CHE 301 Midterm Solved

Qno1. What do you know about pareto diagram? 2marks

Pareto Diagram • is a combination of bar and line graphs of accumulated data

Pareto Diagram • is a combination of bar and line graphs of accumulated data

Benefits • Breaks big problem into smaller pieces

• Identifies most significant factors

• Shows where to focus efforts

• Allows better use of limited resources

Qno2. Name the sources of errors? 3marks

Sources of error

Instrumental Error

• If a balance weigh 2 g as 2.1 g. • If a 10 mL pipette draw a volume of 9.5 mL on average • If a faulty pH meter read 4.0 pH buffer as 4.21 even after calibration • Leakage in burette

Method Error

• If a method say
• heat it
• stay at room temperature
• Use buffer of pH 10 Note: The meaning of such statements may be different for different analyst

Human Error (Personnel error)

• If a personnel
• Problem in identifying colour / meniscus
• Don't follow procedure properly
• Careless behavior in calibration
• Note the meniscus above or below eye level

Qno3. Write down the Goals of sampling. 2marks

Goals of Sampling

• To obtain a mean analyte concentration

• Unbiased estimate of the population mean.

• Every possible sample is equally and likely to be drawn.

Qno4: What is limit of quantization? 2marks

Quantization limit • Based on Visual Evaluation • Based on SNR • Based on STD Dev

Qno5: How equipment can be calibrated? 3marks

Calibration of Equipment

•Calibration of an analytical balance using standard weights

• Calibration of pipette / micropipettes and other volumetric apparatus to SI units using a calibrated balance

• Calibration of pH meter with standard buffers

Qn6: Give the sequence of quality assurance from SI units to products. 2marks

SI Units National ->physical standards (NPSL)-> Accredited calibration laboratory (reference standard) ->In-house calibration laboratory (working standard)-Measuring and test equipment->Product

Qno7: Colloidal suspension crystalline suspension? 3marks

1-Colloidal suspensions

• Particles are invisible to the naked eye (10-7 - 10-4 cm in diameter).

• Colloidal particles show no tendency to settle from solution

• Not easily filtered. 2-Crystalline suspension

• Particles with dimensions on the order of tenths of a millimeter or greater.

• The temporary dispersion of such particles of a tend to settle spontaneously,

• Easily filtered.

Qno8: Classification of gravemetric analysis? 5marks

Classification of gravimetric analysis

1. Precipitation gravimetry

2. Volatilization gravimetry

3. Electrogravimetry Precipitation Gravimetry

• The analyte is converted to a sparingly soluble precipitate which is then filtered, washed (free of impurities), converted to a product of known composition by suitable heat treatment, and weighed.

• For example, a precipitation method for determining calcium in natural waters. The reactions are: 2NH3 + H2C2O4 2NH4+ + C2O4-2 Ca+2(aq) + C2O4-2 (aq) CaC2O4 (s)

Precipitation Gravimetry (Continued)

• The precipitates are filtered using a weighed filtering crucible, then dried and ignited to converts the precipitate to calcium oxide. The reaction is: CaC2O4 (s) CaO (s) + CO (g) + CO2

• After cooling, the crucible and precipitate are weighed, and the mass of calcium oxide is determined by subtracting the known mass of the crucible. The calcium content of the sample is then computed.

Qno9: Define Analytical Chemistry. 2marks

Analytical Chemistry is basically study of testing methods for determining composition of substances. This determination may be limited to qualitative results or quantitative estimation. Qualitative means what substances are present in composition.

