body. (15 marks)

18. a) Describe the process of fertilization in a flowering plant
Pollen grains stick in the stigma surface; that surface of stigma produces a chemical substance; which stimulates the pollen grain to produce a pollen tube/germinate. The pollen tube grows down (into the tissues of the style) from where it derives nutrients; the generative nucleus divides to give rise to two male nuclei and the embryo sac contains eight nuclei, 2 synergids, ovum, two polar nuclei, three antipodal cells, when pollen tube reaches the microphile the vegetative nucleus/pollen tube nucleus in the pollen tube disintegrates and make nucleus fuses with the egg cell and forms the zygote.
The other male nucleus fuss with the two polar nuclei to form a tripoid nucleus.
The process involves double fertilization.

b) State the changes that take place in a flower after fertilization
- **Integument changes into seed coat/testa**
- **Zygote into embryo**
- **Ovary wall into pericarp**
- **Ovary into fruit**
- **Ovule into seed**
- **Tribloid nucleus into endosperm**
- **Style dries up/fall off leaving a scar/Corolla dries up (falls off) stamens dry up (Rej. Degeneration disintegrates)**