Index ...

Sr. No.	Name of the Experiment	Page No.	Date of Exp.	Marks/ Grades	Signature
1.	To study different types of syringes and needles.	03			
2.	To sterilize the given articles by dry heating method and to study the working of hot air oven.	07			
3.	To sterilize the given articles by moist heat method and to study the working of autoclave.	11			
4.	To study various methods of sterilization by filtration.	15			
5.	To sterilize needles by dry heat sterilization methods.	21			
6.	To sterilize syringes and needles by moist heat sterilization methods.	23			
7.	To prepare 100 ml of water for injection.	25			
8.	To prepare 100 ml of sodium chloride injection (Normal saline injection I.P.)	27			
9.	To prepare 100 ml dextrose injection I.P.	29			
10.	To prepare 100 ml of sodium chloride dextrose injection I.P.	31			
11.	To prepare 100 ml compound sodium lactate injection I.P.	33			
12.	To evaluate the given sample of surgical dressing by physical tests.	35			
13.	To evaluate the given sample of surgical dressing by chemical tests.	41			
14.	To evaluate the given sample of absorbent cotton wool.	43			
15.	To perform identification test of absorbent cotton wool.	47			
16.	To perform various tests of Dextrose.	49			
17.	To perform various tests of Sodium Chloride.	55			
18.	To study various services provided by computer system in hospital pharmacy.	61			
19.	To study prescription preparation and dispensing using computer.	63			
20.	To study the test presence of pyrogen in water for injection using rabbits.	65			

Total marks obtained ..... out of 200 Sign of Subject Teacher

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 1

- **Aim:** To study different types of syringes and needles.
- **Requirements:** Syringes and needles.
- **Theory:** Syringes and needles are used for parenteral administration of drugs and to withdraw fluid samples from body. Syringes are of two types: (1) Non-disposable syringes and (2) Disposable syringes

(1) Non-disposable syringes:

(A) All-glass syringes:

Advantages:

- This type is relatively easy to clean.
- Since all parts are transparent or translucent, un-removed dirt is readily detected.
- Sterilization is relatively uncomplicated.

Disadvantages:

- The nozzle is fragile.

(B) Half-record type syringes: These differ from the all-glass type syringes in having a metal needle mount. This may be cemented into barrel or sweated on to a glass boss at its end.

Advantages:

- The nozzle is strong.

Disadvantages:

- These are more difficult to clean thoroughly.
- Absolute cleanliness within the nozzle cannot be confirmed.
- These may not withstand dry heating sterilization as the parts may separate because of difference in melting point of materials.
- With time, metal parts may corrode.
- If plunger fits badly into barrel, it is difficult or impossible to use.

(C) Record type syringes: This has a glass barrel with metal mount on top and bottom and a plunger that is completely or partially made up of metal.

Advantages:

- Durability.
- The plunger usually fits well and does not easily seize; around its centre is split ring that acts as a brake when the syringe is inverted.

Disadvantages:

- It is the most difficult type to clean because of many cervices.

- Metal-ended plungers may be separated from barrels before sterilization because expansion of the metal breaks the glass.
- These may not withstand dry heating sterilization as the parts may separate because of difference in melting point of materials.
- With time, metal parts may corrode.

(D) Nylon syringes: These are of similar design to an all-glass syringe, except that the plunger carries, near to its end, a rubber washer to prevent leakage.

Advantages:

- Light in weight.
- Unbreakable. Can be used for radioactive drugs.

Disadvantages:

- The presence of the washer complicates cleaning because it must be removed to clean the underlying groove.
- It also complicates sterilization because it is damaged by dry heat.
- Syringes discolour with repeated use.
- Plunger movement is not very smooth and worsens with time.
- An air bubble accidentally drawn into barrel often adheres tenaciously to plastic and makes accurate measurements impossible.
- Nylon reacts with certain bactericides and other chemicals.

2. Disposable Syringes:

These syringes are used for one time only. Most of them are made up of transparent polystyrene; sometimes the plunger is of a white opaque colour of same material. At the end of plunger is a rubber grummet that may have been treated with silicon. These syringes are generally sterilized by gamma radiations.

Needles:

(a) Non-disposable needles : These have stainless steel shank and a nickel plated brass hub. These are distinguished by the gauge and length of tubing used for the former.

(b) Disposable needles : These consist of a stainless steel shank in a plastic hub and are designed to provide good physical and bacteriological protection and facilitate aseptic attachment to the syringe. These have advantage of elimination of tedious, time-consuming and costly cleaning and sharpening processes. These are sterilized by gamma radiations and ethylene oxide gas.

