CHM 423 PRACTICE QUESTIONS

Q1. Distinguish between an analyte and a sample.

Ans ⇒ Sample :- A portion of material selected which possesses essential characteristics of the bulk of the original material

Analyte :- Is a substance or chemical constituent that is of interest in analytical procedure

Q2- An undergraduate project student intends to work on the artesian wells water system within Ife Central Local Government Area. As an Analytical chemist, describe the type of sampling method you would recommend for the student.

Ans ⇒ Convenience sampling; is a sampling plan in which samples are collected bcos they are easily obtained.

Q3- Write a note on the general guidelines for the sampling of soil medium

Ans ⇒
- A hand-held auger with a thread of 13 by 2.5cm is ideal for most soil sampling
- Wet-strength bags are good storage medium

- A systematic description of the type of soil is ideal for the sampling.
- The most appropriate depth or horizon to be sampled can be determined by an orientation survey
- Other sampling parameters such as sample weight, the number of sub samples to be combined into one sample, and whether the surface vegetation should be removed prior to sampling; all need detailed consideration.

Q4. A group of Hydrologists are working on the assessment of potential toxic elements pollution of marine environment using African cuttlefish (Sepia bertholdi) from the Gulf of Guinea as an environmental bio-indicator. The grant for the work was facilitated by (FAO) and the organization instructed them to exclude cuttlefish of less than 1.0kg of weight from the study. Describe the best sampling method you would advise the scientists to use.

Ans => Judgmental sampling: It is also known as Selective Sampling, in which available information about the target Population to help select samples is used.

Q5. Write briefly on the general guidelines for the Sampling of water.

Ans ⇒ • Filtration is carried out immediately after the sample is taken, to prevent adsorption of undissolved elements onto the suspended matter

• To analyse Cations Acidify the solution to 0.1M High purity HNO_3, after the filtration, to minimize solute deposition onto the Container walls.

• To analyse anions, a separated, non-acidified sample should be taken and analyzed.

• Some other analyses e.g pH and alkalinity may need to be carried out in the field.

Q6. In not more than four lines in each case, describe the following terms as applied in the field of Environmental Chemistry (i) Sampling Procedure (ii) Sampling unit (iii) Gross Sample (iv) Analy

Ans ⇒ Sampling Procedure: Consists of various techniques used in the collection of the sample.

Sampling Unit: May be defined as a minimum sized package in the consignment of material taken from any bulky sample.

Gross sample: A sample which is prepared by mixing various portion or increments of sample

(Judgemental-Systematic).

Q7 Suppose your Research project (CHM 421/CHM 422) topic is "Determination of the Contamination profile of groundwater in Ilesa township". Name and explain a suitable sampling technique you will employ.

Ans ⇒ Convenience Sampling:- This is a Sampling plan in which samples are collected because they are easily obtained

Q8. Describe briefly the general stages of geochemical study that the Laboratory investigation of geological and environmental materials will pass through.

Ans ⇒ (a) Thinking – (i) decide on geochemical objectives.
(ii) design investigation, to achieve objective

(b) Sampling – Collect samples

(c) Analysis – Prepare sample for analysis, decompose sample, and analyze sample.

(d) Interpretation – assess quality of samples and analysis geochemical analysis.

(e) Conclusion – draw conclusions and/or recommended action

Q9. A student from Elizade University, Ilara-Mokin, Ondo State wish to work on soils for his B.Sc degree research project and he is looking up to you as a student of a Nigerian first generation university. The goal of the Research is to investigate the Concentrations of available metals in the soil samples using Total reflection X-ray flourescence or Atomic absorption spectrometry As an analytical chemist, describe the best type of sample preparation method you would recommend for the student

Ans ⇒

Q10. Briefly explain the following sampling produres, backing your explanation with at least, an example in each case.

(i) Judgmental sampling (ii) Systematic sampling.

Ans ⇒ (i) Judgmental sampling; also known as selective sampling in which available information about the target population to help select sample is used E.g A researcher studying the

(ii) ~~Systemic sampling: This involves~~ bioaccumulation of

(PCBs) (Polychlorinated biphenyls) in fish may choose to exclude the fish that are to small or that appear diseased.

(ii) Systematic Sampling: This involves collection of samples from the target population at regular intervals in time or space.

