



Practical Lab Manual

General Pharmacy

B. Pharm Ist Semester

Index — List of Practical

As prescribed under Course Code BP107P (General Pharmacy – Practical). A minimum of 12 experiments covering all dosage forms must be performed, plus a compendium of marketed dosage forms.

Exp. No.	Name of Experiment
1	Pharmaceutical Calculations — problems based on Allegation and Dilution methods
2 (a)	Strong Solution of Ammonium Acetate — IP
2 (b)	Cresol with Soap Solution — IP
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3	Simple Syrup — IP
4 (a)	Oral Rehydration Salts (ORS) Powder — WHO
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5 (a)	Glycerogelatin Suppository — BPC
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6 (a)	Sulphur Ointment — IP
6 (b)	Non-Staining Iodine Ointment with Methyl Salicylate — BPC
7 (a)	Iodine Gargle — BPC
7 (b)	Chlorhexidine Mouthwash — IP
8	Compendium of Marketed Dosage Forms (Continuous Assessment)

General Instructions to Students

- Report to the laboratory on time in a clean apron, carrying the practical record book, calculator, and this manual.
- Read the experiment and understand the theory before entering the laboratory.
- Check all apparatus and chemicals against the requirement list before starting; report shortages to the instructor.
- Perform all calculations (including allegation/dilution, and displacement value where applicable) on a rough sheet and get them checked before compounding.
- Weigh and measure ingredients accurately; potent/small-quantity substances (< 100 mg) must be weighed on a sensitive/chemical balance, using trituration where necessary.
- Follow the correct order of mixing to avoid physical or chemical incompatibility.
- Select a container appropriate to the dosage form and approximately the same volume as the preparation, as described under 'Compounding' and 'Labelling' in Part A.
- Label every preparation correctly and completely, including secondary labels such as 'Shake the bottle before use' and 'For external use only' where applicable.
- Submit the finished, labelled preparation along with the completed record for evaluation.
- Clean the working bench, glassware and apparatus, and return all reagents to their proper place before leaving the laboratory.
- Handle acids, alkalis, iodine and flammable liquids (alcohol, volatile oils) with care; work near the fume hood where indicated.

Part A — Foundational Theory

A.1 The Prescription

A prescription is an order written by a registered medical practitioner instructing a pharmacist to compound and dispense a specific medication for a patient, together with directions for both the pharmacist and the patient. A typical prescription consists of the following parts:

- Date — helps the pharmacist track when the medicine was last dispensed.
- Name, age, sex and address of the patient — ensures the medicine reaches the correct person at the correct dose.
- Superscription (℞) — the symbol representing the Latin word 'recipe', meaning 'you take'.
- Inscription — the main body, listing the base (active medicament), adjuvant, and vehicle.
- Subscription — directions to the pharmacist regarding the dosage form and quantity to be dispensed.
- Signature (Sig.) — directions to be transferred to the label for the patient (route, dose, frequency, timing).
- Signature of the prescriber — with registration number, mandatory for dangerous/scheduled drugs.

A.2 Handling of a Prescription

1. Receiving: Read the prescription carefully; clarify any doubt with the prescriber before compounding — never guess.
2. Collecting the materials: Read the label of every container at the time of removing it from, and again while returning it to, the shelf.
3. Compounding: Compound one prescription at a time, observing accuracy and cleanliness, and transfer the finished product to a container appropriate to its nature and quantity (round vials for tablets/capsules; oval bottles for low-viscosity liquids; wide-mouth bottles for viscous liquids and bulk powders; coloured fluted bottles for external preparations; ointment jars/collapsible tubes for semisolids; paper wrappers for divided powders; dropper bottles for eye/ear/nasal drops; sifter-top containers for dusting powders).
4. Labelling: Use good-quality paper and adhesive, proportional to the container, written legibly. Every label should state the type and quantity of preparation, patient's name/age/sex, registration number, date of dispensing, expiry (if any), directions for use, storage conditions, and the name and address of the pharmacy. Add secondary labels — 'Shake the bottle before use' for emulsions/suspensions/lotions/liniments, and 'For external use only' for all external preparations.
5. Marking the dose: For multidose liquids, mark graduations on a paper strip fixed to the bottle so the patient can identify each dose level.
6. Finishing: Cork/cap, polish the container to remove fingerprints, and dispense.

