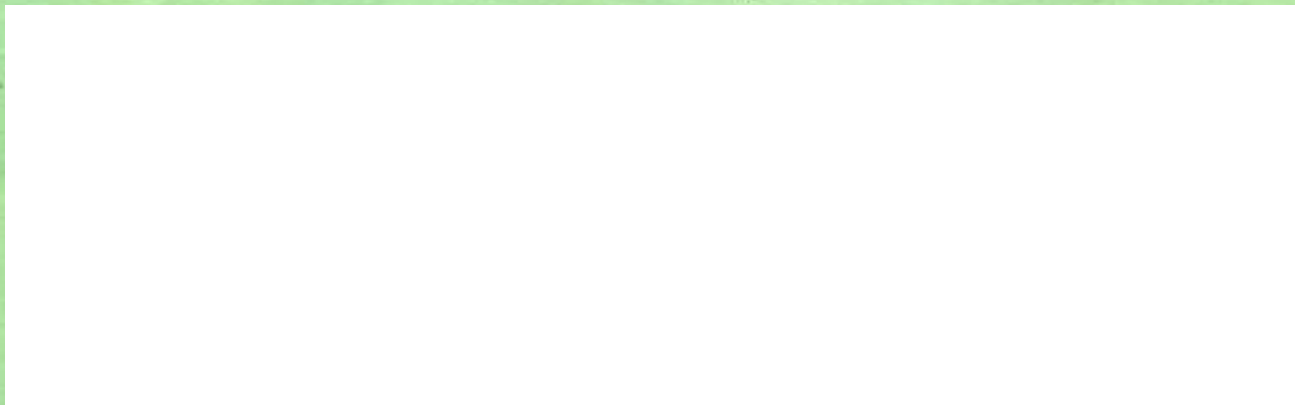


1408/313  
CHEMISTRY TECHNIQUES  
June/July 2010  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
SCIENCE LABORATORY TECHNOLOGY CRAFT  
CHEMISTRY TECHNIQUES

3 hours



**This paper consists of 3 printed pages.**

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

Pg 60  
Manual

## SECTION A (60 marks)

Answer *all* the questions in this section.

1. State any **four** sample storage methods. (4 marks)
2. (a) Define pH. (1 mark)
- (b) Calculate pH of 0.1M NaOH solution. (3 marks)
3. 25cm<sup>3</sup> of a solution prepared using Na<sub>2</sub>CO<sub>3</sub> was neutralized by 24.8cm<sup>3</sup> of 0.2MHCl. Determine the molarity of the Na<sub>2</sub>CO<sub>3</sub>. (4 marks)
4. Draw a labelled diagram of gravity filtration technique. (4 marks)
5. State any **four** factors that affect efficiency in column chromatography. (4 marks)
6. (a) Define ppm. (1 mark)
- (b) Calculate the mass of sodium nitrate (Fw = 85) that must be dissolved in 250cm<sup>3</sup> of solution so as to make a 100ppm with respect to sodium. (Na = 23, N = 14, O = 16) (3 marks)
7. Explain why alkali metals are analysed by flame photometry. (4 marks)
8. A current of 5A was passed through a solution of copper (II) sulphate for two minutes. Calculate the volume of oxygen liberated at the anode. (IF = 96500C, gas molar volume = 24 litres at r.t.p). (4 marks)
9. 20cm<sup>3</sup> of 0.05M AgNO<sub>3</sub> was mixed with excess of (NaCl) solution. Calculate the mass of AgCl precipitated. (Ag = 108, Cl = 35.5, Na = 23, O = 16, N = 14). (4 marks)
10. List any **four** methods of determining the purity of a substance. (4 marks)
11. State any **four** techniques used in purification of substances after separation. (4 marks)
12. (a) State Beer-Lambert's Law. (1 mark)
- (b) State **three** causes of deviation from Beer-Lambert's Law. (3 marks)
13. (a) State **three** advantages of soxhlet extraction as a method of separating mixtures. (3 marks)
- (b) State **one** disadvantage of soxhlet extraction. (1 mark)
14. (a) Convert the following absorbance values into transmittance percent: (4 marks)
  - (a) 0;
  - (b) 2.
15. Differentiate between grab and composite samples as used in Chemistry techniques. (4 marks)

## SECTION B (40 marks)

Answer any Two questions from this section.

16. (a) A sample of  $\text{KMnO}_4$  absorbs visible radiation at 545nm. Describe how the wavelength of 545nm is practically determined. (7 marks)
- (b) An 80ppm solution of  $\text{KMnO}_4$  produced an absorbance of 0.4 in a 1.0 cm cuvette. Calculate the molar absorptivity of  $\text{KMnO}_4$  ( $K = 39, Mn = 55, O = 16$ ). (9marks)  
 $A = \epsilon b c l$
- (c) State **four** advantages of colorimetry over other classical methods of analysis such as titrimetry and gravimetry. (4 marks)
17. (a) The amount of protein in a sample of cheese is determined by a Kjeldahl analysis for proteins. After digesting a 0.9814 g sample of cheese, the nitrogen is oxidised to  $\text{NH}_4^+$  and converted to  $\text{NH}_3$  with  $\text{NaOH}$ . The  $\text{NH}_3$  is then distilled into a flask containing  $50\text{cm}^3$  of 0.1047M  $\text{HCl}$ . The excess  $\text{HCl}$  is then backtitrated with  $22.84\text{cm}^3$  of 0.1183M  $\text{NaOH}$ . Calculate the percentage of protein in the cheese sample given that there is 6.38g of protein for every gram of nitrogen in most dairy products. ( $N = 14, H = 1$ ) (13 marks)
- (b) Draw the Kjeldahl apparatus. (7 marks)
18. (a)  $25\text{cm}^3$  of a sample solution containing  $3.816\text{gdm}^{-3}$  of the crystals of  $\text{Na}_2\text{B}_4\text{O}_7 \cdot n\text{H}_2\text{O}$  required  $25\text{cm}^3$  of 0.02M  $\text{HCl}$  to reach the methyl orange end-point. Given that the ionic equation of the reaction taking place is:
- $$\text{B}_4\text{O}_7^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) + 5\text{H}_2\text{O}(\text{l}) \longrightarrow 4\text{H}_3\text{BO}_3$$
- determine the value of n in  $\text{Na}_2\text{B}_4\text{O}_7 \cdot n\text{H}_2\text{O}$ .  
 ( $\text{Na} = 23, \text{B} = 10.8, \text{O} = 16, \text{H} = 1$ ) (10 marks)
- (b) State six conditions necessary for analysis of a sample by volumetric analysis. (6 marks)
- (c) State four advantages of titrimetry as a method of analysis. (4 marks)
19. (a) Define electrolysis. (1 mark)
- (b) State **three** factors that affect the products of electrolysis. (3 marks)
- (c) State **three** applications of electrolysis. (3 marks)
- (d) A current of 5A was passed through a solution containing the salt  $\text{MCl}_n$  for 15.2 minutes. 1.512124g of metal M and  $567\text{cm}^3$  of chlorine gas were produced at r.t.p. Determine the formula of the salt.  
 ( $M = 64, \text{Cl} = 35.5, \text{IF} = 96500\text{C}, \text{gas molar volume} = 24\text{dm}^3$ ). (13 marks)