Pharma Unit

Pharmaceutical Chemistry Top 15 Questions with Answers According To PCI New Syllabus ER -2020

Q1. Define accuracy and precision

Ans. Accuracy :- accuracy is defined as the degree of agreement between the true value and measured value. So, accuracy refers to how close the measured value is to true value

Precision :- It is defined as the degree of agreement between replicate measurements of the same quantity. It is the repeatability of the result.

Q2. Define impurities and explain different sources of impurities

Ans. Impurity is the undesirable foreign material which may be toxic or may not be toxic present in the pharmaceutical substances

Sources of Impurities

- Raw material employed in manufacturing process ;-
  - ➢ When any medicine is manufactured, the starting material used is raw material. If there are any impurities in raw material, then the final product will also have impurities.
  - ➢ Example;- if arsenic, heavy metal, lead is present in raw material then this will also be found in the final product which may cause harmful effects to human beings.

  Process used in manufacturing;-
  - ➢ There are a number of drugs and chemicals which are manufactured by different methods. Sometimes during manufacturing impurities are also incorporated and this will appear in final product
  - ➢ If the manufacturing process is long, then the number of impurities will also increase in the final product.
- Plant material used in manufacturing process;-
  - ➢ During the manufacturing process, various chemicals are mixed in vessels, these vessels are made up of iron, copper, steel, aluminum. Sometime during mixing reaction takes place between chemicals and vessels which produce impurities in final product
  - ➢ So, it is very necessary to use a proper vessel which does not react with any chemicals.
- Solvent used in manufacturing process;-
  - ➢ Water is the cheapest solvent and most commonly used in the manufacturing of chemicals.
  - ➢ But water may act as a source of impurities if proper precaution is not taken. If a company is using tap water, then tap water contains lots of inorganic impurities. So, if a company is using distiled water then the number of impurities will reduce.
- Adulteration :-
  - ➢ It is a process in which high quality chemicals are mixed with low quality chemicals. Because of this impurity found in the final product.
  - ➢ Examples ;- potassium bromide which is a costly chemical is mixed with sodium bromide which is a cheaper product.
- Improper storage area;-
  - ➢ Many substances may undergo changes if proper storage areas are not provided. Because of these impurities get involved in the final product.
- Atmospheric contamination ;-
  - ➢ If the atmosphere is very polluted, then it may affect the purity of the product and impurities get involved in the final product.

Q3. Explain the limit test of arsenic with diagram principle and procedure

Ans.

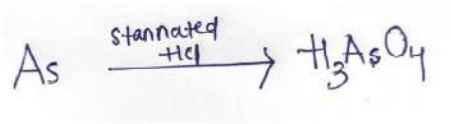
Limit test of arsenic

Principle ;- Limit test of arsenic is based on the reaction in which arsenic is converted into arsenic acid with the help of stanneted Hcl. This arsenic acid is further converted into arsenious acid with the help of potassium Iodide, the arsenious acid is further reduced into arsine gas.

This arsine gas reacts with mercuric chloride paper to produce a yellowish brown stain due to formation of mercuric arsenide. The depth of yellow color stain on mercuric chloride paper is based on the presence of arsenic in the sample.

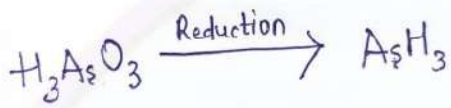
Reaction ;-

1. Arsenic to arsenic acid ;-

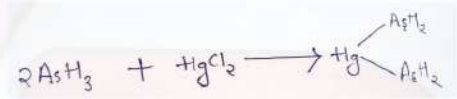


2. Arsenic acid to arsenious acid ;-

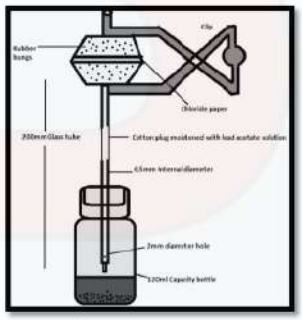
3. Arsenious acid to arsine gas ;-



4. Arsine gas react with mercuric chloride paper



Apparatus :-



- It consists of a wide mouth bottle of 120 ml capacity with a rubber bung in which a glass tube is attached.
- The glass tube has a length of 200mm and a diameter of 6.5mm to 8mm.
- The part of the glass tube has a small hole.
- One mercuric chloride paper is placed between the rubber bung and a clip is attached to hold together the rubber bung.
- One cotton plug is also attached in between the glass tube.