A.3 Latin Terms and Abbreviations Commonly Used in Prescription Writing

Abbreviation	English Meaning
a.c. (Ante cibos)	Before meals
agit. (Agita)	Shake / stir
alt. hrs. (Alternis horis)	Alternate hours
aq. dest. (Aqua destillata)	Distilled water
b.i.d. (Bis in die)	Twice a day

Abbreviation	English Meaning
coch. mag. (Cochleare magnum)	One tablespoonful
coch. med. (Cochleare medium)	One dessertspoonful
coch. parv. (Cochlear parvum)	One teaspoonful
ft. (Fiat / Fiant)	Make / let it be made
gtt. (Gutta / Guttae)	A drop / drops
h.s. (Hora somni)	At bedtime
i.c. (Inter cibos)	During meals
m. (Misce)	Mix
mist. (Mistura)	A mixture
mitt. (Mitte)	Send
non rep. (Non repetatur)	Do not repeat
o.d. (Oculus dexter)	Right eye
o.s. (Oculus sinister)	Left eye
omn. hor. (Omni hora)	Every hour
stat. (Statim)	Immediately

A.4 Weights and Measures

Two systems are used: the Imperial system (Avoirdupois and Apothecaries/Troy) and the Metric system. The Metric (decimal) system is now the official and universally preferred system because of its ease of calculation and accuracy.

Metric System (official)

1 Kilogram (kg)	1000 g
1 Gram (g)	1000 mg
1 Milligram (mg)	0.001 g
1 Microgram (mcg)	0.001 mg
1 Litre (L)	1000 mL
1 Millilitre (mL)	0.001 L

Note: Some old prescriptions and imported products may still use Imperial units (grains, drachms, ounces, minims, fluid ounces). Familiarity with the conversion $1\text{ g} \approx 15.43\text{ grains}$ and $1\text{ fl. oz} \approx 28.4\text{ mL}$ is useful when interpreting such prescriptions.

Part B — Practical Experiments

Experiment 1

Pharmaceutical Calculations — Allegation and Dilution

Aim

To solve pharmaceutical problems based on the Allegation method and the Dilution/Concentration method, used routinely for adjusting the strength of solutions, mixtures and alcoholic preparations.

Requirements

- Calculator, rough worksheet, practical record book.

Theory / Principle

Dilution and Concentration: When a solution of known strength is diluted with a diluent (or a weaker solution is fortified with a stronger one/pure ingredient), the total quantity of solute remains constant. This is expressed as $C_1V_1 = C_2V_2$, where C_1 , V_1 are the initial concentration and volume and C_2 , V_2 are the final concentration and volume.

Allegation Alternate: A rule used to find the proportion in which two or more ingredients of known, different strengths must be mixed to produce a mixture of a desired intermediate strength. The differences between the desired strength and each of the two given strengths are cross-multiplied (criss-cross method) to give the parts of each ingredient required.

Allegation — Worked Example

In what proportion should a 90% (v/v) alcohol and a 30% (v/v) alcohol be mixed to produce a 60% (v/v) alcohol?

By the criss-cross rule: parts of 90% required = $(60 - 30) = 30$ parts; parts of 30% required = $(90 - 60) = 30$ parts. Hence 90% and 30% alcohol are mixed in equal parts (1: 1) to obtain 60% alcohol.

Dilution — Worked Example

How much water should be added to 500 mL of a 10% w/v solution to reduce its strength to 4%?

Using $C_1V_1 = C_2V_2$: $10 \times 500 = 4 \times V_2$, so $V_2 = 1250$ ml. Water to be added = $1250 - 500 = 750$ ml.

Procedure

1. Read each problem carefully and identify whether it is a dilution/concentration type or an allegation type.
2. For dilution/concentration problems, apply $C_1V_1 = C_2V_2$ and solve for the unknown.
3. For allegation problems, set up the criss-cross grid with the desired strength at the centre and the two given strengths on the left, and cross-subtract to obtain the required parts/ratio.
4. Verify the answer by back-calculating the final strength from the proportions obtained.
5. Record at least five solved problems (a mix of dilution and allegation type) in the practical record book, duly checked and signed by the instructor.

Precautions

- Keep the units (% w/v, % v/v, % w/w) consistent throughout a calculation.
- Cross-check the final answer by substitution before proceeding to actual compounding based on it.

Result

The given pharmaceutical calculation problems based on dilution and allegation methods were solved and verified.

Experiment 2 (a)

Strong Solution of Ammonium Acetate (IP)

Aim:

To prepare and submit Strong Solution of Ammonium Acetate IP, used as a mild diaphoretic/diuretic vehicle and as an official reagent solution.

