

1. What is Quality Control :

The term quality control refers to the sum of all procedures undertaken to ensure the identity and purity of a particular pharmaceutical product. It involves in chemical, physical and some time microbiological testing of a pharmaceutical product.

Quality control involves testing of pharmaceutical products against the specifications.

The other responsibilities of Quality Control are sampling of Raw & packing material, Testing of raw material, packing material, In process, Finished product& Stability batches, Sampling & testing of water, Calibration of Instruments, Preparation of Specification of Raw, Packing, In process & Finished products, Preparation of Standard Test procedure of Raw, Packing, In process & Finished products and reporting of result after analysis & preparation of COA.

2. What is Disintegration Test :

It is the time required for the Tablet / Capsule to break into particles, the disintegration test is a measure of the time required under a given set of conditions (Temperature) for a group of tablets/capsules to disintegrate into particles.

Cycle of shaft holding the tube basket limit is 29-32 cycles per minutes and distance covered by shaft basket is 50-60 mm and beaker temperature is 35 to 39 ° C.

Disintegration is to be Performed to determine whether tablets or capsules disintegrate within the prescribed time when placed in a liquid medium at the experimental conditions.

3. What are the Disintegration Time of tablets :

Uncoated Tablet 15 min as per BP ,Uncoated Tablet 30 min as per USP Sugar Coated Tablet 60 min as per BP Film Coated Tablet 30 min as per BP ,Plain Coated Tablets DT in specific medium for 30 min as per USP

Enteric Coated Tablets DT in simulated gastric fluid (0.1 M HCl) for 1 hr and then in simulated intestinal fluid (Phosphate buffer 6.8 pH) until disintegrate as per USP.

Dispersible Tablets 3 min (15- 25° C) as per BP. Effervescent Tablets 1 tablet in 200 mL water for 5 min (15- 25° C as per BP

Buccal Tablets 4 hrs as per USP. Soluble Tablets 3 min (15- 25° C) as per BP. Chewable Tablets are not require to comply with test

4. What are the Disintegration Time of capsules:

Gastro resistant capsule DT 2 hrs without disk in 0.1 M HCl and phosphate buffer pH 6.8 for further 60 min as per BP. Hard and Soft gelatin capsule DT 30 min as per BP & USP.

5. What is Friability Test of Tablet & friability calculation :

Friability is defined as the percentage of weight loss of powder from the surface of the tablets due to mechanical action and the test is performed to measure the weight loss during transportation.

$$\text{Friability (\%)} = \frac{W_1 - W_2}{W_1} \times 100$$

Where,

W₁ = Weight of Tablets (Initial / Before Tumbling) &

W₂ = Weight of Tablets (After Tumbling or friability)

Limit : Friability (%) = Not More Than 1.0 %

Tablets with individual weight equal to or less than 650 mg then take the sample of whole corresponding to as near as 6.5 gram equivalent and tablets with individual weight more than 650 mg then take sample of 10 whole tablets to perform friability test. Tablets must be de-dusted prior to and after use.

6. What is Incident :

Any unplanned or uncontrolled event in the form of non-compliance to the designed systems or procedures at any stage of testing, and storage of drug product due to system failure or equipment breakdown or manual error.

A laboratory Incident is an event in the laboratory that occurs for two primary reasons either due to analyst error or instrument error.

7. What is Chromatography :

Chromatography is an analytical technique commonly used for separating a mixture of chemical substances into its individual components, so that the individual components can be thoroughly analyzed.

Chromatography is a laboratory technique for the separation of a mixture. The mixture is dissolved in a fluid called the mobile phase, which carries it through a structure holding another material called the stationary phase and the separation is based on differential partitioning between the mobile and stationary phases.

13. What is difference between Stationary Phase Mobile Phase:

The key difference between stationary and mobile phase is that stationary phase does not move with the sample whereas mobile phase moves with the sample. Stationary phase and mobile phase are two important terms in chromatography, which is a technique of separation and identification of the components in a mixture.

14. What is Column in Chromatography:

A Chromatography column is a device used in chromatography for the separation of chemical compounds. A chromatography column contains the stationary phase, allowing the mobile phase to pass through it. The columns are mostly made of borosilicate glass, acrylic glass or stainless steel.

15. Which gas is used in Gas Chromatography :

In GC Nitrogen, Helium and Hydrogen are considered to be suitable carrier gases but Helium is most widely used due to safety concerns associated with hydrogen and also the fact that nitrogen is much less efficient.

16. What is HPLC in Chemistry :

High-performance liquid chromatography (HPLC) is a technique in analytical chemistry which is used to separate, identify, and evaluate each component in a mixture.