Result: Different types of syringes and needles are studied.

VIVA VOCE QUESTIONS

Q.1 What are advantages of all-glass syringe?

Q.2 Give one disadvantage of half record syringe.

Date :_____ Marks : _____/10

EXPERIMENT NO. 2

- **Aim:** To sterilize the given articles by dry heating method and to study the working of hot air oven.
- **Requirements:** Hot air oven, glassware articles to be sterilized.
- **Theory: Sterilization:** It is a process by which all viable forms of micro-organisms are removed or destroyed.
- **Sterilization Methods:** For sterilization of product or materials, various methods of sterilization are used. These can be classified as under:
  1. Physical methods: (a) Dry heat sterilization
     (b) Moist heat sterilization (c) Sterilization by radiation
  2. Chemical methods: (a) Gaseous sterilization
     (b) Sterilization with disinfectants
  3. Mechanical methods: (a) Sterilization by filtration

DRY HEAT STERILIZATION METHOD:

- **Principle:** During dry heat sterilization, the micro-organisms and bacteria spores are killed by oxidation. Since dry heat is less effective than moist heat, hence higher temperature and longer period of exposure are required. Exposure time depends upon packaging of materials, thickness of glass, volume of container etc. e.g. syringes and needles may be sterilized at 160°C for one hour. Materials getting decomposed at higher temperature may be sterilized at lower temperature exposed for longer duration of time. Heat sterilization can be done by the hot air oven.
- **Applications and Uses:**
  - For sterilization of injectable needles and syringes.
  - Glass apparatus such as flasks, pipettes, bottles, beakers and test tubes are sterilized by this method. Their mouth is plugged with non-absorbent cotton wool.
  - Generally metallic instruments like scalpels, scissors, knives, spatula and blades are sterilized by the dry heat method.
  - Drugs which are stable at 150°C and are thermo stable.
  - The equipment used for aseptic processing such as mortars, pestles, tiles etc. are conveniently sterilized by this method.

Making: Sterilization by dry heat is usually carried out in an apparatus known as "hot air oven". It is a metallic chamber made up of steel or aluminium, separated from outer case by a thick layer of glass fibre insulation. The door is double walled and inner side has asbestos gasket which makes it air tight and prevents heat loss. Heat is transferred from source to articles in hot air oven by conduction, convection and radiation. A thermometer is fitted in front of oven to note down temperature during sterilization.

Hot air oven should satisfy following requirements:

(i) Every item inside the oven must receive correct exposure of heat.

(ii) The temperature of sterilization must be attained quickly and be maintained with little variation.

At the top of oven, there is a ventilator and on the bottom there is a chamber in which heating elements are fitted.

- **Working:** During sterilization, the material to be sterilized is placed in the oven properly and the door is closed. Extra time is always allowed to penetrate heat into the material. The temperature is adjusted to 150°C and the ventilator is allowed to remain open until the temperature of oven reaches 115°C. It helps in removal of moisture from the container and materials to be sterilized. When it reaches 115°C, ventilator is closed and the temperature is allowed to rise upto 150°C. The heat is transferred from the source mainly by radiation and convection. After one hour, the oven is switched off and allowed to cool to about 60°C.

  During dry heat sterilization, all the living micro-organisms and their spores get destroyed due to oxidation of proteins present in living cells. Although heating at 250°C can destroy all types of micro-organisms and their spores, but this can also spoil the product. Hence dry heat sterilization at temperature of 150-160°C gives most satisfactory results.
- **Precautions:** Following precautions should be taken care of:
  - Overloading should be avoided.
  - There should be sufficient space between the articles to provide uniform distribution of heat.
  - To prevent breakage of glass apparatus, it should be kept in mind to cool down the oven temperature.
  - Openings of glass items should be plugged with non-absorbent cotton wool and wrapped further in a paper.
- **Limitations:**
  - This method cannot be used for thermo labile medicaments, rubbers and plastics.
  - It is unsuitable for surgical dressing because it destroys natural moisture of fibres and makes them brittle and discoloured.
- **Result:** Working and construction of hot air oven is studied.

VIVA VOCE QUESTIONS

Q.1 What is sterilization?

Q.2 What are applications of dry heat sterilization?