Requirements:

- Ammonium carbonate, Dilute Acetic Acid, Purified Water
- Beaker, glass rod, measuring cylinder, funnel, litmus paper, amber/oval prescription bottle

Theory / Principle:

Strong Solution of Ammonium Acetate is prepared by the interaction of ammonium carbonate with dilute acetic acid; carbon dioxide is evolved and ammonium acetate is formed in solution. Acetic acid is added in successive small quantities, with stirring, until effervescence just ceases and the solution is neutral to faintly acid to litmus — a large excess of acid must be avoided as it renders the solution unstable and unofficial.

Formula:

Ingredient	Quantity	Category / Use
Ammonium carbonate	33.0 g	Base — reacts with acetic acid
Dilute Acetic Acid IP	q.s. (to neutrality)	Reacting agent / adjusts pH
Purified Water	to 100 mL	Vehicle

Procedure:

1. Weigh 33.0 g of ammonium carbonate and transfer it to a beaker containing about half the required volume of purified water.
2. Add dilute acetic acid in small successive portions with continuous stirring; effervescence (CO₂ evolution) occurs.
3. Continue adding acid until effervescence just ceases and the solution tests neutral to faintly acid on litmus.
4. Filter the solution if necessary and make up to the required volume (100 mL) with purified water.
5. Transfer to a clean, dry, amber prescription bottle.

Labelling

- Strong Solution of Ammonium Acetate IP — (quantity)
- Name of patient/purpose, date of preparation
- For internal use, diluted as directed

Precautions

- Add the acid gradually — rapid addition causes excessive frothing and loss of material.
- Avoid excess acid; the solution should not be strongly acidic.
- Store in a well-closed, amber container away from light as the solution deteriorates on prolonged storage.

Result- Strong Solution of Ammonium Acetate IP was prepared, tested for neutrality, and submitted in a suitably labelled container.

Experiment 2 (b)

Cresol with Soap Solution (IP (Lysol-type disinfectant))

Aim

To prepare and submit Cresol with Soap Solution IP, used as a general-purpose disinfectant.

Requirements

- Cresol, Soap solution (vegetable/soft soap base), Purified Water
- Beaker, glass rod, measuring cylinder, coloured fluted bottle

Theory / Principle

Cresol is only sparingly soluble in water but is readily solubilised by soap, which acts as a solubilising/emulsifying agent through micelle formation, giving a clear, miscible disinfectant concentrate that produces a milky emulsion on dilution with water.

Formula

Ingredient	Quantity	Category / Use
Cresol	50 mL	Active disinfectant
Soap Solution	to 100 mL	Solubilising agent / vehicle

Procedure

1. Measure the required quantity of soap solution into a clean, dry beaker.
2. Add cresol gradually with constant stirring until a clear, homogeneous solution is obtained.
3. Make up to volume with additional soap solution if required.
4. Transfer to a coloured, fluted (ribbed) bottle to distinguish it from internal preparations.

Labelling

- Cresol with Soap Solution IP — (quantity)
- 'For external/disinfectant use only' — not to be taken internally
- Directions: dilute as directed before use

Precautions

- Use a fluted, coloured bottle — a legal requirement for poisons/disinfectants to distinguish them by touch in the dark.
- Avoid contact with skin and eyes; cresol is corrosive/irritant in concentrated form.
- Prepare in a well-ventilated area away from naked flame.

Result

Cresol with Soap Solution IP was prepared as a clear concentrate and submitted in a correctly labelled, fluted container.

Experiment 2 (c)

Lugol's Solution (BPC (Aqueous Iodine Oral Solution))

Aim

To prepare and submit Lugol's Solution BPC, used as a source of iodine, e.g. pre-operatively in thyrotoxicosis.

Requirements

- Iodine, Potassium iodide, Purified water
- Beaker, glass rod, amber measuring cylinder, amber dropper/prescription bottle

Theory / Principle

Iodine is practically insoluble in water but dissolves readily in a concentrated solution of potassium iodide by formation of the soluble complex ion tri-iodide (I_3^-). Hence potassium iodide is dissolved first in a small quantity of water, and iodine is then dissolved in this concentrated iodide solution before final dilution to volume.

Formula

Ingredient	Quantity	Category / Use
Iodine	5 g	Active medicament
Potassium Iodide	10 g	Solubilising agent for iodine
Purified Water	to 100 mL	Vehicle

Procedure

1. Dissolve the potassium iodide in a small quantity (about 10 mL) of purified water to obtain a concentrated solution.
2. Add the weighed quantity of iodine to this concentrated potassium iodide solution and stir until completely dissolved.
3. Dilute gradually with the remaining purified water to the required volume with continuous stirring.
4. Filter if necessary and transfer to an amber (light-resistant) bottle.