Procedure :-

Sample preparation	Standard preparation
The sample solution is placed in the wide mouth bottle.	The standard solution is placed in the wide mouth bottle.
To this 1gm of potassium iodide is added	To this 1gm of potassium iodide is added
5ml of stannous chloride solution is added	5ml of stannous chloride solution is added
Then 10gm of zinc is also added.	Then 10gm of zinc is also added.
One cotton plug containing lead acetate is packed in glass tube.	One cotton plug containing lead acetate is packed in glass tube.
Keep the apparatus with the above mixture in the water bath for 40 minutes by maintaining the temperature 40 degree Celsius.	Keep the apparatus with the above mixture in the water bath for 40 minutes by maintaining the temperature 40 degree Celsius.
After 40 minutes the yellow color stain is produced on mercuric chloride paper.	After 40 minutes the yellow color stain is produced on mercuric chloride paper.

Q4. Discuss Arrhenius acid base theory with example and limitations

Ans. According to Arrhenius acid base theory;-

Acid is defined as the substance which is capable of providing H+ ion in its aqueous solution

Base is defined as the substance which is capable of providing OH- ion in its aqueous solution

Neutralization reaction can be explained as the combination of H+ and OH- ions to form neutral water molecule

Limitations

1. The definition acid and base are only applicable for aqueous solution not for the substances
2. The theory is not applicable for non-aqueous solvent
3. Neutralization of acid and base in absence of solvent could not be explained
4. Basic substance which does not have oh- ions could not be explained by this theory

Q5. Explain gravimetric analysis

Ans.

Definition:- gravimetric analysis or quantitative analysis by weight is the process of isolating and weighing an element or definite compound of the element in a pure form.

Principle of gravimetric analysis :- In gravimetric analysis analytics quantitatively transformed into pure form which is then separated or isolated and accurately weighed.

Types of gravimetric analysis

- Precipitation method this method involves conversion of analyte to a sparingly soluble precipitate with a known composition which is filtered and washed android or ignited and weight
- Electro analytical method this method involves the electrical deposition of the analyte on a suitable pre-weighed electrode increase in weight of electrode indicate the amount of the analyte
- Volatilization method in this method analyte or its decomposition product are volatilised at a suitable temperature. The amount of product is then collected and weight or alternatively the mass of the product is determined indirectly from the loss in mass of the sample
- Miscellaneous physical method this method involves simple separation of an analyte in the form of gas or solid from a liquid without requiring chemical conversation of analyte

Advantages of gravimetric analysis

1. Gravimetry is an accurate and precise method
2. High accuracy can be obtained even in laboratory conditions
3. This method requires no calibration and involve direct measurement
4. This method is inexpensive

Disadvantages of gravimetric analysis

1. This method is time consuming
2. It is not applicable for qualitative analysis
3. There is a possibility that the impurities may also get converted into insoluble components
4. The drying process may result in loss of substances

Q6. Define general anaesthetic agent explain different stages of general anaesthetics

Ans. General anaesthetics are the agents which produce reversible loss of sensation and consciousness.

Stages of general anaesthetics:

During the administration of general anaesthetics, it is necessary to control the depth of anaesthetics which is related to dose. The progress of anaesthesia is divided into four stages.

1. Stage of analgesia: this stage extends from the beginning of inhalation of anaesthetics up to loss of consciousness. There is a gradual depression of the cortical centre and causes sensation of falling, suffocation and visual and auditory disturbance. Minor surgical operations such as dental extraction can be carried out during this stage, with continued administration of anaesthetics the patient passes into the second stage.

2. Stages of delirium or excitement: this stage extends from loss of consciousness to the beginning of surgical anaesthesia. This stage may be associated with marked excitement with increased muscular activity and vomiting.

3. Stages of surgical anaesthesia:

It has divided into four phases

A) phase 1: the pupils are constricted, and eye balls are moving. The blood pressure and pulse rate are normal.

B) phase 2: the eyes balls are fixed and the pupil begins dilating. There is a loss of cornea reflexes and skeletal muscular relax.

C) phase 3: pupils are dilated, and light reflex lost, the BP begins to fall. There is a marked muscle relaxant.

D) phase 4: the pupil or widely dilated, there in a shallow abdominal respiration and bp is low.

4. Stages of medullary paralysis : It is seen only with overdose. It is the stage of medullary depression. Less action of breathing, circulation failure and death may occur.