17. What is System suitability:

Before start of analysis of the Chromatographic system like HPLC &GC system suitability has to perform to know that the system is working properly or to know the performance.

System suitability criteria may include such factors as plate count, tailing, retention, and/or resolution and the above factors are most important as they indicate system specificity, precision, and column stability.

18. What is RT & RRT in HPLC :

The amount of time it takes for the compound to pass through the column is the retention time (RT). The relative retention time (RRT) is the comparison of the RT of one compound to another.

19. Types of HPLC Pumps :

There are 3 main types of HPLC Pumps : Reciprocating pump, Displacement (or syringe) pump and Pneumatic (or constant pressure) pump.

20. What is Trailing factors :

The tailing factor is a measure of peak tailing. It is defined as the distance from the front slope of the peak to the back slope divided by twice the distance from the center line of the peak to the front slope, with all measurements made at 5% of the maximum peak height.

21. What are the different Types of HPLC Columns :

The different Types of HPLC Columns are Normal phase, Reverse Phase, Ion Exchange and Size Exclusion columns.

22. What is Good Laboratory Practice (GLP) :

Good Laboratory Practice contains a set of principles that provides a framework within which laboratory studies (Activities) are planned, performed, monitored, recorded, reported and archived. GLP help assure regulatory authorities that the data submitted are a true reflection of the results obtained during the study and can therefore be confidence upon when marking risk/safety assessment.

Good Laboratory Practice contains different principles which are designed to ensure and promote consistency, quality, safety, reliability and integrity of chemicals during non-clinical and laboratory testing.

23. What is Working & Reference Standard :

A reference standard is the traceable, raw material standard (usually in crystallized form) that we dissolve and volumetrically dilute to make our working standard. The working standard is what we use to "do our work." and this information makes it traceable and is recorded in the preparation notebook.

- A reference standard is prepared for use as the standard in an assay, identification, or purity test and should have a quality appropriate for its use.

24. Why is Dissolution test Required :

Dissolution tests are performed to establish drug (Active Pharmaceutical Ingredient) release characteristics of solid oral products, such as tablets and capsules. The rationale for conducting these tests is that for a product to be therapeutically effective, the drug must be

released from the product and should generally be dissolved in the fluid of the gastrointestinal (GI) tract. The API in solution form facilitates the absorption of the drug from the GI tract into the systemic (blood) circulation to reach its desired target (site of action) to exert its effect.

25. How dissolution test is Performed :

The drug is placed within the medium in the vessels after it has reached sufficient temperature and then the dissolution apparatus is operated. Sample solutions collected from dissolution testing are commonly analyzed by HPLC or Ultraviolet-visible spectroscopy.

26. What is Q Stands for in Dissolution :

'Q' is the amount of dissolved active ingredient specified in the monograph which is required to be released in the stated time, expressed as a percentage of labelled strength, then the batch of the tablet or capsules is acceptable, if each unit is not less than $Q + 5\%$.

If the initial sample analysis, known as S1 or stage 1 testing fails to meet the acceptable value for Q, then additional testing known as stage 2 and 3 testing is required. S3 testing is performed only if S2 testing fails in Q parameter. If there is a deviation from the acceptable Q values at S3, then an OOS (Out of Specification) investigation is generally initiated.

27. Which tablets are used in Calibration of dissolution Apparatus :

Non disintegrating (Salicylic Acid) and disintegrating (Prednisone) tablets are used in the calibration of dissolution test apparatus.

28. What is Gas Chromatography :

Gas Chromatography is a common type of chromatography which is used for separating and analyzing compounds that can be vaporized without decomposition. Particular uses of GC include testing the purity of a particular substance, or separating the different components of a mixture and in some situations, GC may help in identifying a compound.

In gas chromatography, the mobile phase is a carrier gas, usually an inert gas such as helium or an unreactive gas such as nitrogen.

29. What is Karl Fischer Titration:

Karl Fischer titration is a classic titration method in chemical analysis that uses coulometric or volumetric titration to determine trace amounts of water in a sample. It was invented in 1935 by the German chemist Karl Fischer.

30. What is KF Reaction : The Karl Fischer Titration is a titration method for measuring water content in basically all types of substances. The Karl Fischer Titration is based on an iodine / iodide reaction and the water reacts with iodine.

The endpoint of the titration is reached when all the water is consumed and the process uses an organic base (B), sulphur dioxide, iodine and an alcohol.

31. What is Infrared Spectroscopy :

The infrared spectrum of a sample is recorded by passing a beam of infrared light through the sample and when the frequency of the IR is the same as the vibrational frequency of a bond or collection of bonds, absorption occurs. Examination of the transmitted light reveals how much energy was absorbed at each frequency (or wavelength). This measurement can be achieved by scanning the wavelength range using a monochromator.

