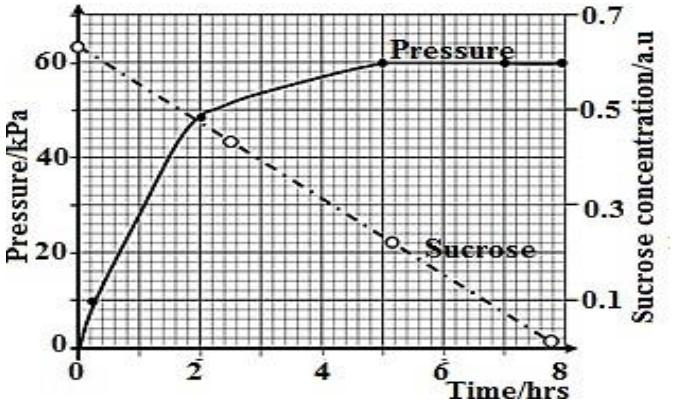
1. In an experiment to investigate the movement of water up the plant, the stem of a herbaceous plant was cut, the cut end of the stump continued to exude copious quantities of water, and a suitable mercury manometer was attached to the cut end, to measure the pressure. The experiment was left to stand for some time.

The results were tabulated



and then plotted in Figure I. At the same time, the amount of sucrose in the cells of the stem was monitored.

(i) Describe the changes in pressure that took place during the period of the experiment.

(ii) Explain the variation in the sucrose concentration.

(iii) Explain the effect of variations in sucrose on the pressure.

(iv) Apart from sucrose concentration, state and explain the other three factors that may affect the process being investigated.

(v) How is the process investigated cause the upward movement of water through the xylem vessels?

(vi) State any five adaptations of the xylem for the movement of water up the plant.

(SEETA HIGH GREEN CAMPUS)

2. Explain how:

(a) Allopatric speciation occurs.

(b) Gene frequency of the population may be altered.

(MUZZA HIGH SCHOOL-MUKONO)

3. In an investigation, the blood glucose level of an adult health human being was measured after eating a complex carbohydrate. The investigation was repeated another day when the same person ate proteins and lastly when the person ate lipids.

The results of the three investigations are reflected in **figure 1** below.

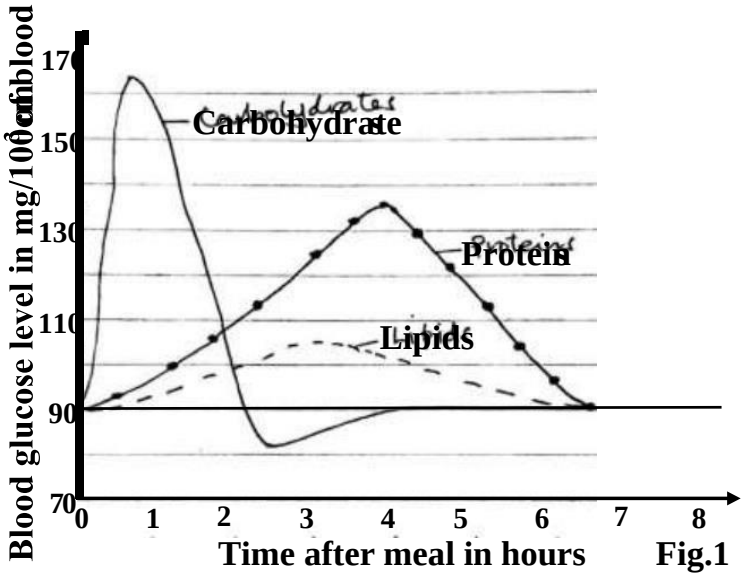


Fig.1

(a)

(a) Explain the observed changes in blood glucose level of the individual after the:

