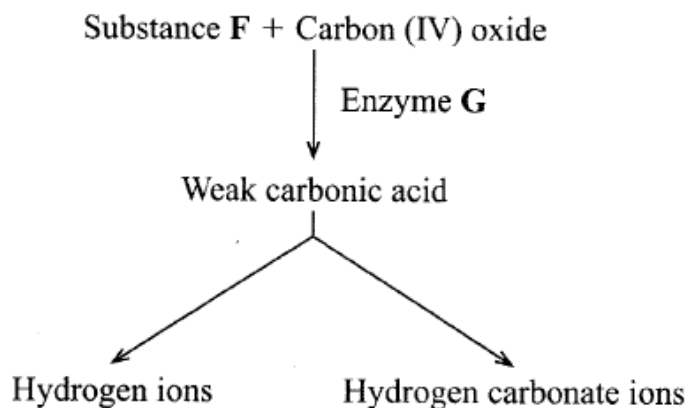# KENYA NATIONAL EXAMINATION COUNCIL
KCSE, 2014

ANALYSI: BIOLGY PAPER 2

,
Osiligi House, Opposite KCB, Ground Floor
Off Magadi Road, Ongata Rongai | Tel: 0711 88 22 27
E-mail:infosnkenya@gmail.com | Website: www.schoolsnetkenya.com

3.3.3 Biology Paper 2 (231/2)

Question 2

The diagram below illustrates the role played by red blood cells in the transportation of carbon (IV) oxide.

Substance **F** + Carbon (IV) oxide

Enzyme **G**

Weak carbonic acid

Hydrogen ions   Hydrogen carbonate ions

(a)   Other than the carbon (IV) oxide transportation in the red blood cells, name the other form of carbon (IV) oxide transportation in humans.   (1 mark)

(b)   (i)   Name substance **F** .... (1 mark)

        (ii)   Name the enzyme marked **G** and state its role in the reaction.   (2 marks)

                Enzyme ....

                Role..

(c)   Explain why transportation of carbon (IV) oxide in red blood cells is advantageous.
                                                                                                        (2 marks)

(d)   Explain the role of calcium ions in blood clotting.   (2 marks)

Weaknesses

Most candidates were not able to correctly interpret the diagram. This could be associated with inadequate instruction on carbon (IV) oxide transportation. Some candidates confused carbon (IV) oxide transportation with carbon (II) oxide poisoning.

27

Expected responses

(a)   Carbonic acid/carbaminohaemoglobin/hydrogen carbonate;

(b)   (i)   Water;
        (ii)   Carbonic acid;

                Role: catalyses reaction between carbon IV oxide and water to form (weak)
                carbonic acid;

(c)   Prevents accumulation of acidity/maintains pH of blood since hydrogen ions combine
        with haemoglobim to form haemoglobinic acids
        Faster; due to the catalytic effect of carbonic anhydrase;

(d)   Activates thromboplastin; thrombokinase to neutralize heparin/convert prothrombin to
        thrombin;

Question 4 (b)

(b)   (i)   Differentiate between sickle cell anaemia and sickle cell trait.   (2 marks)

        (ii)   Explain why people with sickle cell trait have an adaptive survival advantage
                over normal individuals in malaria endemic regions.   (2 marks)

Weaknesses

Most of the candidates were unable to distinguish between sickle cell anaemia and sickle cell trait.
Neither could they explain the survival advantage sickle trait has over normal individuals in malaria
endemic regions. Genetics is covered in form four and in a rush to clear the syllabus; the area may not
have been addressed adequately during instruction.

Expected response

(i)   Sickle-cell trait is heterozygous while sickle cell anaemia is a homozygous condition;

(ii)   People with sickle cell trait are resistant to malaria; because the plasmodium cannot
        survive in sickle shaped red blood cells.

Question 6

An experiment was done to determine the uptake of nitrogen from the soil by broad bean seedlings. The experiment was done with one set of seedlings **M** grown in the atmosphere enriched with carbon (IV) oxide and another set up of seedlings **N** grown in the normal atmosphere.

The amount of nitrogen in each seedling was measured in milligrams at intervals of ten days. The table below shows the results obtained.

	Amount of Nitrogen in Milligrams									
SET M	0	25	70	125	160	395	635	860	895	915
SET N	0	15	35	50	65	105	120	125	135	140
TIME (DAYS)	15	25	35	45	55	65	75	85	95	105

(a) Using the same axis draw line graphs of nitrogen uptake by the two (**M** and **N**) sets of broad bean seedlings against time. (8 marks)

(b) Determine the rate of uptake of nitrogen in Set **M** between 65 and 85 days. (2 marks)

(c) (i) What is the relationship between carbon (IV) oxide concentration in the air and nitrogen uptake? (1 mark)

(ii) Account for the relationship in (c)(i) above. (3 marks)

Weaknesses

Some candidates were not able to draw the correct graph. This could be attributed to the weakness in obtaining the correct scales for the two axes given the diversity of the figures provided in the table. Most of the candidates did not understand the fact that in addition to glucose synthesis, amino acids are also formed in the process of photosynthesis.

Expected response

(a) Scale 2x1 mark

   Identity of axes 2x1 mark

   Plotting of points 2x1 mark

   Labelling of curves 1 mark ($\frac{1}{2} \times 2$)

   Smooth curves 1 mark ($\frac{1}{2} \times 2$)

(b) At $65 = 395$; $\dfrac{860 - 395}{20}$ $\dfrac{465}{20}$; $= 23.25 \pm 1$ mg/day

At $85 = 860$

NITROGEN UPTAKE BY BROAD BEAN SEEDLINGS

30
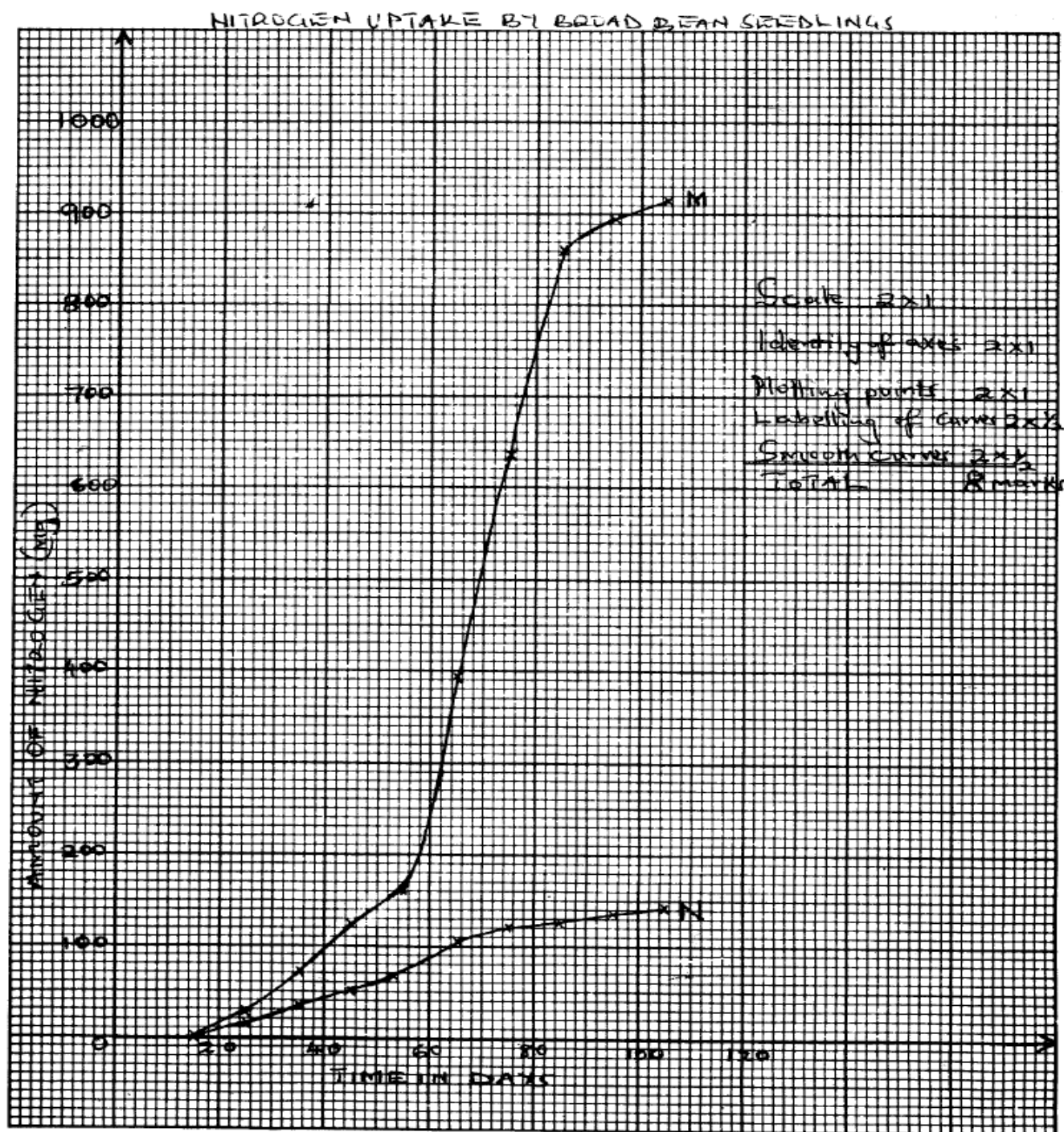
(c) (i) The higher the carbon (IV) oxide content in air, the higher the nitrogen uptake and vice versa;

(ii) More Carbon (IV) oxide in the air makes the seedlings to photosynthesize more; hence more amino acids/protein; are formed in the dark stage; formation of amino acids/protein requires nitrogen;

(d) (i) The concentration of nitrogen would remain constant;

(ii) Despite decline in CO_2; the nitrogen already absorbed/taken up by the plant will still remain;

(iii) Lightning;
By free-living bacteria/micro organisms;
By Rhizobium (in root nodules of legumes);