



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF **PURE AND APPLIED SCIENCES**

DIPLOMA IN ANALYTICAL CHEMISTRY

(DAC 10M)

ACH 2309 : CHEMICAL ANALYTICAL METHODS III

SPECIAL/SUPPLEMENTARY: EXAMINATIONS

SERIES: February 2013

TIME: 2 HOURS

INSTRUCTIONS:

You should have the following for this paper

- *Answer booklet*

This paper consists of **FIVE** questions.

Answer Question **ONE (compulsory)** and any other **TWO** questions

This paper consists of 3 PRINTED pages

Question ONE

a) The following figure represents apparatus used to carry out Vacuum filtration in a laboratory.

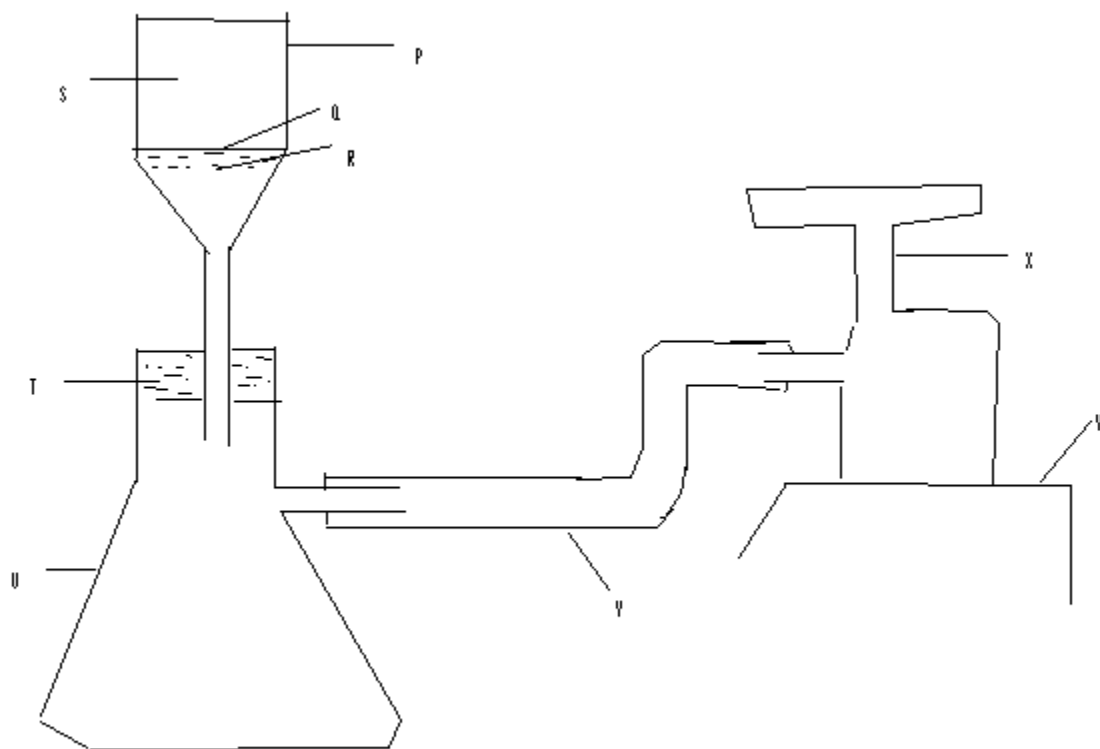


Fig I vacuum filtration apparatus

- (i) State what each of the letters P to W represents **(9marks)**
 - (ii) Name TWO components of the vacuum system not shown in fig I **(2marks)**
 - (iii) State ONE advantages of vacuum filtration over ordinary filtration **(1mark)**
 - (iv) State TWO other uses of vacuum in the laboratory **(2marks)**
- b) Gravimetry takes different forms e.g. Precipitation gravimetry. State and explain FIVE other forms of gravimetry **(10marks)**
- c) (i) Define the term supersaturated solution **(1mark)**
- (ii) Given the equation $R = \frac{Q - S}{S}$
- a) State what each symbol in the equation represents **(3marks)**
 - b) State where the equation is applicable in chemical analysis
 - c) State the effect of a large value of R. **(1mark)**

Question TWO

- a) State the principle on which solvent extraction method is based on **(1mark)**
b) State and explain the seven factors considered in selecting a solvent for liquid – liquid extraction

(14marks)

Question THREE

- a) State FOUR non chromatographic separation processes which depend on distribution of components between two phases and in each case identify the two phases **(12marks)**
b) Name THREE substances that can be used to bring down the temperature of a solid down to desired level in the cooling before weighting **(3marks)**

Question FOUR

- a) List the five factors that influence the selection of a suitable adsorbent in adsorption chromatography **(5marks)**
b) You are provided with 20g of organic solid compound X contained in 100cm³ of water. The partition coefficient of X between ether and water = 4
Calculate
(i) The amount of X extracted when using (i) 50cm³ of ether in one single extraction. **(3marks)**
(ii) 50cm³ of ether in two successive extractions using 25cm³ of ether in each extraction. What conclusion do you draw from the two methods of extraction **(7marks)**

Question FIVE

- a) Nickel can be precipitated with dimethyl glyoxine (DMG) according to the reaction
$$\text{Ni}^{2+} + 2\text{DMG} \rightleftharpoons \text{Ni}(\text{DMG})_2 + 2\text{H}^+$$

If 2.0116g of nickel containing substance dissolved and nickel precipitated as above so that the Ni(DMG)₂ weighed 2.6642g.
Calculate the % weight of nickel in the sample of nickel containing substance.
Mol wt of Ni(DMG)₂ = 288.92
Ni = 58.7 **(6marks)**
- b) (i) Define the term desiccant and state its importance in gravimetry **(2marks)**
(ii) Give THREE examples of desiccant **(3marks)**
- c) State FOUR essential characteristics of the liquid used to wash the precipitate **(4marks)**