Q14 A research student wishes to study the concentration of toxic metals in groundwaters within Ibadan metropolitan. As an analytical chemist, suggest and describe an appropriate sampling method you would recommend for the research student.

Ans => Judgmental systematic Convenience sampling (as described earlier).

Q15 Answered in Q8

Q13 Classify and describe briefly the chemical methods for the analyses of gaseous N and S Compound Pollutants.

Ans Acidimetric techniques
Colorimetric techniques
Coulometric techniques
} Atmosphere Sampling.

* Acidimetric technique involves the determination of the free H^+ produced following the adsorption of the gas in an oxidizing solution.
* Colorimetric method involves interaction in solution of the gas or its hydrolysis/oxidization products with a colour-forming reagent followed by spectrophotometric measurement of the colour
* Coulometric method involves measurement of the electrical current produced when strongly oxidizing or reducing pollutant gases react with KI or KBr soln in an electrochemical cell

Q4+ Explain briefly the term Proximate Composition.

Ans => Proximate composition is the term used in the field of feed/food and means the 6 components of moisture (1), Crude protein (2), ether extract (3), Crude fiber (4), Crude ash (5) and nitrogen free extracts (6), which are expressed as the content (%) in the feed, respectively.

And the 5 of foods are moisture (1), lipid (2), ash (3), protein (4) and Carbohydrate (5) contents.

Q15. State how the five standard proximates in industry can be obtained analytically.

Ans ⇒ Ash
Moisture
Protein
Fat
} Obtained via chemical reaction and experiment

AMPF

Carbohydrates; This is calculated for, based on the determination of the four (i.e AMPF)

Q16. Name and describe the best sampling technique you would recommend for an air pollution expert investigation air pollution of a metropolitan area.

Ans ⇒ Stratified sampling; this is a sampling plan that divides the population into distinct strata from which random samples are collected. Its advantage is that the composition of each stratum is often more homogeneous than that of the entire target population.

Q17. Answered in Q3.

Q18. List four objectives of sample preparation.

Answer ⇒ (i) To remove unwanted Contaminant
(ii) To preserve the essential features of the sample composition until analysis takes place.
(iii) To convert the form of the sample material into one suitable for Chemical analyses
(iv) In some cases, to separate or Concentrate a particular constituents

Q19. As an Environmental Chemist, briefly educate a BSc degree research project student on the usefulness of chemical methods of instrumental analysis as applied in mineral exploration and exploitation by listing five (5) important information these methods can provide.

Answer ⇒ It provides important information like
(i) Grade of ore samples
(ii) Chemical nature of rock samples
(iii) Chemical composition of rocks and ores in terms of major (>1 wt.%), minor (<0.1 – 1 wt.%)
(iv) nature of matrix (e.g. Silicate, Oxide and carbonate) of analysed samples.
(v) Possible by-products in ores (vi) presence and content of precious metals like Au, Ag in ores with no mineralogical expression
(vii) nature and amount of impurities in beneficiation pdts.

Q20. Answered in Q.13

Q21. Describe briefly the general guidelines for the sampling of the herbage.

Ans =) • The sampling of the herbage (e.g plant's, leaves, fruit bark) has the particular problem of identification of the species required

• Care must be taken to minimize the effect of soil contamination, the degree of contamination is estimated experimentally, and this can be achieved using electron microprobe analysis or by comparision b/w different acid decomposition.

Q22. Answered in Q.6

Q23. List the different types of sampling.

Ans => i, Random Sampling
ii, Judgmental sampling
iii, Systematic Sampling
iv, Systematic - Judgmental sampling
v, Stratified Sampling
vi, Convenience sampling.

PRACTICE QUESTION

CHM 423

1.) Difference between an analyte and a Sample

Analyte	Sample
a) A Substance or Chemical Constituent that is of interest in analytical Procedure	A Portion of material Selected which Possess an essential characteristics of the bulk of the Original material
b) the Substance that is of interest in the analysis e.g (amount of haemoglobin in blood)	Object of the analytical Procedure e.g (blood Sample)
c) It's what is analyzed in the lab	It's what the lab receive

2.] An Undergraduate Project students intends to work on the artesian wells water System within the Central Area Government Area. As an Analytical Chemist, describe the type of Sampling method you would recommend for the stude

Solution:

I would recommend a **CONVENIENCE SAMPLING** method due to its ease of Collection by making use of existing wells. In this method, Cost, expedience, and accessibility are the Primary factors used in selecting Sampling sites.