32. What is the use of Incubator :

An incubator is a device used to grow and maintain microbiological cultures or cell cultures. The incubator maintains optimal temperature, humidity and other conditions such as the CO₂ and oxygen content of the atmosphere inside. Incubators are essential for a lot of experimental work in cell biology, microbiology and molecular biology and are used to culture bacterial cells.

33. What is Out of Specification :

Out of Specification (OOS) means the test result that falls outside the specifications or acceptance criteria which has been specified in the official monographs or the Blend, In process, Raw material, Packing material, Stability and finished product specification.

During analysis if any OOS observed then it should be investigated to find out the root cause and required Corrective & preventive actions shall be taken to avoid the reoccurrence.

There are two phases of Investigation Laboratory investigation and production process investigation.

34. What is Out of Trend :

Out of Trend (OOT) means the test result that is within the specification limit or acceptance criteria as mentioned in the Blend, In process, Raw material, Packing material, Stability and finished product specification but outside the trend of previously tested batches.

Suppose X Product has the Specification limit 95 to 105 % & we have tested many batches of product X and the trend result shows is 98 to 102 %. Suppose X Product current result is 97.5 % so in this case it is called OOT.

35. What is Stability Study :

Stability of a pharmaceutical product means how long it can maintain its original form for the duration of the shelf life assigned to it and should comply the specification without any visible changes under the influence various environmental factors like temperature and humidity.

The pharmaceutical industry conducts this testing to develop a new product and establish the shelf-life of a product.

36. What is Bracketing in Stability Testing :

The design in which only the extremes are tested at all time points e.g., strength, pack size, container fill etc. are tested.

Bracketing is applicable if the strength are identical or very closely related in composition (e.g. for a tablet range made with the different compression weights of similar basic granulation, or a capsule range made by filling different plug fill weight of the same basic composition in to different size capsule shells. Bracketing can be applied to different container sizes or different fills in the same container closure system).

37. What is Shelf Life :

The period of time during which a drug product, if stored correctly, is expected to comply with the specifications determined by stability studies on a number of batches of the product. The shelf life is used to establish the expiry date of each batch.

38. In stability how many conditions are there :

There are Three stability Condition Long term or Controlled Room Temperature (CRT), Accelerated and Intermediate

39. What is Significant changes in Stability Study :

At long term and intermediate condition : Failure to meet the specification is considered as significant change.

At accelerated condition : Following changes are considered as "Significant change".

A 5% change in assay from its initial value, any degradation product exceeding its acceptance criterion. Failure to meet the acceptance criteria for appearance, physical attributes. Failure to meet the acceptance criteria for dissolution.

40. What is limit of detection (LOD) :

The detection limit of an individual analytical procedure is the lowest amount of analyte in a sample which can be detected but not necessarily quantitated as an exact value. Several approaches for determining the detection limit are possible.

Based on visual evaluation the detection limit is determined by the analysis of samples with known concentrations of analyte and by establishing the minimum level at which the analyte can be reliably detected.

41. What is limit of Quantification (LOQ) :

The quantification limit of an individual analytical procedure is the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy. The quantification limit is a parameter of quantitative assays for low levels of compounds in sample matrices, and is used particularly for the determination of impurities and/or degradation products.

Based on visual evaluation: The detection limit is determined by the analysis of samples with known concentrations of analyte and by establishing the minimum level at which the analyte can be quantified with acceptable accuracy and precision.

42.What is ALCOA+ and Why Is It Important to Validation and Data Integrity

ALCOA+ is a set of principles that ensures data integrity in the life sciences sector. It was introduced by, and is still used by, the FDA – the US Food and Drug Administration. It has relevance in a range of areas, particularly in relation to pharmaceutical research, manufacturing, testing, and the supply chain.

As well as being crucial for compliance reasons, ALCOA+ principles are becoming increasingly important to GMP (Good Manufacturing Practices). Their relevance is also growing as manufacturers in the life sciences sector continue to implement Industry solutions and processes.

ALCOA and ALCOA+ Principles

ALCOA is an acronym for the original five principles of data integrity. Those principles are:

A- Attributable, L-Legible, C-Contemporaneous, O-Original, A-Accurate

These original ALCOA principles have since been updated to ALCOA+. The original principles remain with four additions:

Complete , Consistent, Enduring, Available

Attributable

To ensure collected, generated, or updated data is attributable, the following must be recorded:

The identity of the person, system, sensor, equipment, or device that collected, generated, or updated the data
The source of the data
The date and time

The above applies whether the data is collected, generated, or updated automatically or manually.