Labelling

- Lugol's Solution BPC — (quantity)
- 'For internal use — dilute as directed'
- Store protected from light

Precautions

- Never attempt to dissolve iodine directly in plain water — dissolve it only in the concentrated KI solution.
- Iodine stains skin, clothing and corrodes metal — handle with a glass rod/spatula, not metal instruments.
- Dispense in an amber/light-resistant bottle as iodine solutions are light-sensitive.

Result Lugol's Solution BPC was prepared as a clear, dark-brown solution and submitted in a light-resistant, correctly labelled container.

Experiment 3

Simple Syrup (IP)

Aim

To prepare and submit Simple Syrup IP, used as a sweetening/flavouring vehicle and preservative base for medicated syrups.

Requirements

- Sucrose (cane sugar), Purified Water
- Beaker, glass rod, water bath, measuring cylinder, muslin cloth, amber/clear syrup bottle

Theory / Principle

Simple Syrup is a concentrated, near-saturated aqueous solution of sucrose. At the official concentration (66.7% w/w), the high sugar content itself acts as a preservative by osmotic action, inhibiting microbial growth, so gentle heat (not prolonged boiling) is used only to hasten dissolution, avoiding caramelisation/inversion of sucrose.

Formula

Ingredient	Quantity	Category / Use
Sucrose	66.7 g	Sweetening agent / base
Purified Water	to 100 g	Vehicle / solvent

Procedure

1. Weigh the required quantity of sucrose and place it in a clean beaker.
2. Add about three-quarters of the calculated water and heat gently on a water bath with stirring until the sugar dissolves completely.
3. Avoid prolonged or excessive heating, which causes inversion/caramelisation and darkens the syrup.
4. Strain the hot syrup through muslin cloth to remove any undissolved particles.
5. Make up to the final weight/volume with purified water while still warm, mix, and allow to cool.
6. Transfer to a clean, dry bottle, cork and label.

Labelling

- Simple Syrup IP — (quantity)
- Date of preparation
- Store in a cool place, well closed

Precautions

- Do not boil for a prolonged time — this causes inversion of sucrose and darkening.
- Use freshly prepared syrup wherever possible; if storage is needed, add a suitable preservative.
- Strain while hot, as the syrup thickens and is difficult to filter once cool.

Result

Simple Syrup IP, a clear, colourless, viscous liquid of the specified concentration, was prepared and submitted.

Experiment 4 (a)

Oral Rehydration Salts (ORS) Powder (*WHO reduced-osmolarity formula*)

Aim

To prepare and submit ORS Powder as per the WHO formula, used for the management of dehydration due to diarrhoea.

Requirements

- Sodium chloride, Trisodium citrate dihydrate, Potassium chloride, Glucose (anhydrous)
- Weighing balance, mortar and pestle, sieve, polythene/laminated sachet

Theory / Principle

ORS works on the principle of sodium–glucose co-transport across the intestinal mucosa: glucose actively facilitates the absorption of sodium (and accompanying water) even during diarrhoea, thereby correcting dehydration and electrolyte loss. The WHO reduced-osmolarity formula lowers total osmolarity to reduce stool output and vomiting compared with earlier formulations.

Formula

Ingredient	Quantity	Category / Use
Sodium chloride	2.6 g	Electrolyte replacement
Trisodium citrate dihydrate	2.9 g	Buffer / corrects acidosis
Potassium chloride	1.5 g	Electrolyte replacement
Glucose, anhydrous	13.5 g	Facilitates sodium/water absorption
(Reconstitute in Potable water)	to 1 litre	Vehicle, at time of use

Procedure

1. Individually weigh the four ingredients accurately.
2. Powder each ingredient finely (if not already fine) and pass through a fine sieve.
3. Mix the powders in geometric dilution — combine smaller quantities with larger ones progressively to ensure uniform blending.
4. Triturate thoroughly until a homogeneous powder mixture is obtained.
5. Pack the mixed powder into a clean, dry, moisture-proof sachet sized for reconstitution in exactly 1 litre of clean drinking water.

Labelling

- ORS Powder — WHO Formula
- Directions: dissolve entire contents of one packet in 1 litre of clean drinking water
- Use within 24 hours of reconstitution; discard leftover solution

Precautions

- Weigh each electrolyte accurately — errors can render the solution hypertonic/hypotonic.
- Store the dry powder in an airtight, moisture-proof container/sachet, as the ingredients are hygroscopic.
- Do not boil the reconstituted solution.

Result

ORS Powder conforming to the WHO reduced-osmolarity formula was prepared, packed and submitted.

Experiment 4 (b)

Effervescent Granules (IP (e.g. containing Ferric Ammonium Citrate))

Aim

To prepare and submit Effervescent Granules IP, which evolve carbon dioxide on contact with water to give a pleasant, sparkling medicated drink.