❖❖❖

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 3

- **Aim:** To sterilize the given articles by moist heat method and to study the working of autoclave.
- **Requirements:** Autoclave, glassware articles to be sterilized.
- **Theory: Sterilization:** It is a process by which all viable forms of micro-organisms are removed or destroyed.
- **Sterilization equipment:** For sterilization of product or materials, various methods of sterilization are used. These can be classified as under:

1. Physical methods:
   (a) Dry heat sterilization
   (b) Moist heat sterilization
   (c) Sterilization by radiation
2. Chemical methods:
   (a) Gaseous sterilization
   (b) Sterilization with disinfectants
3. Mechanical methods:
   (a) Sterilization by filtration

MOIST HEAT STERILIZATION:

Micro-organisms can be killed using hot water, boiling water, steam at atmospheric pressure and steam under reduced pressure. Moist heat sterilization is more powerful than dry heat sterilization as:

(i) Penetration power of steam is more as compared to dry heat.
(ii) Thermal capacity of steam is much greater than the thermal capacity of dry heat.
(iii) During moist heat sterilization, micro-organisms are killed due to coagulation or denaturation of proteins present in living cells of micro-organisms and the coagulation occurs at a lower temperature due to presence of moisture.

Moist heat sterilization can be categorized under following heads:

(1) Autoclaving
(2) Heating with bactericide
(3) Electric boiling water sterilizer
(4) Tyndallization
(5) Pasteurization

Autoclaving:

Applications and Uses:

- This method is used for sterilization of glass containers and apparatus. (115°C for 30 minutes)
- Plastic screw caps, rubber lines, closures, rubber gloves must be autoclaved.
- It is a suitable method of sterilization for injectable solutions and suspensions.
- Surgical dressings can be autoclaved for sterilization.

- **Principle:** During moist heat sterilization, the materials are sterilized by saturated steam at a pressure higher than atmospheric pressure. The time required for sterilization of materials is inversely proportional to steam. The table shows varying time, temperature and pressure of saturated steam in an autoclave.

Approximate Temperature	Pressure in lb/sq. in.	Approximate sterilization time with saturated steam
100°C	5	20 hours
115°C	10	30 minutes
121°C	15	15 minutes
130°C	20	2.5 minutes

- **Apparatus and Working:** Autoclave is a strong cylindrical chamber made up of aluminium alloy or stainless steel. On its lid, there are various controls like steam vent, pressure gauze, safety valve and sometimes thermometer. Inner side of the lid has a rubber gasket which makes it air tight. To keep its cover in a position, it is provided with wing nuts and bolts. Inside the chamber, there is a perforated metallic basket or wire container in which the material to be sterilized is packed inside. The perforated metallic chamber is removed out and water is put to level so that it does not touch the bottom of perforated chamber. The material to be sterilized is loosely packed so as to leave a space for expansion and prevent breakage and then it is placed into chamber. Caps of bottled fluid should be screwed down tightly so that there is no danger of explosion as the internal pressure is approximately balanced by the steam pressure outside.

  The lid is put into position with the help of wing nuts and bolts. The vent is opened. The autoclave is switched on and water is allowed to boil. The steam is allowed to pass freely from vent for 5 minutes. When whole of air is removed, steam vent is closed and pressure is allowed to rise upto 10 pounds/sq. in. B.P. allows exposure of whole contents to 115-116°C for 30 min. Then autoclave is switched off and is allowed to cool until the pressure falls to normal. Now the vent can be opened, if internal pressure is high.
- **Limitations:**
  - This method cannot be used for thermo labile substances, powders and oily preparations.
- **Result:** Working and construction of autoclave is studied.

VIVA VOCE QUESTIONS

Q.1 What is moist heat sterilization?

Q.2 What are limitations of moist heat sterilization?

❖❖❖

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 4

- **Aim:** To study various methods of sterilization by filtration.
- **Requirements:** Filtration assembly, solution to be filtered.
- **Theory:** Sterilization: It is a process by which all viable forms of micro-organisms are removed or destroyed.
- **Sterilization equipment:** For sterilization of product or materials, various methods of sterilization are used. These can be classified as under:

1. Physical methods:
   (a) Dry heat sterilization
   (b) Moist heat sterilization
   (c) Sterilization by radiation
2. Chemical methods
   (a) Gaseous sterilization
   (b) Sterilization with disinfectants
3. Mechanical methods
   (a) Sterilization by filtration

STERILIZATION BY FILTRATION:

Sterilization by filtration is another old method used for injectable preparations. By this method all living and dead bacteria get removed when the solution is filtered through bacteria-proof filtration media. Various filter media are used for bacteria-proof filtration which includes:

(a) Sintered ceramics
(b) Fibrous pad
(c) Sintered glass
(d) Microporous plastic

These filters function by pores which are formed by fusion of porcelain, sintered glass, metal, cellulosic or plastic polymer matrix. The filtration involves the bacteria to be entrapped in the pores and get removed from the solution. As the pores are of very small size, hence require lot of time. Vacuum or pressure or both are used to increase the rate of filtration.