(i) Carbohydrate meal

(ii) Protein meal

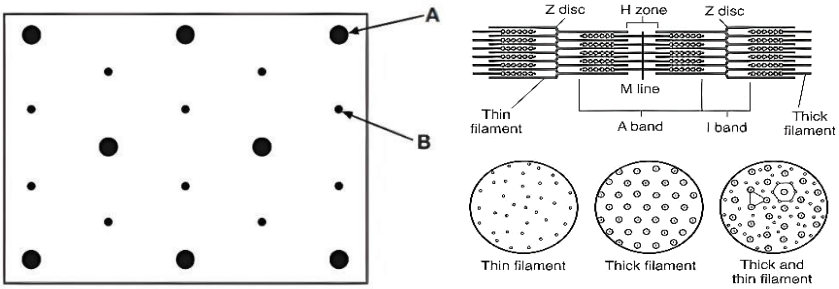
(iii) Lipid meal

(b) (i) Compare the changes in blood glucose level of the individual after the carbohydrate and protein meal

(ii) Explain the difference(s) stated in (b) (i) above on **figure 1**, sketch a curve to show how blood glucose level of a diabetic person would have changed with time after a carbohydrate meal

(c) What is the significance of the process illustrated in **figure** 1 above?
(FOREST HILL-MUKONO)

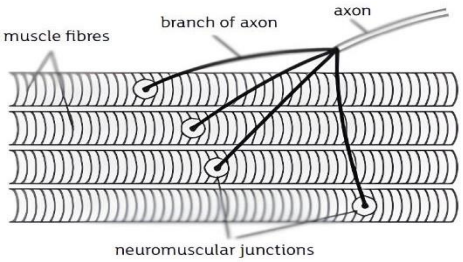
4. (a) The diagram below shows a representation of part of a myofibril in cross-section



(*i*) Identify the type of protein found in the structures represented by A and B.

(*ii*) Draw a sarcomere to show the region (band) of the myofibril where the cross-section was taken.

(*b*) The diagram below neuromuscular junctions that bare specialized synapses that link neurones to muscle fibres.



(*i*) What is the main functional difference between neuromuscular junctions and neurone to neurone synapses in the nervous system?

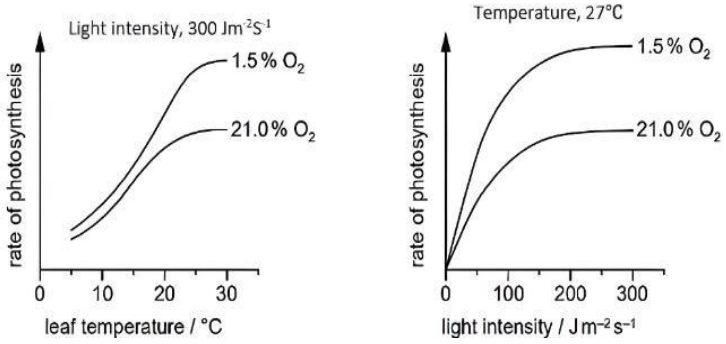
(*ii*) Explain the significance of the axon of one motor neurone branching to a number of muscle fibres.

(*c*) Describe the sliding filament mechanism of muscle contraction.

(K0JJA SS -MUKONO)

5. Figure A and B show the effect of leaf temperature and light intensity on the rate of photosynthesis in al leaf of a temperate plant, A triplex patula at two different oxygen concentrations.

All measurements were made at atmospheric carbon dioxide concentration.



a) Describe the effect of the factors depicted in the figures, A and B on the rate of

photosynthesis in *A. patula*

b) With reference to fig. A and B,

i) State the conditions under which oxygen exerts a significant inhibitory effect on photosynthesis in *A. patula*.

ii) Explain how oxygen inhibits photosynthesis in *A. patula*

c) Why was the experiment on the effect of leaf temperature (Fig A) carried out in conditions of light saturation?