Requirements

- Sodium bicarbonate, Citric acid, Tartaric acid, active medicament (e.g. Ferric Ammonium Citrate), Sucrose/Saccharin sodium, Rectified spirit
- Mortar and pestle (or dish), sieve (No. 10/16), oven/water bath at low heat, wide-mouth bottle

Theory / Principle

Effervescent granules contain an acid (citric and/or tartaric acid) and a base (sodium bicarbonate) which, in the presence of moisture, react to liberate carbon dioxide. The granular form (rather than fine powder) is deliberately produced to slow down the acid–base reaction during manufacture and storage, and the granules are dried rapidly at a low temperature to remove moisture that would otherwise trigger premature effervescence.

Formula

Ingredient	Quantity	Category / Use
Sodium bicarbonate	40% of granule base	Alkaline component (CO ₂ source)
Citric acid	25% of granule base	Acidic component
Tartaric acid	25% of granule base	Acidic component
Active medicament (e.g. Ferric Ammonium Citrate)	as prescribed	Therapeutic agent
Sucrose / Saccharin sodium	q.s.	Sweetening agent
Rectified spirit	q.s. (moistening agent)	Granulating fluid

Procedure

1. Individually powder and pass sodium bicarbonate, citric acid and tartaric acid through a fine sieve; keep them separate until the final mixing step.
2. Dissolve/incorporate the medicament and sweetening agent into the powder blend as directed.
3. Mix the acids and the medicament first; add the sodium bicarbonate last, mixing rapidly and briefly to minimise the acid–base reaction.
4. Moisten the mixed powder with just sufficient rectified spirit (not water) to bind it into a coherent mass, keeping the reaction to a minimum.
5. Pass the moist mass through a sieve of suitable mesh size (No. 10) to form granules.
6. Dry the granules rapidly at a low temperature (below 54°C) on a tray or in a warm-air oven.
7. Re-sieve if necessary to obtain uniform granules and pack in a well-closed, wide-mouth, moisture-proof bottle.

Labelling

- Effervescent Granules IP — (quantity)
- Directions: dissolve one dose in a glass of water and drink while effervescing
- Store in a well-closed container, protected from moisture

Precautions

- Use rectified spirit, not water, as the granulating fluid to avoid premature effervescence.
- Add sodium bicarbonate last and work quickly to minimise loss of carbon dioxide during preparation.
- Dry at low temperature — excessive heat may decompose citric acid/medicament or trigger the effervescent reaction.
- Pack immediately in an airtight container as the granules are strongly hygroscopic.

Result

Effervescent Granules IP were successfully prepared, dried, and submitted in a moisture-proof container.

Experiment 4 (c)

Dusting Powder (IP)

Aim

To prepare and submit an antiseptic Dusting Powder IP for external application to the skin.

Requirements

- Boric acid, Zinc oxide, Talc, Starch
- Mortar and pestle, fine sieve (No. 100), sifter-top container

Theory / Principle

Dusting powders are powders for external use, meant to be antiseptic, absorbent, lubricant and protective. They must be free from gritty particles and are therefore passed through a very fine sieve before packing. Insoluble antiseptics and absorbents (boric acid, zinc oxide) are combined with talc (lubricant/glide) and starch (absorbent) to give a smooth, adherent powder.

Formula

Ingredient	Quantity	Category / Use
Boric acid	10%	Mild antiseptic
Zinc oxide	10%	Astringent, protective
Starch	20%	Absorbent
Talc	to 100%	Lubricant, glide, base

Procedure

1. Individually powder boric acid and other crystalline ingredients finely using a mortar and pestle.
2. Weigh all ingredients accurately.
3. Mix the powders in geometric proportion, starting with the smallest quantity and progressively doubling with the next larger quantity, triturating thoroughly at each stage.
4. Pass the final blended powder through a fine sieve (No. 100) to ensure freedom from grit and uniform particle size.
5. Pack the powder into a sifter-top container for easy application.

Labelling

- Dusting Powder IP — (quantity)
- 'For external use only'
- Directions: apply lightly to the affected area

Precautions

- The powder must be free of gritty particles — always sieve before packing.
- Avoid inhalation of fine powder dust while mixing and sieving; work with care.
- Use a sifter-top container to allow controlled, even application.

Result

A smooth, homogeneous antiseptic Dusting Powder IP was prepared and packed in a sifter-top container.

Experiment 4 (d)

Divided Powders (IP)

Aim

To prepare and submit Divided (Individual dose) Powders IP for oral administration.