(a) Sintered ceramics:

(i) Unglazed porcelain

(ii) Kieselguhr

It consists of bacteria-proof candles made up of porcelain or kieselguhr. These candles are also known as ceramic candles. For sterilization, the candle is placed in the solution to be sterilized and other end is attached to vacuum pump. The vacuum pump decreases the pressure inside the candle and helps in filtration of the solution. When the candle getd filled, process is stopped and filtrate is collected. Used filter candles are immediately soaked in distilled water. They are not allowed to get dry, because then it becomes difficult to dislodge the hard deposits. To loosen the surface deposits, candles are always flushed with pyrogenic water in the opposite direction. Kieselguhr candles are thicker than unglazed porcelain type candles and have metal mounts attached by cement.

Applications and uses:

- These filters are useful for thermo labile medicaments
- All living and dead bacterias are removed from the preparations.

Limitations:

- As the process is not reliable, hence sterility test is necessary. It can't be used for suspensions and oily preparations.

(b) Fibrous pad:

These are soft pads of thickness about 3 mm and are usually round in shape. It is made up of asbestos blended with wood cellulose which keeps the porosity high. Every time new pad is used for filtration, hence chances of contamination are less. Filtration is carried out either by vaccum or pressure as vacuum type units are Buchner funnel shaped, made up of highly polished stainless steel. By loosening the wing nuts, they can be separated into 2 parts. The lower portion contains a wire grid or perforated plate on which the pad is kept. The solution to be filtered is filled and vacuum is applied. The filtrate is collected and stored aseptically.

Advantages:

- No risk of contamination as fresh pad is used every time.
- They clog less easily than other media.
- They are more suitable than ceramics or glass for viscous solutions.

Limitations:

- Sharp pressure change may break the wet pads and may cause contamination.
- It is highly unsuitable for strongly alcoholic solutions.

(c) Sintered glass:

It is manufactured by powdering high grade borosilicate glass and sintering appropriate sizes into discs in suitable moulds, usually Buchner type. Sintering point of the glass is that temperature at which different particles adhere together without melting. These Buchner type funnels are known as "sintered glass funnel" and have different grades with different pore sizes. Grade 5 is suitable for removing bacteria. After using the filters are immediately soaked in water and then hot, concentrated sulphuric acid is drawn through the filter. Finally water is passed until it is free from acid.

It has got advantage of very little adsorption of medicaments, but is unsuitable for large volume filtration.

(d) Microporous plastic filters:

These are generally known as membrane filters which are made up of regenerated cellulose (rayon), polyvinyl chloride, nylon and polyvinyl acronitrile. They are fixed in funnel of desired size and shape. They are always supported by wire gauze. When the membrane filter has pore size between 0.005 micron to 1 micron, it is known as Millipore filters.

Advantages:

- Adsorption of medicament is insignificant.
- Rate of filtration is high.
- It can be used for sterility testing.
- Chances of contamination are very less.

Limitations:

- They are fragile in nature and very less resistant to chemicals.

- **Result:** Working and construction of filtration assembly is studied.

VIVA VOCE QUESTIONS

Q.1 What are the applications of filter sterilization?

Q.2 What are the advantages of filter sterilization?

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 5

- **Aim:** To sterilize needles by dry heat sterilization methods.
- **Requirements:** Metallic needle, syringe box, test tube, fine brush, hot air oven, etc.
- **Procedure:**

  For syringes: Separate the glass syringe into barrel and plunger. Rinse thoroughly with cold water and wash with a safe and effective detergent. Clean the outside of barrel with a fine brush and inside with a test tube brush. Rinse with water 3 times. The final rinse should be done with fresh distilled water. Allow the syringe to dry in case of dry heat sterilization.

  For needles: Wash the needle with cool water after use, so there is no occlusion or blockage. Place the needle in hot water in which an alkaline detergent capable of dissolving blood is present. Wash thoroughly both inside and outside of needle, flush the cannula with the help of syringe and clean the needle thoroughly. Rinse well with freshly distilled water and inspect for cleanliness and sharpness. Sterilize with dry heat accordingly.

  Dry heat sterilization: Place the glass syringe parts in syringe box and keep it in a hot air oven. Leave adequate space between syringe parts for proper air circulation. Allow the hot air oven to operate at 180°C, note the time and continue exposure at this temperature for at least one hour.
- **Result**: Given syringes and needles are sterilized with dry heat method.