(GODMARK HIGH SCHOOL -MUKONO)

6. Figure 1 below shows changes in renal plasma ratio of individual solutes in different parts of the nephron. **In figure 2,** curve A shows changes in the concentration of solutes on administering **Antidiuretic hormone (ADH)** while **curve B** shows changes in concentration of the solutes in **absence of ADH.**

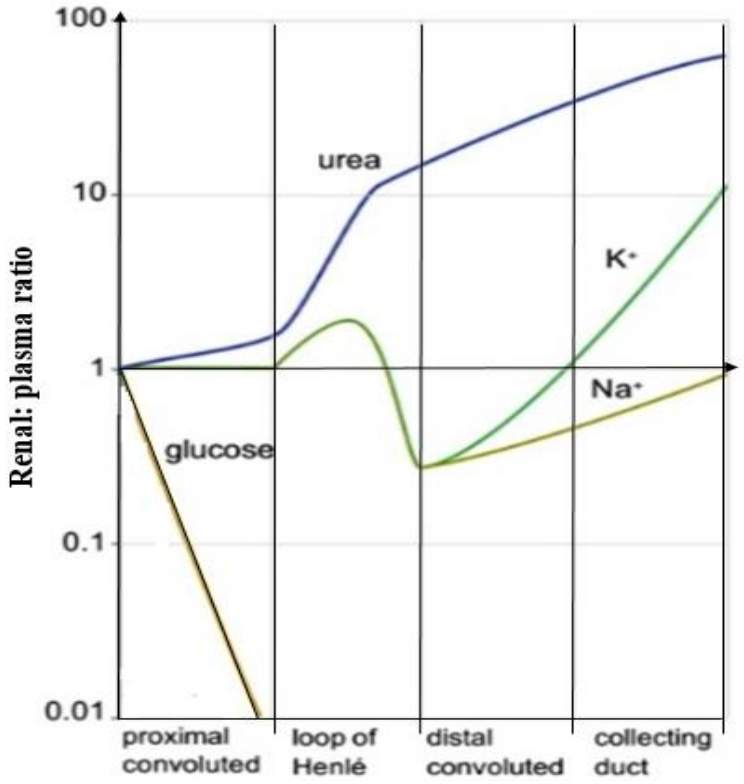
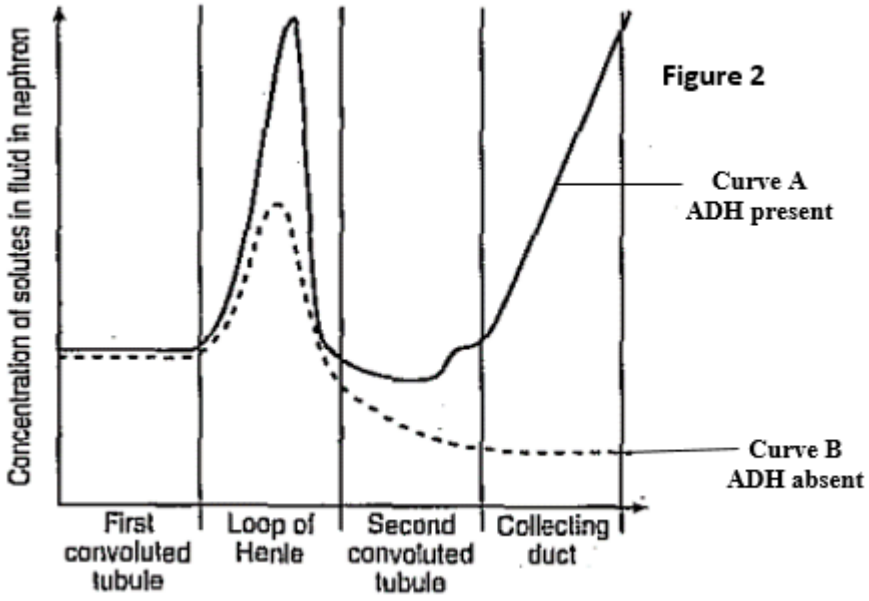


Figure 1



(a) Describe the changes in the renal plasma ratio of each solute in different parts of the nephron

(b) Explain the changes you have describe in a) above

(c) Phlorizin is a chemical which makes the wall of the tubules impermeable to glucose. Predict how the renal plasma ratio would change for glucose within the proximal convoluted tubule and loop of Henle if the nephron was treated with Phlorizin. Give reasons for your answer.