Ensuring data is attributable is not a technical issue, as all modern (and many old) systems and software applications have the above capabilities. The main challenges come with procedures and policies.

An example is password integrity, where one password is used by multiple workers. When this occurs, data that is collected, generated, or updated is not attributable.

Legible

Ensuring data is legible is about more than being able to clearly read the data, although that is important in situations where manual record-keeping takes place. Being able to make out words and figures is much less of a problem with electronic data, though.

That said, legibility still has relevance when data is digitally created, generated, or updated, as it is essential that data can be read and understood years and even decades after it's recorded. This point is as relevant to digitally recorded data as it is to data recorded in notebooks.

So, it's important to avoid using clichés and unusual phraseology as this may be difficult to decipher in the future without getting clarification from the originator of the data, a person who may no longer be available.

Using consistent, straightforward language throughout an entire organization, regardless of locality, is the best approach.

One final point to consider in terms of the legibility of data is that data collected, generated, or updated must be permanent.

Contemporaneous

It's essential that individuals or systems record data whenever an activity or action takes place. With electronic data, timestamping is usually normal practice, although there are some points that should be considered. This includes ensuring data operations are not held in a queue that could delay timestamping, while also ensuring system clocks are accurate and time zones are recorded.

In general, though, contemporaneous data recording is another point that has more relevance to manual record-keeping. The main aim is to avoid the practice of creating or updating data at some point in the future. When data is recorded after an event or action, mistakes can happen, i.e., elements can be forgotten, parts can be left out, and information can be recorded inaccurately.

Original

Records should be original rather than copies or transcriptions. Again, this applies mostly to manual record-keeping. For example, you should not write information on a scrap of paper with the intention of completing the main record later, as this can result in errors.

Instead, the original recording of the data should be the main record, whether that record is on paper or on a digital system. With digitally recorded data, it is also important there are technical and procedural processes in place to ensure an original recording of data cannot be changed.

Any analysis, reports, or calculations based on data collected, generated, or updated should be traceable back to the original source.

Furthermore, copies of an original record should be formally verified as being a true copy, and they should be distinguishable from the original. The original version of the data should also be preserved, even when copies exist.

Accurate

All records should reflect the reality of what happened and should be error-free. Also, there should be no editing of the original information that results in that information being lost.

If changes are necessary, those changes must be documented in a way that makes it possible to refer back to the original information. Nothing should be removed, blocked out, or deleted.

When recording data electronically, the system must have built-in accuracy checks and verification controls. Measurement equipment should be regularly calibrated as part of this process.

Complete

All recorded data should have an audit trail to show nothing has been deleted or lost. This doesn't just cover the original data recording, but also metadata, retest data, analysis data, etc. There should also be audit trails covering any changes made to the data.

Consistent

This primarily means ensuring data is chronological, i.e., has a date and time stamp that is in the expected sequence. Changes made to an original data recording should be timestamped.

Enduring

While durability is a factor in many of the above data integrity principles, ALCOA+ places specific emphasis on ensuring data is available long after it is recorded – decades in some situations.

For digitally recorded data, specific steps should be taken to ensure data is enduring, including putting in place robust and tested data backup systems as well as disaster recovery plans and uninterruptable power supplies. Cybersecurity is also an important consideration.

Available

Data must not only exist, but it must also be accessible. So, data storage systems should be searchable, with data properly indexed and labeled. The most efficient way of achieving this is normally by recording data electronically.

By being available, the data must be readable at any time during the retention period. This could be for a range of purposes, including audits, reviews, and inspections.

Aliquot and Diluent.

Aliquot: Aliquot is a measured sub-volume of the original sample.

Diluent: the component used to dilute the sample.

43.Titration.

Titration is also called volumetric analysis. It is a quantitative chemical analysis used to determine the concentration of an analyte that has been identified. The titrator is a reagent that

is prepared as a standard solution with a known concentration and volume. The titrant reacts with the analyte solution to determine the concentration of the analyte. The titration volume is the amount of titrant that reacts with the analyte.

There are basically four types of titration, acid-base titration, complexometric titration, precipitation titration, and redox titration.

Acid-base titration: this acidic or basic titrant reacts with an analyte that is a base or an acid.

EXAMPLE : NITROGEN ESTIMATION BY HCL AND NAOH

Complexometric titrations: involving metal-ligand complexation reactions

Eg: ZN CA MG METAL analysis by using EDTA

Precipitation titrations: When the analyte and titrant react, a precipitate is formed.

Eg: silver nitrate titration by for chloride using potassium cromate

Redox titrations: Where the titrant is oxidizing agents or reducing agents.