Requirements

- Prescribed medicament(s), diluent if required
- Mortar and pestle, weighing balance, powder papers, spatula

Theory / Principle

Divided powders are dispensed as individual, pre-measured doses, each wrapped separately. When more than one ingredient is present, they are mixed in ascending order of quantity (geometric dilution) to ensure uniform distribution. Potent substances with a dose below 100 mg must first be triturated with a suitable inert diluent to bring the weighable quantity within the accuracy of the balance used.

Formula

Ingredient	Quantity	Category / Use
Medicament(s) as prescribed	as calculated per dose	Active ingredient(s)
Inert diluent (e.g. Lactose)	q.s. (if potent/low dose)	Bulking agent to permit accurate weighing

Procedure

1. Calculate the total quantity of each ingredient required for the number of doses to be dispensed, allowing for one extra powder to cover unavoidable wastage.
2. Powder any crystalline ingredients finely.
3. Mix the ingredients in the mortar in ascending order of quantity (geometric dilution) until a uniform blend is obtained.
4. Divide the bulk powder visually into equal heaps corresponding to the number of doses, and adjust each heap on the balance for accuracy.
5. Wrap each individual dose neatly in a powder paper (using the diagonal or three-fold wrap) and arrange in a box or envelope.

Labelling

- The Powder — (5×250 mg, or as prepared)
- For patient's name, age, sex, registration no.
- Directions for use as prescribed

Precautions

- Ensure each divided dose is uniform in weight — check representative powders on the balance.
- Potent substances of dose < 100 mg must be triturated with a diluent before dividing.
- Use waxed inner paper for hygroscopic powders to protect against moisture.

Result

The prescribed number of accurately divided, uniformly filled powder doses were prepared, wrapped and submitted.

Experiment 5 (a)

Glycerogelatin Suppository (BPC)

Aim

To prepare and submit a Glycerogelatin Suppository BPC, a water-soluble base suitable for slow-release/vaginal suppositories.

Requirements

- Gelatine, Glycerine, Purified water
- Water bath, suppository mould (glycero-gelatin type), lubricant (liquid paraffin/arachis oil), knife

Theory / Principle

Glycerogelatin base is a mixture of glycerin and water made stiff by the addition of gelatin; the stiffness depends on the proportion of gelatin used. This base is well suited to medicaments such as boric acid, chloral hydrate, bromides, iodides and iodoform, and is particularly favoured for vaginal suppositories because it dissolves/softens slowly in the cavity fluids, prolonging local action.

Formula

Ingredient	Quantity	Category / Use
Gelatin	14 g	Gelling / stiffening agent
Glycerin	60 g	Base / humectant
Purified water	26 g	Solvent for gelatin

Procedure

1. Soak the gelatin in the purified water for about 15–20 minutes to allow it to swell.
2. Heat the swollen gelatin gently on a water bath with the glycerin, stirring until a clear, homogeneous, bubble-free mass is obtained.
3. Incorporate the medicament (previously powdered, if solid) into the melted mass and mix thoroughly.
4. Pour the melted mass into a mould lubricated with liquid paraffin, previously cooled on ice, filling each cavity to slight overflow.
5. Allow to cool and set fully on ice; trim off the excess with a sharp knife or blade.
6. Remove the suppositories from the mould, wrap individually in waxed paper.

Labelling

- Glycerogelatin Suppository BPC — (number and weight)
- 'For external/vaginal use only'
- Store in a cool place

Precautions

- Avoid overheating the gelatin–glycerin mass, which can degrade the gelatin.
- Lubricate the mould with an oily lubricant (glycerogelatin bases require an oily lubricant, opposite to the base type).
- Cool the mould on ice before pouring, and allow full setting before unmoulding.

Result

Glycerogelatin suppositories of uniform size and weight were successfully prepared, cooled, trimmed and submitted.

Experiment 5 (b)

Cocoa Butter Suppository (IP)

Aim

To prepare and submit Suppositories IP using Cocoa Butter (Theobroma Oil) as the base, applying the concept of Displacement Value.

Requirements

- Cocoa butter (Theobroma oil), prescribed medicament (e.g. Bismuth subgallate)
- Water bath, suppository mould (1 g capacity), lubricant (soft soap/glycerol/alcohol mixture), ice, knife

Theory / Principle

Cocoa butter is a yellowish-white solid with a melting point of 30–35°C, obtained from the roasted seeds of Theobroma cocoa; it melts readily at body temperature, releasing the medicament. Because the mould is calibrated for pure cocoa butter, the addition of a denser medicament displaces a smaller weight of cocoa butter than its own weight. This is expressed as the Displacement Value (DV) — the quantity of medicament that displaces one part of cocoa butter — and must be used to calculate the correct quantity of base for a given mould size and dose.