Qno10: Explain the two examples of Scatter Diagram. 3marks

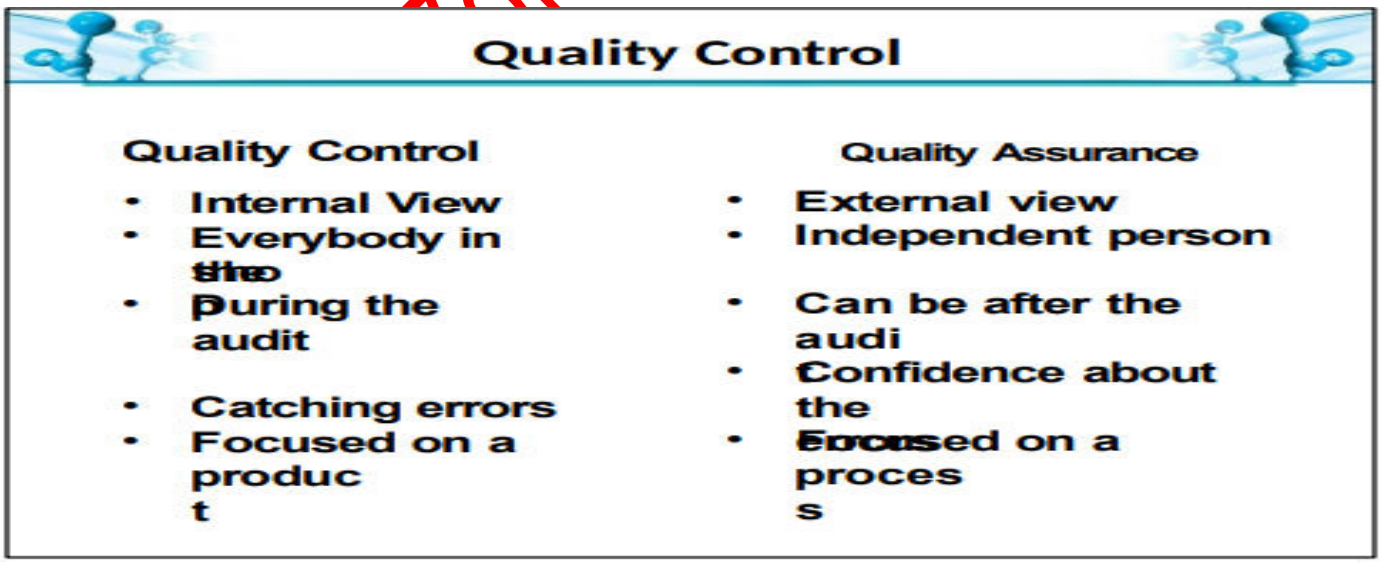
Examples of Scatter diagram

• Relationship between thermal treatment temperature of a steel material and its tensile strengths

• Relationship between visit made by a salesman and volume of sales

• Relationship between the number of persons visiting a department store and volume of sales

Qno11: Difference between Quality control and Quality assurance. 3marks



Qno12: How we prepared sample? 5marks

From 100 of Kg, 1000 of litters or acres of land we collect the sample in grams. And to analyse we have to finalize just 2-3 gram of sample, or maximum 100 mL of liquid. Some time sample need dilution while some

time we have to concentrate a sample. To analyse we have to digest or extract our analyte from the sample. This is called sample preparation.

Qno13: Explain Histogram. 5mark

Histogram

• is mainly used to analyze a process by examining the location of the mean value in the graph or degree of variations, to find a problem point that needs to be improved.

Histogram

• When creating a histogram, "a range of data is divided into smaller sections having a uniform span and the number of data contained in each section (the number of occurrences) is counted to develop a frequency distribution table." • Then, "a graph is formed from this table by using vertical bars, each having the height proportional to the number of occurrences in each section."

• Used to analyze a process to identify a problem point that needs to be improved by finding the location of the mean value or degree of variations in the graph.

Histogram

• Can identify the location of the mean value or degree of variations.

Qno14: Method for finding crystalline growth. 3 marks

Crystal Growth:

• Used for single crystal X-ray studies

• Separation of synthesized products

• Separation from impurities

Qno15: What is signal to noise ratio? 2 marks

Signal to Noise Ratio (3 or 2:1 is acceptable of LOD while 10:1 is generally acceptable for LOQ).

Qno16: What is Molarity? 2 marks

Molarity is based on the volume of solution containing the solute. Molar concentration is a measure of the concentration of a chemical species, in particular of a solute in a solution, in terms of amount of substance per unit volume of solution.

Qno17: Define Beer Lambert Law. 2 marks

One connected to absorbance with Transmittance; the lambert law and second discuss relation of absorbance with concentration of sample; that is Beer's law.

$$A = \text{Log}_{10} \frac{Io}{I} = \varepsilon/c$$

I0 = Incident light

I = Transmitted light

l = path length

C = Concentration

ε = Molar Absorptivity Constant

Qno18: Write down properties of good precipitates. 3 marks

Properties of good precipitates

• Should be filtered and washed easily

• Very low solubility (no significant loss during filtration / washing)

• Uncreative with constituents of the atmosphere

• Chemical composition must be known, if necessarily ignited.

Qno19: What is method error? 3 marks

Method Error

• If a method say heat it stay at room temperature use buffer of pH 10

Note: The meaning of such statements may be different for different analyst

Qno20: Which test can be applied for the analysis of variance? 2 marks

Analysis of Variance

• Z-test

• T-test

• F-Test

Qno21: What is fish bone? 3 marks

Cause & Effect Diagram

• Also called fishbone or Ishikawa diagram presents a systematic representation of the relationship between the effect (result) and affecting factors (causes).” It is also called fish bone diagram, or Ishikawa diagram is a tool to identify the root because that is responsible for an effect.

Qno22: What is standard deviation? 2 marks

Standard deviation is the measure of precision. The standard deviation is square root of variance.