Eg : iodine vs sodium thiosulphate titrations

44.Karl Fischer's Titration

Ans: Karl Fischer titration is a classic titration method in chemical analysis that employs coulometric or volumetric titration to identify trace quantities of water in a sample. Karl Fischer, a German scientist, created it in 1935.

45.the solution

Ans: A solution is a mixture of liquids, gases, and solids, the solution consists of many different types of solutes like salts, oxygen, and organic molecules.

46.Saturated and Unsaturated solutions

Ans: A saturated solution is defined as a solution in which a solvent is not capable of dissolving any more solute at a given temperature.

At a given temperature, an unsaturated solution is one in which the solvent is capable of dissolving any extra solute.

47.qualitative and Quantitative analysis Qualitative analysis involves the identification of the compound or chemical based on its chemical (absorption, emission) or physical properties, eg. melting point and boiling point.

Quantitative analysis: this involves the estimation or determination of the concentration or amount of the chemical compounds or components.

48.Ultraviolet Spectroscopy.

Ans: Ultraviolet spectroscopy uses light in the UV part of the electromagnetic spectrum. UV absorption spectra form when the outer electrons of a molecule or an atom absorb energy and move from a lower to a higher energy level. The wavelength absorbance of each molecule is unique.

49.The HPLC Principle?

Ans: It's a technology used for separating the mixture of compounds into individual components based on absorption, partition, ion exchange, and size exclusion principles. The stationary phase and mobile phase are used in it. HPLC is used for the identification, quantification, and purification of components from a mixture.

50.Infrared spectroscopy

Ans: Infrared spectroscopy is a technique used to study and identify chemical substances by measuring their interaction with infrared radiation. This interaction can occur through absorption, emission, or reflection of infrared light. Infrared spectroscopy is valuable for analyzing the functional groups and chemical bonds present in solid, liquid, or gaseous samples.

51.Infrared Spectroscopy Principle.

Ans: When a molecule absorbs infrared radiation, it vibrates and gives rise to a packed infrared absorption spectrum. This IR spectrum is specific for every different molecule absorbing the IR radiation, useful for identification.

Question: What is the range of infrared spectroscopy?

Ans: Infrared spectroscopy covers a range of wavelengths from 700 to 1000 nanometers (nm) in terms of wavenumber or 14,286 to 12,800 per centimeter (cm^{-1}) in terms of wavenumber. Ultraviolet radiation has wavenumbers above these values, typically ranging from 25,000 to 50,000 cm^{-1} or 100 to 400 nm in wavelength.

52.What is the Ultraviolet (UV) and visible spectroscopy range

Ans: The range of UV Spectroscopy is 200-400 nm, and visible spectroscopy ranges from 400- 800 nm.

53.What is the use of UV Spectroscopy

Ans: Spectroscopy can be used to detect functional groups, and impurities, and perform qualitative and quantitative analyses

54.Molarity

A number of moles of solute per liter solution. molarity is denoted with a capital “M”.

molality. The number of moles of solute per kilogram solvent. it is denoted with a small “m”.

normality. The number of moles equivalent per liter solution

buffer solutions

A buffer solution is an aqueous solution consisting of a mixture of a weak acid and its conjugate base, or vice versa. When a minimal amount of strong acid or base is introduced to it, the pH changes very little.

Polarity: the ability of an atom to attract shared electrons in a covalent bond.

What is Calibration:

The demonstration that a particular instrument or device produces results within specified limits by comparison with those produced by a traceable standard over an appropriate range of measurements.

What is Qualification :

The action of proving that any equipment or process work correctly and consistently and produces the expected result. Qualification is part of, but not limited to a validation process, i.e. Installation Qualification (IQ), Operation Qualification(OQ) and Performance Qualification (PQ).

The act of planning, carrying out and recording the results of tests on equipment to confirm its capabilities and to demonstrate that it will perform consistently as intended use and against predefined specification.

Change Control :

It is a Approved Procedure which is taken to change in any documents, Standard operating procedures, Specification, Process parameters and change in batch size etc. Change control is raised by user department as per requirement and finally the change control is approved by Quality assurance. Change control can be raised through software or through manually.

After Final approval of change control the changes can be made in documents and change control can be closed after completion of required action plan which is mentioned in the Change control form.

Change controls are of two types i.e Major and Minor.

CAPA

Corrective action :

An action taken to eliminate the cause of the existing deviation, incident or problem in order to prevent its recurrence (occurring again).

Preventive action:

An action taken to eliminate the cause of potential deviation, incident or problem in order to prevent its occurrence (an incident or event).