Name_____ Index No._____/_____

2528/102
2922/102
ENVIRONMENTAL CHEMISTRY
AND APPLIED SCIENCES
Oct/Nov 2012
Time: 3 hours

Candidate's Signature_____

Date _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY

MODULE I

ENVIRONMENTAL CHEMISTRY AND APPLIED SCIENCES

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of the examination in the spaces provided above.
You should have a non-programmable scientific calculator for this examination.
This paper consists of TWO Sections; A and B.
Answer ALL the questions in Section A and any THREE questions from Section B in the spaces provided in this question paper.
Each question in Section A carries 4 marks while each question in Section B carries 20 marks.
Maximum marks for each part of a question are as shown at the end of each question.

For Examiner's Use Only

SECTION A

Question	1	2	3	4	5	6	7	8	9	10	Total

SECTION B

Question	11	12	13	14	15	Total

GRAND TOTAL

This paper consists of 16 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A: *(40 marks)*

Answer ALL questions from this Section in the spaces provided after each question.

1. Define the following terms:

   (a) atmospheric chemistry; (2 marks)

   _____

   _____

   (b) aquatic chemistry. (2 marks)

   _____

   _____

2. Identify any **four** factors considered when siting a place for a dump site. (4 marks)

   _____

   _____

   _____

   _____

3. Complete the following equations:

   (a) ${}^{3}_{1}H + {}^{1}_{1}H \rightarrow$ _____ (2 marks)

   (b) ${}^{3}_{2}He + {}^{4}_{2}He \rightarrow$ _____ (2 marks)

4. Calculate the time required for 0.09 g of tritium having half life of 10 years to decay to 0.01 g of its original activity. (4 marks)

   _____

   _____

   _____

   _____

5. (a) Define the term homologous series. (2 marks)

   _____

   _____

(b) Name the first member of each of the following:

(i) Aldehydes; _____ (1 mark)

(ii) Alkanoic acid. _____ (1 mark)

6. Distinguish between chemotroph and phototroph. (4 marks)

_____

_____

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_____

7. Identify any **four** classes of water pollutants. (4 marks)

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_____

8. (a) State the Ohm's law. (2 marks)

_____

_____

(b) A lamp connected to a 6 V battery passes a current of 60 mA. Calculate the resistance of the lamp. (2 marks)

_____

_____

_____

_____

9. The instantaneous current, i amperes at time, t seconds is given by:

$$i = 6.0\, e^{-t/CR}$$

when a capacitor is being charged. The capacitance **C** is 8.3×10^{-6} farads and the resistance **R** has a value of 0.24×10^{6} ohms. Calculate the instantaneous current when t is 3.0 seconds. (4 marks)

10. Evaluate the determinant of $\begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix}$. (4 marks)

SECTION B: *(60 marks)*

*Answer any **THREE** questions from this Section in the spaces provided after Question 15.*

11. Figure 1 represents phosphorous cycle. Study it and answer the questions that follow.

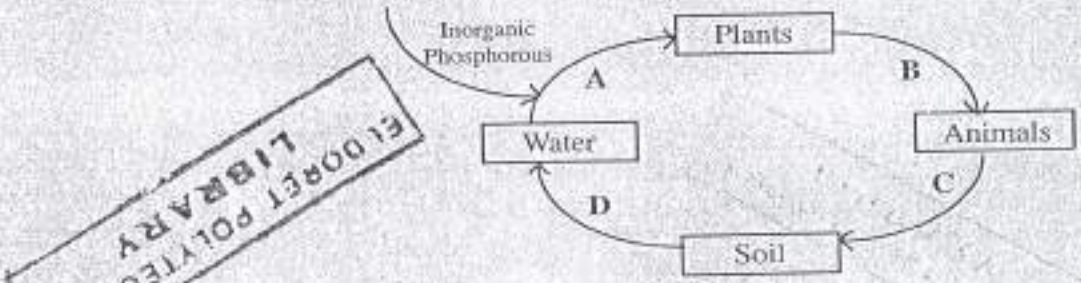

Figure 1

(a) Explain the above phosphorous cycle. (6 marks)

(b) Identify the processes **A**, **B**, **C** and **D**. (4 marks)

(c) Identify any **four** functions of phosphorous. (4 marks)

(d) Explain the negative impact of phosphorous fertilizers on the environment. (6 marks)

12. (a) Explain any **two** processes by which a pesticide can undergo microbial transformation. (4 marks)

(b) Describe using an illustration the microbial transformation of naphthalene in soil. (6 marks)

(c) Describe a procedure for determining Biochemical Oxygen Demand (BOD) in water sample. (10 marks)

13. (a) Explain the following applications of isotopes:

(i) Carbon-14 dating; (4 marks)

(ii) Food irradiation. (4 marks)

(b) Explain the following observations:

(i) methanol is highly soluble in water than propanol; (3 marks)

(ii) methyl chloride has higher boiling point than methyl fluoride. (3 marks)

(c) With the aid of equations, describe how ethanol can be prepared from ethane. (6 marks)

14. (a) Using a well labelled diagram, explain how an electric bell works. (12 marks)

(b) A cell supplies a current of 0.6 A through a 2Ω coil and a current of 0.2 A through a 7Ω coil. Calculate the e.m.f. of the cell and the internal resistance. (8 marks)

15. (a) The velocity, v of a body was measured at various times, t and the results obtained were:

Velocity, (m/s)	7.7	10.5	13.3	15.5	16.3	20.5	23
Times, (s)	1	2	3	4	5	6	7

Using a well labelled graph, verify that the law connecting velocity and time is $v = u + at$ where u and a are constants.
(graph paper is provided on the last page.) (10 marks)

(b) Simplify log 27 - log 9 + log 81. (5 marks)

(c) Solve for x: $3^{x+1} = 2^{2x-3}$. (5 marks)