Q7. Define and classify antibiotics with examples draw and explain the structure of basic nucleus of penicillin

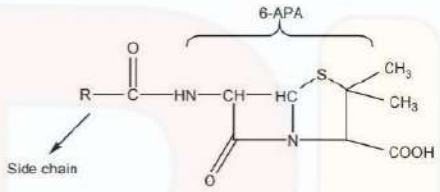
Ans. These are the chemical substances produced by microorganisms having the property of inhibiting the growth or destroying other microorganisms.

Classification

1. Antibiotics effective against gram positive bacteria: for e.g., penicillin, erythromycin, cephalosporins
2. Antibiotics effective against gram negative bacteria: for e.g., streptomycin, gentamycin, kanamycin
3. Broad spectrum antibiotics (effective against both gram -ve and gram +ve bacteria): for e.g., tetracycline, chloramphenicol
4. Antibiotics effective against acid resistance bacilli : for e.g., rifampicin, streptomycin
5. Antibiotics effect against cancer : for e.g., actinomycin-d, mitomycin

Penicillin is the most important and oldest antibiotics. It was first extracted from penicillin notatum

The basic structure of all the penicillins consists of a thiazolidine ring fused with a beta-lactam ring, creating a fundamental nucleus (also known as 6-amino penicillanic acid) that is crucial for their antibacterial activity.



Basic structure of penicillin

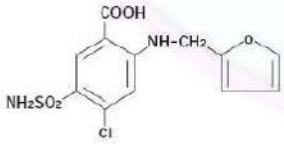
Q8. Define and classify diuretics with examples draw the chemical structure of furosemide with chemical name and uses

Ans. Diuretics are the drugs which increase the rate of urine output.

Classification

1. Carbonic anhydrase inhibitors :- for example acetazolamide, methazolamide
2. Thiazide derivatives :- for example hydrochlorothiazide and chlorothiazide
3. Loop diuretics :- for example furosemide, bumetanide and ethacrynic acid
4. Potassium sparing diuretics :-for example spironolactone, amiloride
5. Osmotic diuretic :- for example urea mannitol isosorbide
6. Miscellaneous diuretics :- for example clopamide, chlorthalidone, metolazone

Structure of furosemide:-



Chemical name :- 4-chloro-2-(furan-2-ylmethylamino)-5-sulfamoylbenzoic acid

Uses of furosemide

1. It is used for the treatment of oedema related to congestive heart failure, liver cirrhosis and renal disease
2. It is also used either alone or with antihypertensive agent for the management of hypertension

Q9. Explain diabetes mellitus classify hypoglycaemic agent with example

Ans. Diabetes mellitus is a chronic condition or a disease that affects the body's ability to use the energy found in food. It is referred to as diabetes. It is the condition where the pancreas gland does not generate enough insulin required by the body to regulate glucose metabolism

Hypoglycemic agent are the drugs administered orally for the treatment of type-ii diabetes. These agents lower blood glucose level on oral administration.

Classification

1. Sulfonylureas
   - 1st generation: ex:- tolbutamide, chlorpropamide, tolazamide
   - 2nd generation: ex:- glibenclamide, glipizide, gliclazide, glimepiride
2. Biguanides: ex:- phenformin, metformin
3. Meglitinides: ex:- repaglinide

4. Thiazolidinediones: ex:- troglitazone, rosiglitazone, pioglitazone

5. Alpha glucosidase inhibitors: ex:- acarbose, miglitol

Q10. Define and classify antihypertensive agent draw the chemical structure of captopril

Ans. The drug used for the treatment of hypertension is known as anti-hypertensive drugs.

Classification of anti-hypertensive drugs

1. Ace inhibitors: ex:- captopril, enalapril, lisinopril, ramipril

2. Angiotensin antagonist: ex:- candesartan, losartan, telmisartan, valsartan

3. Calcium channel blockers: ex:- diltiazem, verapamil, amlodipine, felodipine, nicardipine

4. Diuretics: ex:- chlorothiazide, hydrochlorothiazide, frusemide, amiloride, spironolactone

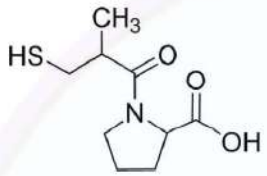
5. Beta adrenergic blockers: ex:- propranolol, metoprolol, atenolol

6. Alpha adrenergic blockers: ex:- prazosin, terazosin, phentolamine

7. Central sympatholytic: ex:- clonidine, methyldopa

8. Vasodilators: ex:- diazoxide, hydralazine, minoxidil, nitroprusside

Structure of Captopril :-



Q11. Define and classify antineoplastic agent with example

Ans. The drugs which are used in the treatment of cancer is known as antineoplastic agents