(d) Using Figure 2,

(i) Compare the concentration of solutes in the renal fluid in presence of ADH and in absence of ADH.

(ii) Explain the differences in concentration of the fluid in the nephron in different parts in presence of ADH and absence of ADH

(iii) Explain the role of the vasa recta in water conservation

(SEETA HIGH MAIN CAMPUS)

7. (a) Describe the functioning of ecdysone hormone.

(b) Describe hormonal control of spermatogenesis in human testes.

(c) What is the role of the dartos muscles?

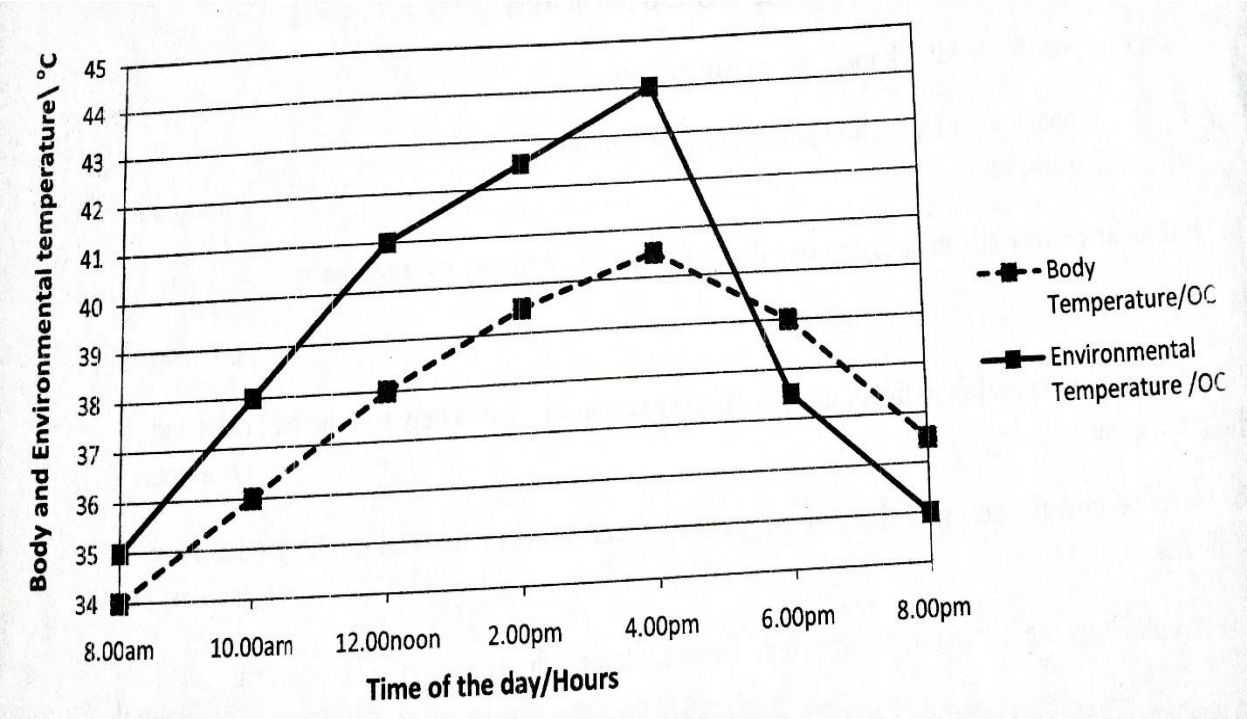
(SEROMA CHRISTAIN HIGH SCHOOL-MUKONO)

8. (a) Explain how Tilapia fish overcome their osmoregulatory challenges in a fresh water lake like Lake Victoria.

(b) Describe elimination of nitrogenous wastes from the insect's body.