VIVA VOCE QUESTIONS

Q.1 What materials can be sterilized by dry heat sterilization?

_____

Q.2 What is temperature required for dry heat sterilization?

_____

❖❖❖

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 6

- **Aim:** To sterilize syringes and needles by moist heat sterilization methods.
- **Requirements:** Syringes, metallic needle, syringe box, test tube, fine brush, hot air oven, autoclave etc.
- **Procedure:**

  For syringes: Separate the syringe into barrel and plunger. Rinse thoroughly with cold water and wash with a safe and effective detergent. Clean the outside of barrel with a fine brush and inside with a test tube brush. Rinse with water 3 times. The final rinse should be done with fresh distilled water. Allow the syringe to dry in case of dry heat sterilization and leave the surface moist in case of autoclaving.

  For needles: Wash the needle with cool water after use, so there is no occlusion or blockage. Place the needle in hot water in which an alkaline detergent capable of dissolving blood is present. Wash thoroughly both inside and outside of needle, flush the cannula with the help of syringe and clean the needle thoroughly. Rinse well with freshly distilled water and inspect for cleanliness and sharpness. Sterilize with dry or moist heat accordingly.

  Moist heat sterilization: Keep the moist barrel and plunger in syringe box. Place the box in an autoclave and allow the temperature to reach 121°C at 15 psig. Note the time and continue sterilization for 20 minutes. Allow pressure to come down to 0, switch off autoclave and disassemble on cooling.
- **Result:** Given syringes and needles are sterilized with moist and dry heat method.

VIVA VOCE QUESTIONS

Q.1 What material can be sterilized by moist heat sterilization?

_____

Q.2 What are conditions required for moist heat sterilization?

_____

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 7

- **Aim:** To prepare 100 ml of water for injection.
- **Requirements:** Distillation assembly, glass ampoules, gas burner, forceps, aseptic room.
- **Theory:** WFI is pyrogen free distilled water intended for use as a vehicle in the preparation of parenteral solutions. It is obtained by distilling water through pyrogen free filters. WFI has no added substances and is used as a solvent for parenteral preparations.
- **Procedure:**
  - Fresh tap water is distilled in a distillation assembly of neutral glass or metal fitted with a device for entrapment of pyrogens.
  - Reject first 50 ml of distillate and collect the remaining distillate in a suitable container.
  - Perform pyrogen test for presence/ absence of pyrogens.
  - Transfer the water for injection (pyrogen-free water) in a suitable container and affix an appropriate label.
- **Result:** Water for injection 100 ml was prepared and labelled.

VIVA VOCE QUESTIONS

Q.1 What is water for injection?

Q.2 How will you prepare water for injection?

❖❖❖

WATER FOR INJECTION I.P. (100 ml)

Each 100 ml contains
Water for injection

Caution:

Mfg. Lic. No.
Batch No.
Mfg. Date
Expiry Date
MRP (Rs.)

Manufactured By:

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 8

- **Aim:** To prepare 100 ml of sodium chloride injection (Normal saline injection I.P.)
- **Requirement:** Sodium chloride, water for injection, beaker, filter medium, glass infusion bottles, etc.
- **Theory:** Sodium chloride injection is a sterile, non-pyrogenic solution of 0.9% w/v sodium chloride in WFI for fluid and electrolyte replenishment in single dose container for I.V. administration. It contains no antimicrobial agents. It is also called normal saline as it is made isotonic with blood plasma which has the same osmotic pressure as that of blood plasma.

  Composition: Sodium chloride : 0.9 g
  Water : q.s to 100 ml
- **Procedure:** Weigh accurately 0.9 g of sodium chloride, dissolve it in WFI and make up the final volume. Filter the solution if any foreign particles are present. Fill the solution into glass infusion bottle of 100 ml capacity, close it by a rubber closure and seal it with aluminium cap under aseptic conditions. Place the bottle in autoclave and sterilize it moist heat at 15 psi for 30 minutes. After sterilization, allow the bottle to cool and pressure to come down to zero. Perform clarity and leakage test and affix an appropriate label.
- **Result:** Sodium chloride injection 100 ml is prepared and labelled.

VIVA VOCE QUESTIONS

Q.1 What is normal saline injection?

_____

Q.2 What are the uses of normal saline injection?