Formula

Ingredient	Quantity	Category / Use
Cocoa butter (Theobroma oil)	calculated by displacement value	Suppository base
Medicament (e.g. Bismuth subgallate)	as prescribed per suppository	Active ingredient

Procedure

1. Calculate the number of suppositories required, adding two extra to allow for wastage.
2. Using the displacement value of the medicament, calculate the actual weight of cocoa butter needed: $\text{Weight of base} = (\text{mould capacity} \times \text{total number}) - (\text{total weight of medicament} \div \text{displacement value})$.
3. Grate or slice the cocoa butter and melt about two-thirds of it gently on a water bath (avoid overheating, as cocoa butter shows polymorphism and overheated butter sets poorly).
4. Incorporate the finely powdered medicament into the melted base and stir until uniformly dispersed; add the remaining unmelted cocoa butter to help cool the mass while stirring (helps prevent particle sedimentation).
5. Pour the mass into a mould lubricated with a soft-soap/glycerol/alcohol lubricant and pre-cooled on ice, filling each cavity to slight overflow.
6. Allow to set fully on ice (about 15 minutes), then trim off excess with a sharp knife.
7. Remove suppositories from the mould, wipe off any lubricant, and wrap individually in waxed paper.

Labelling

- Suppository BP/IP — (number and nominal weight, e.g. 1 g)
- 'For external/rectal use only'
- Store in a cool place — cocoa butter melts near room temperature

Precautions

- Do not overheat cocoa butter — this destroys its stable crystalline form and causes poor setting/loss of gloss.
- Always calculate and use the correct displacement value for the medicament used.
- Cool the mould on ice before pouring; fill to slight overflow to compensate for the contraction of cocoa butter on cooling.

Result

Cocoa Butter suppositories of the correct calculated weight, incorporating the prescribed medicament, were prepared and submitted.

Experiment 5 (c)

Zinc Oxide Suppository (IP)

Aim

To prepare and submit Zinc Oxide Suppositories IP, applying the displacement value method for an indiffusible medicament of high density.

Requirements

- Cocoa butter, Zinc oxide (finely powdered)
- Water bath, suppository mould, lubricant, ice, knife

Theory / Principle

Zinc oxide is a dense, insoluble, astringent and protective medicament with a high displacement value (about 5.0), meaning a comparatively large weight of zinc oxide displaces only a small weight of cocoa butter. Accurate application of the displacement value is essential, or suppositories will be significantly overweight/underweight compared with the nominal mould size.

Formula

Ingredient	Quantity	Category / Use
Cocoa butter	calculated by displacement value (DV of ZnO = 5.0)	Suppository base
Zinc oxide	as prescribed per suppository	Astringent / protective medicament

Procedure

1. Calculate the required quantity of cocoa butter using the displacement value of zinc oxide (5.0), as illustrated in Experiment 5(b).
2. Melt two-thirds of the calculated cocoa butter gently on a water bath.
3. Incorporate the finely powdered, sieved zinc oxide into the melted base with continuous stirring to ensure uniform dispersion (zinc oxide is indiffusible and tends to settle, so stirring must continue until the mass begins to thicken on cooling).
4. Add the remaining unmelted cocoa butter to assist cooling and stir until a smooth, homogeneous, semi-set mass is obtained.
5. Pour into a lubricated, ice-cooled mould, filling to slight overflow.
6. Allow to set fully on ice, trim excess, unmould and wrap each suppository in waxed paper.

Labelling

- Zinc Oxide Suppository IP — (number and nominal weight)
- 'For external/rectal use only'
- Store in a cool place

Precautions

- Zinc oxide must be finely powdered and free from grit before incorporation.
- Stir continuously while the mass is cooling to prevent the dense zinc oxide from settling to the bottom of the mould before it sets.
- Use the correct displacement value to avoid dosing errors.

Result

Zinc Oxide suppositories of uniform weight and drug content were prepared and submitted, applying the calculated displacement value.

Experiment 6 (a)

Sulphur Ointment (IP)

Aim

To prepare and submit Sulphur Ointment IP, used for its keratolytic and mild antiparasitic (scabicial) action.

Requirements

- Sublimed sulphur (finely powdered), Simple ointment base (wool fat, hard paraffin, white/yellow soft paraffin)
- Ointment slab, spatula, water bath, ointment jar

Theory / Principle

Sulphur ointment is prepared by the trituration method: the finely powdered, insoluble medicament (sulphur) is first levigated with a small quantity of the base to form a smooth, grit-free paste, which is then incorporated into the remaining base by thorough trituration on an ointment slab, avoiding lump formation.