(SEETA HIGH SCHOOL-MBALALA CAMPUS)

9. The graph below shows the variation of the body temperature of the camel with the external environmental temperature. Study the data and answer the questions



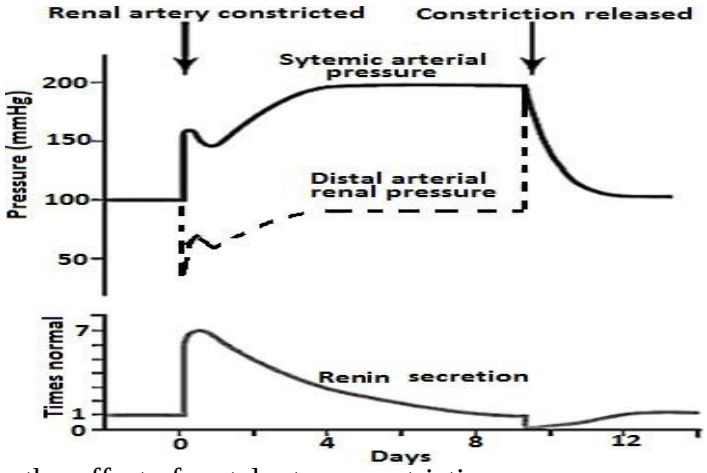
a) Compare the variation of the body temperature of the camel with the environmental temperature.

b) Explain the variation of the body temperature with the environmental temperature from;

i) 8.00am to 2.00pm, (ii) 4.00pm to 8.00pm

c) What is the significance of pyrogens?

10. Figure below shows effect of placing a **constricting clamp** on the renal artery of one kidney after the other kidney has been removed. Changes in systemic arterial blood pressure, renal artery distal to the clamp and rate of renin secretion are shown



a) Describe the effect of rental artery constriction on,

(i) Systemic arterial pressure.

(ii) Distal arterial renal pressure.

(iii) Renin secretion.

b) Explain the observed changes in systemic arterial pressure, distal arterial renal pressure and renin secretion during renal artery constriction.

c) Explain the relationship between systemic arterial pressure and distal arterial renal pressure when constriction is released.

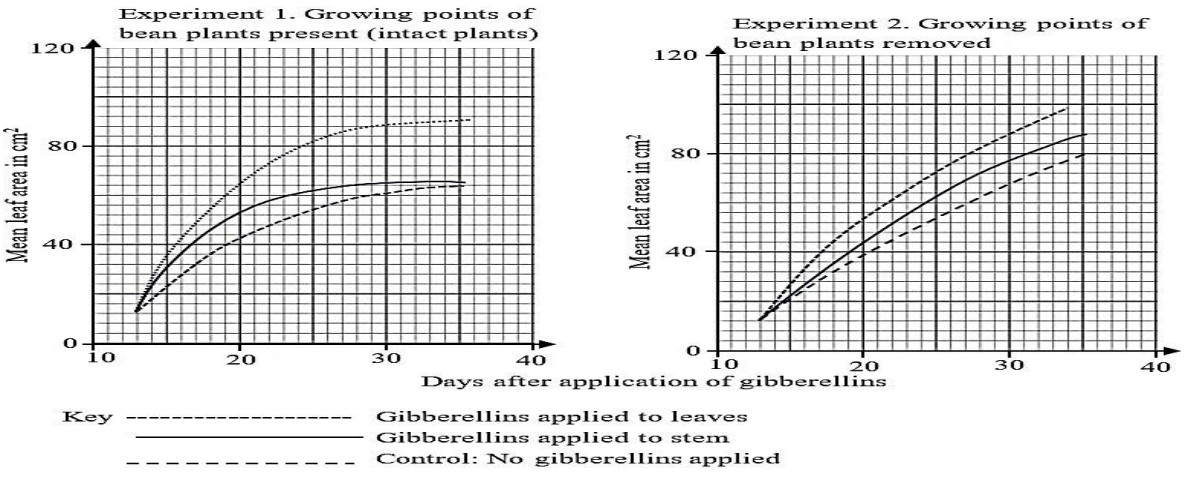
d) Describe the production of acidic urine by the kidney of a runner after the race.

e) Account for the effect of drinking bicarbonate-rich mineral water on the pH of urine.