_____

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 9

- **Aim:** To prepare 100 ml dextrose injection I.P.
- **Requirement:** Dextrose, water for injection, beaker, filter medium, glass infusion bottles, etc.
- **Theory:** Dextrose injection is a sterile isotonic solution of 5% w/v dextrose in water for injection. It is a sterile, non-pyrogenic solution for fluid replenishment and caloric supply in single dose container for I.V. administration. It contains no antimicrobial agents.
- **Composition:**

Dextrose	:	5 g
Water	:	q.s to 100 ml

- **Procedure:** Weigh accurately 5 g of dextrose, dissolve it in WFI and make up the final volume. Filter the solution if any foreign particles are present. Fill the solution into glass infusion bottle of 100 ml capacity, close it by a rubber closure and seal it with aluminium cap under aseptic conditions. Place the bottle in autoclave and sterilize it moist heat at 15 psi for 30 minutes. After sterilization, allow the bottle to cool and pressure to come down to zero. Perform clarity and leakage test and affix an appropriate label.
- **Result:** Dextrose injection 100 ml is prepared and labelled.

VIVA VOCE QUESTIONS

Q.1 What is dextrose injection?

_____

Q.2 What are uses of dextrose injection?

_____

❖❖❖

DEXTROSE INJECTION I.P. (100 ml)
Each 100 ml contains Dextrose : 5g Water for injection : q.s.
Caution:
Mfg. Lic. No. Batch No. Mfg. Date Expiry Date MRP (Rs)
Manufactured By:

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 10

- **Aim:** To prepare 100 ml of sodium chloride dextrose injection I.P.
- **Requirement:** Sodium chloride, dextrose, water for injection, beaker, filter medium, glass infusion bottles, etc.
- **Theory:** It is a clear, colourless or faintly straw-coloured solution. Sodium chloride and dextrose injection is a sterile solution of sodium chloride and dextrose in water for injections. Sodium chloride and dextrose injection contain not less than 95.0 % and not more than 105.0 % of the stated amounts of sodium chloride, NaCl, and dextrose, $C_6H_{12}O_6$.
- **Composition:**

Sodium chloride I.P.	:	0.9 g
Dextrose anhydrous I.P.	:	5 g
Water for injection	:	q.s.

- **Procedure:** Weigh accurately 0.9 g of sodium chloride and 5 g of dextrose. Dissolve in WFI and make up the final volume. Filter the solution if any foreign particles are present. Fill the solution into glass infusion bottle of 100 ml capacity, close it by a rubber closure and seal it with aluminium cap under aseptic conditions. Place the bottle in autoclave and sterilize it moist heat at 15 psi for 30 minutes. After sterilization, allow the bottle to cool and pressure to come down to zero. Perform clarity and leakage test and affix an appropriate label.
- **Result:** Sodium chloride dextrose injection 100 ml was prepared and labelled.

VIVA VOCE QUESTIONS

Q.1 How will you sterilize sodium chloride dextrose injection?

_____

Q.2 What are aseptic conditions?

_____

❖❖❖

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 11

- **Aim:** To prepare 100 ml compound sodium lactate injection I.P.
- **Requirement:** Lactic acid, sodium hydroxide, dilute hydrochloric acid, sodium chloride, potassium chloride, calcium chloride, water for injection, beaker, filter medium, glass infusion bottles, etc.
- **Theory:** It is also known as 'Compound sodium lactate intravenous infusion' or 'Ringer-lactate solution for injection' or 'Hartmann's solution for injection. It is a clear and colourless solution. It is a sterile solution containing 0.24% v/v of lactic acid (equivalent to 0.32% w/v of sodium lactate) with 0.6% w/v of sodium chloride, 0.04% w/v of potassium chloride and 0.027% w/v of calcium chloride in water for injections.
- **Composition:**

Lactic acid	:	2.4 ml
Sodium hydroxide	:	1.15 g
Dilute hydrochloric acid	:	q.s.
Sodium chloride	:	6 g
Potassium chloride	:	0.4 g
Calcium chloride	:	0.27 g
Water for injection	:	q.s. to 1000 ml

- **Procedure**: Dissolve 1.15 g of sodium hydroxide in 200 ml of water for injection, add 2.4 ml of lactic acid and heat in autoclave at 115°C for one hour. Cool and cautiously add dilute hydrochloric acid until 0.15 ml of solution gives full orange colour with 0.05 ml of phenol red solution. Dissolve the other ingredients in 700 ml of water for injection. Mix the two solutions and add sufficient water for injection to produce 1000 ml. Filter the solution if any foreign particles are present. Fill the solution into glass infusion bottle of 1000 ml capacity, close it by a rubber closure and seal it with aluminium cap under aseptic conditions. Place the bottle in autoclave and sterilize it moist heat at 15 psi for 30 minutes. After sterilization, allow the bottle to cool and pressure to come down to zero. Perform clarity and leakage test and affix an appropriate label.
- **Result**: 100 ml compound sodium lactate injection is prepared and labelled.