Formula

Ingredient	Quantity	Category / Use
Sublimed sulphur	10 g	Active medicament (keratolytic)
Simple Ointment IP	to 100 g	Oleaginous base

Procedure

1. Pass the sublimed sulphur through a fine sieve to remove lumps.
2. Place a small quantity of the simple ointment base on the ointment slab and levigate the sulphur with it using a spatula, forming a smooth, uniform paste.
3. Gradually incorporate the remainder of the base into this paste in small increments, triturating thoroughly after each addition until a uniform, smooth ointment is obtained.
4. Pack the finished ointment into a clean, dry ointment jar and level the surface.

Labelling

- Sulphur Ointment IP — (quantity, e.g. 40 g)
- 'For external use only'
- Directions: apply to the affected skin as directed

Precautions

- Sulphur must be finely powdered and free of grit before incorporation.
- Add the base gradually to the levigated sulphur to achieve a smooth, non-gritty product.
- Pack in a well-closed container to avoid oxidation/discolouration on storage.

Result

A smooth, homogeneous, grit-free Sulphur Ointment IP was prepared and packed in an ointment jar.

Experiment 6 (b)

Non-Staining Iodine Ointment with Methyl Salicylate (BPC)

Aim

To prepare and submit Non-Staining Iodine Ointment BPC, used as a mild counter-irritant/rubefacient without the characteristic staining of ordinary iodine preparations.

Requirements

- Iodine, Potassium iodide, Methyl salicylate, Wool fat/soft paraffin base
- Ointment slab, spatula, water bath, ointment jar

Theory / Principle

In ordinary iodine ointments, free iodine causes brown staining of skin and clothing. In the non-staining formula, iodine is first dissolved in a strong aqueous solution of potassium iodide (forming the soluble, less-staining tri-iodide complex), and this solution is then emulsified into the ointment base together with methyl salicylate, which also masks the characteristic iodine odour and adds a rubefacient action.

Formula

Ingredient	Quantity	Category / Use
Iodine	1 g	Active medicament
Potassium iodide	1 g	Solubilises iodine, reduces staining
Methyl salicylate	2 mL	Rubefacient, odour masking
Wool fat / Soft paraffin base	to 100 g	Ointment base

Procedure

1. Dissolve the potassium iodide in a minimum quantity of purified water; dissolve the iodine in this concentrated solution.
2. Levigate this iodine–potassium iodide solution with a small quantity of the ointment base on the slab to form a smooth paste.
3. Incorporate methyl salicylate into the paste and mix thoroughly.
4. Gradually add the remaining ointment base in increments, triturating after each addition until a smooth, uniform ointment is obtained.
5. Pack into a clean, dry ointment jar or collapsible tube.

Labelling

- Non-Staining Iodine Ointment BPC — (quantity)
- 'For external use only'
- Directions: apply to the affected part as directed

Precautions

- Dissolve iodine only in the concentrated potassium iodide solution, never directly in water.
- Handle iodine with a glass/plastic spatula, not metal, to avoid corrosion and discolouration.
- Mix thoroughly to ensure even distribution and avoid localised staining.

Result

A smooth, non-staining Iodine Ointment BPC incorporating methyl salicylate was prepared and submitted.

Experiment 7 (a)

Iodine Gargle (BPC)

Aim

To prepare and submit Iodine Gargle BPC, a concentrated antiseptic solution for use, after dilution, in infections of the throat.

Requirements

- Iodine, Potassium iodide, Peppermint oil (flavouring), Purified water
- Beaker, glass rod, amber measuring cylinder, amber prescription bottle

Theory / Principle

Gargles are concentrated aqueous solutions intended to be diluted with water before use, brought into contact with the mucous membrane of the throat, and then expelled (not swallowed). As with other iodine preparations, iodine is dissolved in a concentrated potassium iodide solution before dilution to the final volume, and a flavouring oil is added to improve palatability.

Formula

Ingredient	Quantity	Category / Use
Iodine	1 g	Antiseptic
Potassium iodide	1.5 g	Solubilises iodine
Peppermint oil	0.05 mL	Flavouring agent
Purified water	to 100 mL	Vehicle

Procedure

1. Dissolve the potassium iodide in a small quantity of purified water.
2. Dissolve the iodine in this concentrated potassium iodide solution with stirring.
3. Add the peppermint oil and mix.
4. Dilute gradually to the final volume with purified water, mixing throughout.
5. Filter if necessary and transfer to an amber prescription bottle.

Labelling

- