Name: _____   Index No: _____

1408/313
CHEMISTRY TECHNIQUES
June/July 2012
Time: 3 hours

Candidate's Signature: _____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

SCIENCE LABORATORY TECHNOLOGY CRAFT

CHEMISTRY TECHNIQUES

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in spaces provided above.
Sign and write the date of the examination in the spaces provided.
You should have the following for this examination:
Scientific calculator (battery operated).
This paper consists of TWO sections; A and B.
Answer ALL questions in section A and any TWO questions from section B.
Each question in section A carries 4 marks while each question in section B carries 20 marks.

For Examiner's Use Only

Section	Question	Maximum Marks	Candidate's Score
A	1 - 15	60	
B		20	
		20	
		TOTAL	

This paper consists of 12 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

*Answer **ALL** the questions in this section*

1. Explain why EDTA is added to the samples during analysis of calcium by flame photometry.

    (4 marks)

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    _____

    _____

    _____

2. List **four** procedures used in weighing substances in a chemistry laboratory. (4 marks)

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3. Calculate the mass of pottasium chloride that must be dissolved in 250cm^3 of solution so as to make 200ppm with respect to pottassium (K = 39, cl = 35.5).

    (4 marks)

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4. State **four** ways of increasing the selectivity of EDTA. (4 marks)

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5. List **four** ways of expressing the concentration of solutions. (4 mark)

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6. (a) State the partition law. (1 mark)

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(b) State the instances when the law is not obeyed. (3 marks)

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7. List **four** advantages of colorimetry as a method of analysis. (4 marks)

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8. (a) Define pH. (1 mark)

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(b) Calculate the pH of 0.05M H_2SO_4. (3 marks)

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9. In an experiment to determine sodium by flame photometry, the following standard solutions were used; 0 ppm, 2 ppm, 4 ppm, 6 ppm.
    State with reasons the order in which the sample standards were run.   (4 marks)

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10. $25cm^3$ of acidified $K_2Cr_2O_7$ reacted completely with $18.9cm^3$ of 0.05M sodium oxalate.
    Calculate the molarity of $K_2Cr_2O_7$ solution.   (4 marks)

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11. (a) State the Beer-Lamberts law.   (1 mark)

    _____

    _____

    (b) State **three** causes of deviation from Beer-Lamberts law in colorimetry.

                                                                                          (3 marks)

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12. Excess sodium chloride solution was mixed with $25cm^3$ of $0.1M$ lead (II) nitrate at room temperature. Calculate the mass of the precipitate formed.
($Na = 23$, $Cl = 35.5$, $Pb = 108$ $N = 14$, $O = 16$). (4 marks)

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13. $0.8A$ of an electric current was passed through a molten sodium chloride for 29.6 minutes. Calculate the volume of chlorine gas produced at s.t.p (molar gas volume = 22.4 l; $1F = 96500C$). (4 marks)

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14. List any **four** components of a biological sample. (4 marks)

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15. List **four** methods of determining the purity of a substance. (4 marks)

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SECTION B: (40 marks)

*Answer any **TWO** questions from this section.*

16. (a) (i) Define "sample digestion" as used in analytical chemistry. (1 mark)

    (ii) Name **two** ways of digesting samples in a chemistry laboratory. (2 marks)

    (iii) You are provided with a rock sample suspected to contain strontium. Outline a procedure for converting the rock sample into a solution.

    (5 marks)

    (iv) Identify **two** analytical methods that can be used to estimate the amount of strontium in the sample. (2 marks)

    (b) (i) Outline the process that leads to the production of analytical signal in photometry flame. Use equations where necessary. (10 marks)

17. (a) The resistance of a conductivity cell containing 0.1M KCl solution at 25°C is 47.9Ω. If the same cell contains potassium sulphate solution of concentration 0.02M, the resistance is 254Ω. The conductivity of potassium chloride is $0.013\Omega^{-1}cm^{-1}$. Calculate:

    (i) conductivity of the potassium sulphate solution. (3 marks)

    (ii) the molar conductivity of the potassium sulphate solution. (2 marks)

    (b) From the data in table I plot a graph of molar conductivity against dilution.

Table I

Concentration of AgNO$_3$ in mol dm^{-3}	Molar conductivity in Scm^{2}mol^{-1}
1.0110	1.433
0.2529	2.221
0.06323	6.561
0.03162	9.260
0.01581	13.030
0.003952	25.600
0.001976	35.670
0.000988	49.500
0.000494	68.220

(15 marks)

18. (a) Draw a labelled diagram of the soxhlet extraction and describe how it functions.

(10 marks)

(b) (i) State **four** advantages of soxhlet   (4 marks)

(ii) Explain the limitation of soxhlet extraction.   (3 marks)

(c) Giving examples name **two** types of extraction techniques.   (3 marks)

19. (a) Define the term buffer solution   (2 marks)

(b) Describe the standard procedure of calibrating a pH-meter.   (9 marks)

(c) (i) calculate the amount of sodium ethanoate that must be dissolved in $1dm^3$ of ethanoic acid with a concentration of 0.01M to produce a buffer of pH 5. ($K_a = 1779 \times 10^{-5}$, Na = 23, C = 12, O = 16).   (7 marks)

(ii) determine the hydrogen ion concentration of the buffer.   (2 marks)