VIVA VOCE QUESTIONS

Q.1 What are the other names of compound sodium lactate injection ?

COMPOUND SODIUM LACTATE INJECTION I.P. (100 ml)

Each 100 ml contains

Lactic acid	:	0.24 ml
Sodium hydroxide	:	0.115 g
Dilute hydrochloric acid	:	q.s.
Sodium chloride	:	0.6 g
Potassium chloride	:	0.04 g
Calcium chloride	:	0.027 g
Water for injection	:	q.s. to 100 ml

Caution:

Mfg. Lic. No.
Batch No.
Mfg. Date
Expiry Date
MRP (Rs)

Manufactured By:

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 13

- **Aim:** To evaluate the given sample of surgical dressing by chemical tests.
- **Theory:** A dressing is an adjunct used by a person for application to a wound in order to promote healing and to prevent further harm. A dressing is designed to be in direct contact with the wound, which makes it different from a bandage, which is primarily used to hold a dressing in place. Dressings are frequently used in first aid and nursing.
- **Procedure:**
  1. **pH:** Weigh 5 g of bandage. Cut it into pieces and place in 100 ml of water. Allow to stand for 10 minutes. Decant the supernatant by filtering the turbid solution. Measure the pH extract by pH meter or pH paper.

     Variation is calculated as V = G – 7

     where, G = Observed pH value

     7 = Neutral pH value

     The pH of the bandage should be in the range 6.5 - 8.5.
  2. **Colour of extract:** Weigh 15 g of bandage and add 150 ml of water. Keep in a closed vessel for 2 hours. Decant the supernatant liquid after filtering the solution. The extract should be colourless.
  3. **Acidity or alkalinity:** Take 50 ml of the extract and divide into two portions of 25 ml each. Add 0.1 ml of phenolphthalein (for detection of alkali) to one portion and 0.1 ml of methyl orange (for acidity) into another portion. Neither solution should become coloured.
  4. **Loss on drying:** Dry the bandage at 150°C for one hour in an oven. The sample should not lose more than 13% of its original weight.
- **Result:** The given sample is evaluated for chemical standards.

VIVA VOCE QUESTIONS

Q.1 What is a dressing?

_____

Q.2 What are various parameters for chemical testing of dressings?

_____

❖❖❖

- **Observation Table:**

Sr. No.	Test	Observation	Inference
1.	5 g bandage + 100 ml water. Keep for 10 minutes Filter and measure pH of filtrate.	pH = (Range = 6.5 - 8.5)	☐ Pass ☐ Fail
2.	15 g bandage + 150 ml water for 2 hours Filter.	Colourless/coloured	☐ Pass ☐ Fail
3.	To the 2 portions of filtrate (25 ml each) above, add 0.1 ml of phenolphthalein to one portion, 0.1 ml methyl orange to 2nd portion.	Colourless/coloured	☐ Pass ☐ Fail
4.	Dry bandage at 150°C for 1 hour	Weight lost (< 13% / > 13%)	☐ Pass ☐ Fail

Date :_____ **Marks :** _____/10

EXPERIMENT NO. 14

- **Aim:** To evaluate the given sample of absorbent cotton wool.
- **Theory:** Absorbent cotton consists of the new fibres or good quality new combers obtained from the seed coat of various species of the genus Gossypium Linn., cleaned, purified, bleached and carded. It does not contain any compensatory colouring matter. It is white, well-carded fibres of average staple length not less than 10 mm, containing not more than traces of leaf residue, seed coat and other impurities. It offers appreciable resistance when pulled and does not shed a significant quantity of dust when shaken gently; practically odourless.
- **Procedure:**
  - **Tests:** To 15.0 g of cotton add 150 ml of water, macerate for 2 hours in a closed vessel, decant the liquid, carefully squeezing out the residual liquid with a glass rod and mix. Reserve 10 ml for the test for surface-active substances and filter the remainder (solution S).
  - **Acidity or alkalinity:** To 25 ml of solution S, add 0.1 ml of dilute phenolphthalein solution; to another 25 ml add 0.05 ml of methyl orange solution. Neither solution shows a pink colour.
  - **Surface-active substances:** Into a 25 ml graduated, groundglass stoppered cylinder with external diameter of 18 to 22 mm, previously rinsed with sulphuric acid and then with water, add the 10 ml portion of solution S, shake vigorously 30 times in 10 seconds, allow to stand for 1 minute and shake again 30 times. After 5 minutes, the height of the froth does not exceed 2 mm above the surface of the liquid.
  - **Colouring matter:** Slowly extract 10 g of absorbent cotton wool in a narrow percolator with ethanol (95 %) until 50 ml of extract is obtained. The extract is not more intensely coloured than solution prepared in the following manner. To 3.0 ml of CSS, add 7.0 ml of a solution of hydrochloric acid containing 1 % v/v of hydrochloric acid and dilute 0.5 ml of the resulting solution to 10 ml with the same solution of hydrochloric acid.
  - **Ether-soluble substances:** Extract 5 g of absorbent cotton wool with ether in a continuous extraction apparatus for 4 hours in such a way that the rate is at least four extractions per hour. Evaporate the ether and dry the residue to constant weight at 105°. Ether soluble substances should not be more than 0.5%.
  - **Water-soluble substance:** Boil 5 g of absorbent cotton wool with 500 ml of water for 30 minutes, stirring frequently and replacing the water lost by evaporation. Decant the liquid into a beaker, squeeze the residual liquid from the

