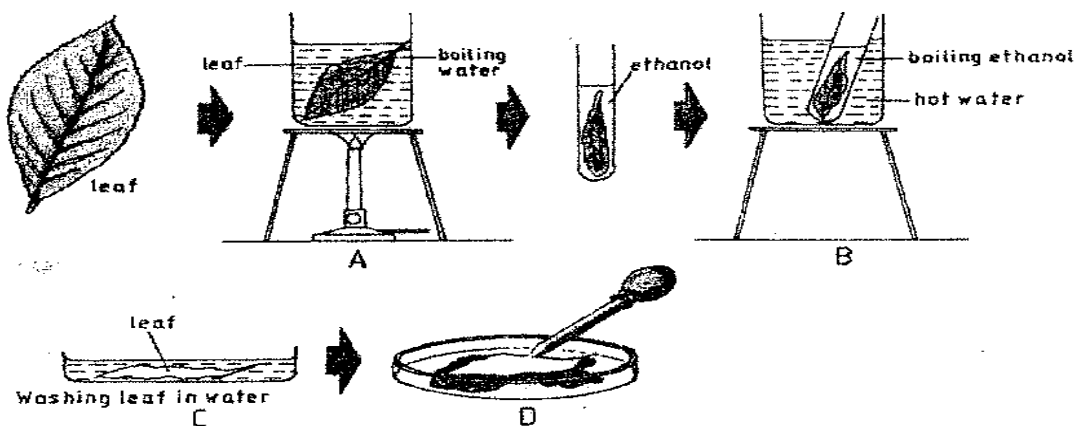


**THE YEAR 2011 KCSE KNEC EXAMINATION
BIOLOGY 231
PAPER 2**

SECTION A (40 marks)

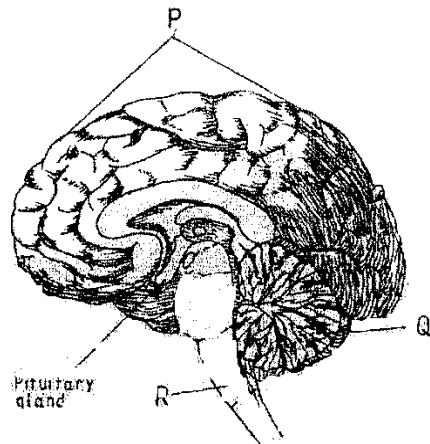
Answer *all* the questions in this section in the spaces provided.

1. The set-up below illustrates a procedure that was carried out in the laboratory with a leaf plucked from a green plant that had been growing in sunlight.



- (i) What was the purpose of the above procedure? (1 mark)
- (ii) Give reasons for carrying out steps A, B and C in this procedure. (3 marks)
- (iii) Name the reagent that was used at the step labeled D. (1 mark)
- (iv) State the expected result on the leaf after adding the reagent named in (iii) above. (1 mark)
2. In humans, hairy ears is controlled by a gene on the Y Chromosome.
- (a) Using letter Y^H to represent the chromosome carrying the gene for hairy ears, work out a cross between a hairy eared man and his wife. (4 marks)
- (b) (i) What is the probability of the girls having hairy ears? (1 mark)
- (ii) Give a reason for your answer in (b) (i) above. (1 mark)
- (c) Name **two** disorders in humans that are determined by sex-linked genes. (2 marks)
- (d) Explain how comparative embryology is an evidence for organic evolution. (2 marks)
- (a) Name the causative agents for the following respiratory diseases. (2 marks)
- (i) Whooping cough.
- (ii) Pneumonia.
- (b) Describe how oxygen in the alveolus reaches the red blood cells. (4 marks)
- (c) How are the pneumatophores adapted to their function?

- 4 (a) The diagram below represents a section of the human brain.

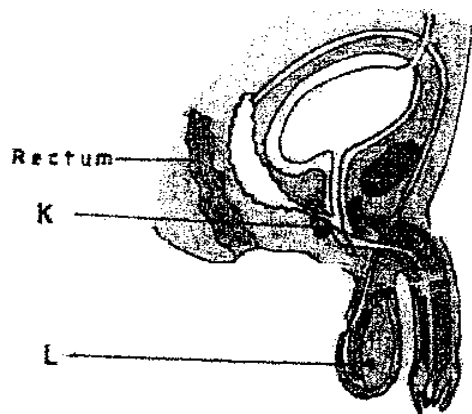


- (i) Name the structures labelled P and R. (2 marks)
 (ii) State two functions of the part labeled Q. (2 marks)
- (b) (i) Name **two** reproductive hormones secreted by the pituitary gland in women.



- (ii) State **one** function of each of the hormones named in (b)(i) above. (2 marks)
- 5 (a) The diagram below represents a flower. (2 marks)
- (i) On the diagram, name **two** structures where meiosis occurs. (2 marks)
- (ii) How is the flower adapted to prevent self-pollination? (2 marks)

(b) The diagram below represents a human reproductive organ.



(i) Explain two adaptations of the structure labeled L to its functions.
mark)

(2

(ii) Explain the role of the gland labeled K.

SECTION B (40 marks)

Answer question 6 (compulsory) and either question 7 or 8 In the spaces provided after question 8,

6. (a) An experiment was carried out to investigate the population of a certain micro-organism. Two petri-dishes were used. Into the petri-dish labelled JVI, 60cm^3 of a culture medium was placed while 30cm^3 of the same culture medium was placed in petri-dish labelled N. Equal numbers of the micro-organisms were introduced in both petri-dishes. The set-ups were then incubated at 35°C . The number of micro-organisms in each petri-dish was determined at irregular intervals for a period of 60 hours. The results were as shown in the table below.

Relative number of micro-organisms	M	40	40	180	280	1200	1720	1600	1840	1560	600
	N	40	40	120	200	680	560	560	600	600	400
Time in hours		0	5	10	15	23	30	35	42	45	60

On the same axes, draw the graphs of relative number of micro-organisms against time on the grid provided. (7 marks)

- (ii) After how many hours was the difference between the two populations greatest? (1 mark)
- (iii) Work out the difference between the two populations at 50 hours. (2 marks)
- (iv) With a reason state the effect on the population of micro-organisms in petri-dish M if the temperature was raised to 60°C after 20 hours. (2 marks)
- (v) Account for the shape of the curve for population in petri-dish N between 46 hours and 59 hours. (3 marks)

Explain how the osmotic pressure in the human blood is maintained at normal level. (5 marks)

- 7 (a) Explain how structural features in terrestrial plants affect their rate of transpiration. (13 marks)
- (b) Explain how the human skin brings about cooling of the body on a hot day. (7 marks)
- 8 (a) Describe the exoskeleton and its functions in insects. (13 marks)
- (b) Describe how accommodation in the human eye is brought about when focusing on a near object. (7 marks)

**KCSE 2011 BIOLOGY
PAPER 2
MARKING SCHEME**

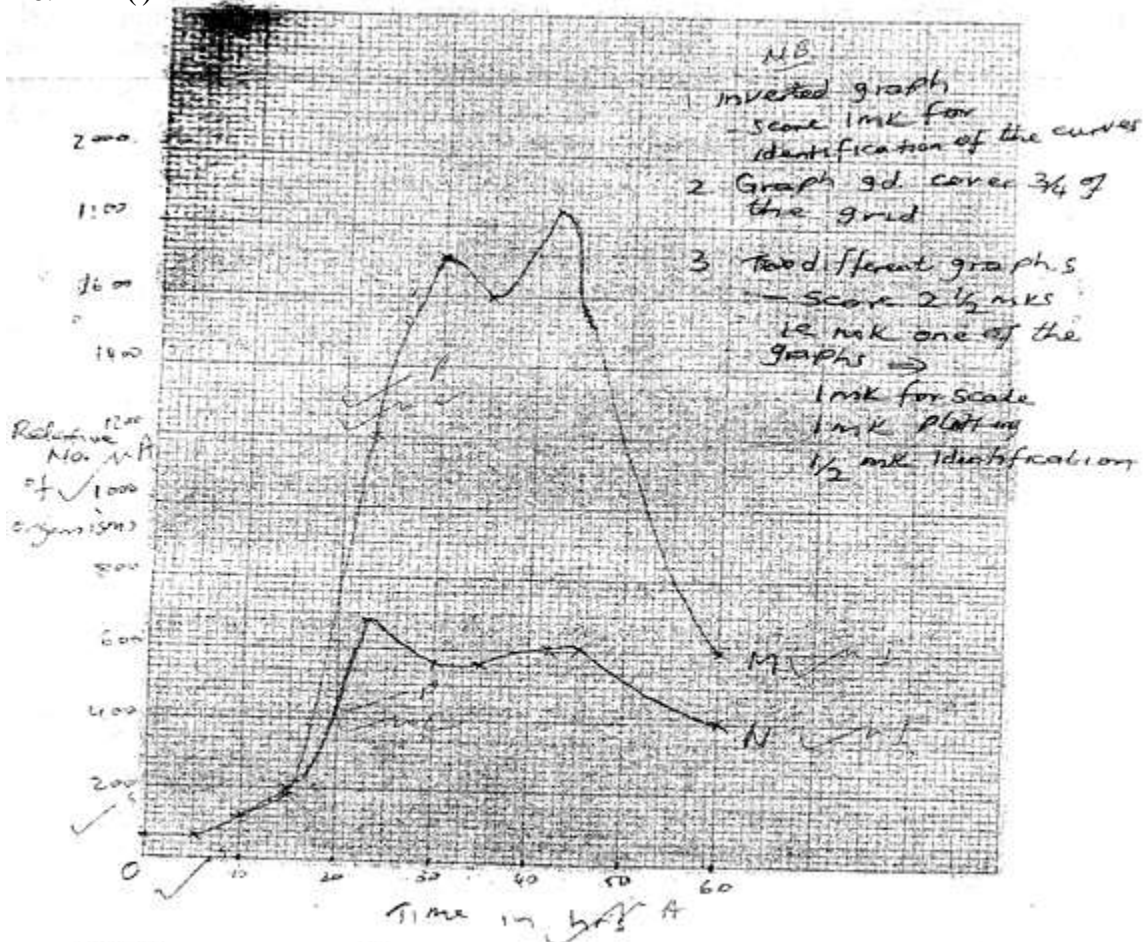
1. (i) Testing for the presence of starch
 - (ii) A. Kill the leaf/cells/photoplasm/breakdown starch/granules/stop enzymatic activities; acc. denature enzyme
B. Removal of chlorophyll/decolorize the leaf/dissolve chlorophyll
C. Soften the leaf/make the leaf less brittle
 - (iii) Iodine solution, rej; iodine alone, rej; reagent
 - (iv) Stain dark blue/blue-dark
2. (a)
 - (b) (i) Zero/0/nil acc $0/2$; rej. $0/4=0$
(ii) The gene for heavy ear is on Y chromosome which girls do not inherit from fathers OWTTE Muscular dystrophy
 - (c) Haemophilia, colour blindness, premature baldness, muscular dystrophy
 - (d) Vertebrates embryos have similar morphological features which suggest a common ancestry; invertebrates, annelids and molluscs have similar blastula/trochophore larva suggesting common ancestry
3. (a) (i) Whooping cough
Bordetella pertussis
(ii) Pneumonia
Streptococcus pneumonia/acc. para influenza virus/influenza virus young chrolo mycoplasma pne
 - (b) Inhaled O_2 dissolves in alveolus in the alveolus; since the O_2 concentration in blood is lower than alveolus; O_2 diffuses through epithelium the capillary wall into the plasma/blood/blood cells and finally into red blood cells
 - (c) Grow into the air above mud/water
Have lenticels for gaseous exchange
4. (a) (i) P. Cerebral hemisphere/cerebrum
R. medulla oblongata
(ii) Muscular coordination, maintain body posture/balance/manual motor dexterity
 - (b) (i) Follicle stimulating hormone, lutenizing hormone, oxytocin, Prolactic
(ii) FSH-Stimulates secretion of Oestrogen, stimulate development of graafian follicle
LH-Ovulation, development of corpus luteum, stimulates production of progesterone by corpus luteum
5. (a) (i)
 - (ii) Anthers are below the stigma (to minimize self pollination)

Petals are large/conspicuous for insects to land on/to attract insects (encouraging cross pollination)

- (b) (i) L is hanging outside the body to ensure optimal temperature for sperm production. It has many long coiled seminiferous tubules to increase surface area for production of sperms
- (ii) Produces an alkaline fluid that neutralizes acid in the vagina/urethra. This fluid contains nutrients for the sperm and also activates the sperms.

SECTION B

6. (i)



scale
 ✓ check origin
 * intervals
 * Highest PE

plotting
 - All pts should be there

Curve
 - Free hand

(ii) 42 Hrs

(iii) Graph at 50Hrs = 1240 Graph N = 547

$$1240 - 547 = 693 + 4$$

$$M: 1220 - 20 = 1200 - 1240$$

$$N: 540 - 20 = 520 - 56$$

$$\text{Ans} = 680 - 40 = 640 - 720$$

(iv) Pop growth decreases/reduces, high temperature kills the main organism/denature enzymes

- (v) Pop (growth rate) decreases, death rate is higher than rate of multiplication due to exhaustion of nutrients (in the culture medium), accumulation of toxic wastes, shortage of O₂, overcrowding/shortage of space.
 - (b) When OP of the blood increases (beyond normal) the osmoreceptors in the hypothalamus detects this and stimulates pituitary glands to secrete more ADH/Vasopresin which makes kidney tubules more permeable to water and more water is reabsorbed into the blood reducing up to normal level. Osmoreceptors in the hypothalamus detect this pituitary gland less stimulated, less ADH released, kidney tubules less permeable to water, less water reabsorbed into the blood raising up to normal level
7. (a) Plants in arid/semi-arid/desert habitats have leaves covered with thick/waxy cuticle that are water proof/impermeable to water allowing for reduced rate of transpiration. Sunken stomata in some desert/semi-arid areas plants have water vapour accumulating in the pits reducing rate of transpiration as moisture in the pits is not carried away by wind. Most plants have few or no stomata on the upper surface of the leaf/more stomata on the lower surface or sheltered from direct sunlight, small stomata/small stomata size thus reducing rate of transpiration. Plants with small/needle like leaves/spines expose less surface area hence reduced rate of transpiration. Leaves with shiny surfaces reflect light resulting in reduced leaf temperature thus reducing rate of transpiration. Some plants have leaves covered/scales to trap a large moisture on the leaf surface reducing transpiration. Plants growing in wet habitat/mesophylls have thin layer of cuticle which allow high rate of transpiration. Broad leaves expose large surface area. Many stomata on both surfaces of the leaf, have large stomatal aperture
- (b) Erector pilli muscle relax and hairs lies flat, trapping less air thus reducing insulation/more heat lost, blood capillaries/vessels/arterioles in the skin vasodilate and more blood is brought near skin surface increasing heat loss by radiation/convection. Sweat glands release (move) sweat to the skin surface the sweat takes away heat from the body when it evaporates.
8. (a) The exoskeleton is made of chitin, chitin is not evenly distributed/is thin and flexible at joints for movement. Exoskeleton is secreted by epidermal cells, when still soft it allows for growth of the insect. When (in contact with the air) it hardens limiting growth, it is shed regularly thus regulating growth. It also supports internal structures, because if is hard, it protects internal organs from mechanical damage. It is waterproof preventing/reducing water loss/desiccation of the insect. It also provides a surface for attachment of muscles, it is light/has low density/modified into wings for flight, can be modified to form jaws/mouth for biting/piercing/sucking/grinding, pigmented for camouflage, can be transparent in some places allowing entry of light into the eyes for camouflage in water.

- (b) Light rays from near object are more divergent and need to bend more.
Ciliary muscles contract, suspensory ligaments slaken, the lens become thicker/more convex/increases in curvature/reduces focal length
Light from the object is refracted more in order to be focused sharply/form an image on the retina