3.] Write a note on the general guidelines for the Sampling of Soil medium.

Solution:

The Sampling of Soils should ideally be accompanied by Systematic description of the type of soil. A hand-held auger with a thread of 15 by 2.5 cm is ideal for most Soil Sampling and wet-strength bags are a good storage medium. The most

appropriate depth to be sampled can be determined by an Orientation survey. The B horizon, for example is often sampled for mineral exploration in temperate climates. The other sampling parameters such as the sample weight, the number of sub-samples to be combined into one sample and whether the surface vegetation should be removed prior to sampling, all need detailed consideration.

4.] A group of Hydrologists are working on the assessment of Potential toxic elements pollution of marine environment using African Cuttlefish (sepia bertholoti) from the Gulf of Guinea as an environmental bio-indicator. The grant for the work was facilitated by the Food and Drug Organization (FAO) and the Organisation instructed them to exclude Cuttlefish of less than 1.0kg by weight from the study. Describe the best sampling method you would advise the scientists to use.

Solutions

I would advise the scientist to use JUDGMENTAL SAMPLING in which available information about the target Population to help select Samples is used, this Sampling is also encountered in many Protocols in which the Sample to be Collected is specifically defined by the regulatory agency.

Judgmental ~~Sampling~~ Sampling is Common when we wish to limit the number of undesired variables influencing the results of an analysis.

5.] Write briefly on the general guidelines for the Sampling of water.

Solution: Filtration is Carried out immediately after the sample is taken, to Prevent adsorption of dissolved elements onto the suspended matter. For analyzing Cations, it is normal to acidify the Solution to 0.1M (~1% by volume) with high purity HNO_3 immediately after filtration, to minimize solute deposition on to the Container walls.

A Separate, non-acidified Sample should be taken

if anions are to be determined and some analyses (e.g pH & alkalinity) may need to be carried out in the field.

For polluted water/effluent, the sampling Protocol must prescribe appropriate safety measures to protect operator health.

6.] In not more than four lines in each case, describe the following terms as applied in the field of Environmental Chemistry

(a) Solution

(i) Sampling Procedure:

It Consists of various steps i.e. technique used in the Collection of the sample.

(ii) Sampling Unit

It is defined as a minimum sized package in the Consignment of material taken from any bulk sample.

(iii) Gross Sample:

Is one which is Prepared by mixing various portions or increments of sample

(iv.) Analyte:

Is a Substance or Chemical Constituent that is of inter-

est in analytical Procedure.

7.] Suppose your Research Project (CHM421/CHM422) topic is "Determination of the Contamination Profile of ground water in Ilesa township" Name and explain a Suitable Sampling technique you will employ.

Solution:

A suitable Sampling technique you will employ is SYSTEMATIC-JUDGMENTAL Sampling, It Combines Judgmental and Systematic Samplings. It involves Combinations of the three Primary approaches to Sampling which is encountered in Environmental studies when a Spatial or ~~temporary~~ temporal distribution of Pollutants is anticipated.

8.) Describe briefly the general stages of geochemical study that the laboratory investigation of geological and environment materials will Pass through.

Solution:

(a.) Thinking - decide on geochemical objectives, design investigation to achieve objective.

(b.) Sampling - Collect Samples

(c.) Analysis - Prepare sample for analysis, decompose geochemical Sample, analyze Sample

(d.) Interpretation - assess quality of samples and analysis, geochemical analysis.

(e.) Conclusion - draw Conclusions and/or recommend actions

9.) Questions is too long, straight to answer →

Solution

This is Part of the ones he told us not to read, but I will Confirm from him.

(a.) Briefly explain the following Sampling Procedures, backing your explanation with at least an example in each case

Solution

(i) Judgmental Sampling:

The opposite of random Sampling is selective or Judgmental Sampling in which available information about the target Population to help Select Samples is used. Because assumption about the target Population are included in the Sampling Plan, Judgmental Sampling is more biased than random Sampling; however fewer examples are required

For Judgmental Sampling, Samples are Collected from the target Population using available information about the analyte's distribution within the Population

11.] Same Answer As Number 7

12.] Same Answer As Number 8

13.] Briefly Classify and describe briefly the Chemical methods for the analyses of gaseous N and S Compound