- **Observation Table:**

Sr. No.	Test	Observation	Inference
1.	15 g of cotton + 150 ml water, macerate for 2 hours decant liquid. Reserve 20 ml and filter the remainder (solution S). To 25 ml of solution S, add 0.1 ml of phenolphthalein. To another 25 ml of solution S, add 0.05 ml of methyl orange solution.	Two solutions do not show/show pink colour.	☐ Pass ☐ Fail
2.	To 25 ml graduated cylinder, add 10 ml of solution S. Shake vigorously 30 times for 10 seconds. Stand for 1 minute. Shake again for 30 times. Note after 5 minutes.	Froth height does not/ does exceed 2 mm	☐ Pass ☐ Fail
3.	Extract 10 g of absorbent cotton wool with ethanol and compare with standard solution.	Extract colour less intense/more intense	☐ Pass ☐ Fail
4.	Boil 5 g of absorbent cotton wool in 500 ml water for 30 minutes, decant off 400 ml liquid and filter. Evaporate to constant weight at 105°C.	Water soluble substance less than 0.5% / more than 0.5%	☐ Pass ☐ Fail
5.	Take 5 g of absorbent cotton wool in dried crucible, weigh and ignite till charred. Cool and moisten with 1 M H_2SO_4. Heat gently till white fumes stop and ignite at 800°C. Cool and weigh.	Sulphated as not more than/ more than 0.5%	☐ Pass ☐ Fail
6.	Dry and weigh weighing bottle. Add 5 g of cotton and cover. Dry at 105°C with stopper removed and then cool the bottle.	Loss on drying not more than/ more than 8%	☐ Pass ☐ Fail

material carefully with a glass rod, mix the liquids and filter the extract whilst hot. Evaporate 400 ml of the filtrate and dry the residue to constant weight at 105° C. Water soluble substance should not be more than 0.5%.

- **Sulphated ash:** Heat a silica or platinum crucible to redness for 10 minutes, allow to cool in a desiccator and weigh. Transfer 5 g of the absorbent cotton wool to the crucible and weigh the crucible and the contents accurately. Ignite gently at first, until the substance is thoroughly charred. Cool, moisten the residue with 1 ml of sulphuric acid, heat gently until the white fumes are no longer evolved and ignite at 800° ± 25°C until all black particles have disappeared. Conduct the ignition in a place protected from air currents. Allow the crucible to cool, add a few drops of sulphuric acid and heat. Ignite as before, allow cooling and weighing. Repeat the operation until two successive weighings do not differ by more than 0.5 mg. Sulphated ash should not be more than 0.5%.
- **Loss on drying:** Weigh a glass-stoppered, shallow and dried weighing bottle. Transfer to the bottle 5 g of absorbent cotton wool, cover it and accurately weigh the bottle and the contents. Dry the substance by placing the loaded bottle in the drying chamber, remove the stopper and leave it also in the chamber. Dry the sample to constant weight at 105°C. After drying is completed, open the drying chamber, close the bottle promptly and allow it to cool to room temperature in a desiccator before weighing. Weigh the bottle and the contents. Loss on drying should not be more than 8.0%.

- **Result:** Given sample of absorbent cotton wool is evaluated and sample passed/failed the tests.

VIVA VOCE QUESTIONS

Q.1 What is absorbent cotton?

Q.2 What are the various tests to evaluate absorbent cotton?

❖❖❖