Classification:

A) alkylating agents:

- Nitrogen mustards: ex: melphalan, cyclophosphamide, chlorambucil
- Ethylenimines: ex: diethylene melamine, diethylene triphosphamide
- Alkyl sulfonates: ex: busulfan

B) antimetabolite:

- Folic acid antagonist :- ex: methotrexate
- Purine antagonist: ex: 6-mercaptopurine
- Pyrimidine antagonist: ex: 5-fluorouracil

C) radioactive isotopes: ex: radio gold, radio iodine, radio phosphorus

D) miscellaneous:

- Natural alkaloids: ex: vincristine, vinblastine
- Antibiotics: ex: actinomycin-d, mitomycin-c
- Hormones : ex: androgens, progestins, corticosteroids
- Others: ex: procarbazine, l-asparaginase, oxiplatins

Q12. Define sedative and hypnotics and classify it with example

Ans.

Sedative: these are the drugs which reduce excitement without producing sleep

Hypnotics: are the drugs which produces sleep resembling natural sleep

Classification:

1) Barbiturates :

A. Long acting barbiturates (duration of action in 8hrs or more) :- ex: barbitone, phenobarbitone.

B. Intermediate acting barbitone (4 hrs or more) :- ex: amylobarbitone, cyclobarbitione

C. Short acting barbitone (less than 4 hrs) :- ex: hexobarbitone, secobarbitone.

D. Ultra-short acting barbiturates. (Less than 1 hrs) :- ex: thiopentone, methohexitone.

2) Non- barbiturates :

A. Benzodiazepines :- ex: diazepam, nitrazepam, alprazolam.

B. Alcohol :- ex: chlorhydrate

C. Aldehydes :- ex: paraldehyde

Q13. Define non-steroidal anti-inflammatory(NSAIDs) drugs any classify it with example

Ans. These drugs produce relief of pain and elevated body temperature. As these drugs also produce anti-inflammatory effects they are known as NSAIDs. As these drugs act without interacting with opioid receptors they are also called as non-opioid analgesic

Classification

A) Non-selective cox-I inhibitors

1. Salicylates and congeners :- ex: salicylates , aspirin, salicylic acid, sodium salicylate

2. Para-amino phenol derivatives :-ex: paracetamol

3. Pyrazolone derivatives :- ex: aminopyrine, antipyrine, phenylbutazone

4. Miscellaneous :- ex: Indomethacin, ibuprofen, diclofenac, nimesulide

B) selective cox-II inhibitors:

Ex: celecoxib, rofecoxib, valdecoxib

Q14. Write a note on sulphonamides

Ans. Antibacterial compounds containing SO_2NH_2 (sulphanilamide) group in their side chain are called sulphonamide.

Classification

1. Used for treating systemic infections

- Short acting sulfonamides :- ex: sulphadiazine, sulphafurazole, sulphadimidine
- Intermediate acting sulfonamides :- ex: sulfamethoxazole, sulfaphenazole
- Long acting sulfonamides :- ex: sulfamethoxypyridazine, sulfadimethoxine

2. Used for gastrointestinal succinyl sulfathiazole :- ex: sulphaguanidine, succinyl sulfathiazole

Uses

1. It is used to treat vaginal infection
2. It is used to treat upper respiratory tract infection
3. It is used to treat bronchitis
4. it is used to treat acute conjunctivitis

Q15. What is tuberculosis define anti-tubercular drug and classify with examples

Ans. Tuberculosis is an infectious disease most commonly affecting the lungs and caused by mycobacterium tuberculosis it is an airborne disease it spread via air in the form of small droplets tuberculosis can be treated in a long term i.e., 8 months to 3 years

The drug used for the treatment of tuberculosis is called anti-tubercular drugs.

Classification

1. First line drugs

Example:- isoniazid, rifampicin, pyrazinamide, ethambutol and streptomycin

2. Second line drugs

Fluoroquinolones:- for example, ofloxacin, levofloxacin moxifloxacin, ciprofloxacin

Other oral drugs :- for example, ethionamide prothionamide, cycloserine, para amino salicylic acid, rifabutin

Injectable drugs :- for example kanamycin, amikacin, capreomycin

Very Imp Note :-

- **Please Read All the chapters very carefully before Pharmaceutical chemistry Exam**
- **These questions are only for the reference purpose**