11. An investigation was carried out into the effect of gibberellin on the growth of leaves in dwarf bean plants. Equal amounts of the hormone were applied either to the stem or the first leaves produced by the plants.

In one experiment the plants were left intact, but in a second experiment, the growing point (apex) of each plant was removed when gibberellin was applied. In both experiments, a control group of plants received no gibberellins.

Results are shown in the graphs below



(a) Compare the effects of applying gibberellin on the stem and the leaves of the intact bean plants.

(b) (i) Describe the effect on leaf growth of removal of the growing points from the bean plants when no gibberellin is applied.
(ii) Suggest one reason why the removal of the growing point has this effect.

(c) How did the removal of the growing points from the bean plans affect the results of gibberellin applications?

(d) Explain how gibberellins exert their effects on plants

(a)Compare the effects of applying gibberellin on the stem and the leaves of the intact bean plants.
(b)(i) Describe the effect on leaf growth of removal of the growing points from the bean plants when no gibberellin is applied.
(ii) Suggest one reason why the removal of the growing point has this effect.
(c)How did the removal of the growing points from the bean plans affect the results of gibberellin applications?

(d)Explain how gibberellins exert their effects on plants.

12. (a) What are the merits and demerits of reproduction by seeds.

(b) Describe the reproductive strategies of angiosperms that increase variety in the offspring produced. **(ST. BALIKUDDEMBE SS-KISOGA)**

13.(a) Describe mechanism of action of mammalian hormones.

(b) What is the purpose of each effect caused by noradrenaline and adrenaline during fight or flight situations. **(ST. BALIKUDDEMBE SS-KISOGA)**

14(a)(i) Describe how blood circulation occurs in insects.
(ii) How is circulation in an insect different from that in a fish?
(b)What is the significance of the short term changes that occur in the cardiovascular system of an athlete who trains regularly?
(c)Explain the need a vascular system and respiratory pigments in multicellular organisms.
(d) How is large surface area to volume ratio achieved in the different organisms?

(ST. BALIKUDDEMBE SS-KISOGA)

15. The table shows the blood flow to various organs of an athlete, while at rest and during strenuous exercise.

Organ	**Blood flow at rest in cm^3min^{-1}**	**Blood flow during strenuous exercise in $cm^3\ min^{-1}$**
Body muscle	1000	16,000

Skin	500	1000
Kidneys	1000	300
Liver and intestines	2500	90
Brain	750	750
Heart muscle	250	1200

(a) Calculate:

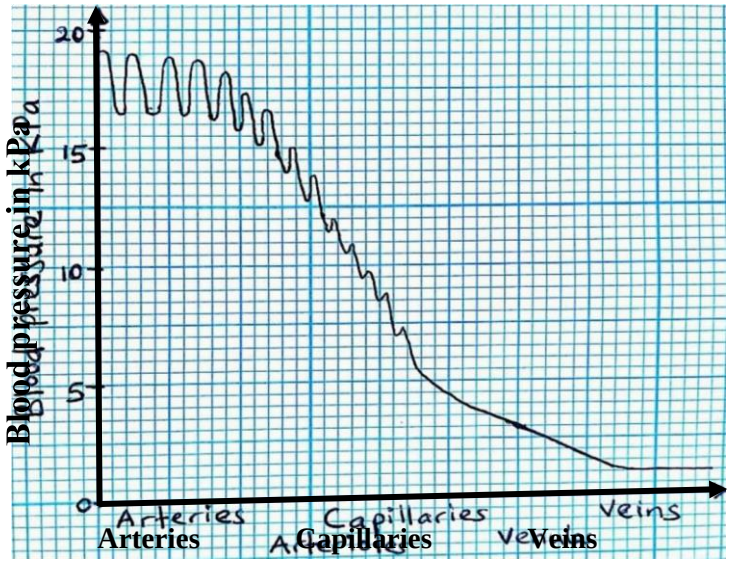
(i) Cardiac out at rest and during the strenuous exercise

(ii) Percentage change in blood flow to the body muscle the strenuous exercise

(b) Comment on the pattern of changes in blood flow to the different organs during strenuous exercise

(c) Suggest explains for the changes in pattern of blood flow to the different organs during strenuous exercise

(d) The figure below shows changes in blood pressure as blood flows through the different blood vessels.



Arteries **Capillaries** **Veins**

Arterioles **Venules**

(i) Describe the changes in blood pressure of blood as it flows through the different blood vessels

(ii) Explain the changes in blood pressure stated in (c)(i) above

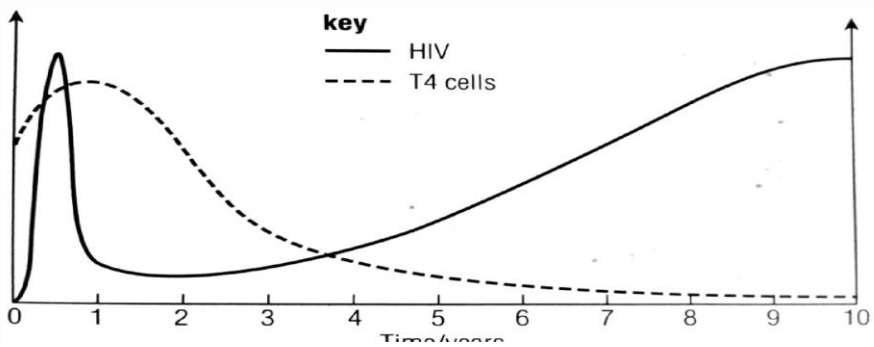
(e) What is the significance of the pressure changes shown in the following blood vessels?

(i) Arteries

(ii) capillaries

(HILTON HIGH SCHOOL-MUKONO)

16. Figure 1 below shows the development of an infection with human immunodeficiency virus (**HIV**) over a period of 10 years. Changes in number of **T_4 cells** are also shown.



(a)Describe the changes in the number of **HIV** particles over the 10-year period

(b)(i) Compare the changes in number of **HIV** particles and number of **T_4** cell

(ii) Explain the differences in between the number of HIV particles in blood and number of **T_4 cells** stated in (b) (i) above

(c)Predict the changes in numbers of **HIV** particles and **T_4 cells** if the infection continued for more 2 years

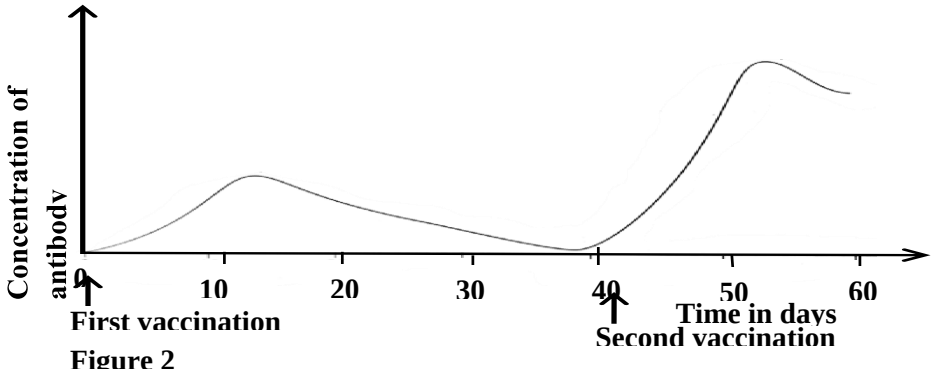


Figure 2

Figure 2 below shows the immune response of a child's blood after two vaccinations. The second vaccine was given 40 days after the first vaccine.

(d)(i) From **figure 2**, State the differences in the effect of the first and second vaccine

(ii) Explain the differences stated in (d) (i) above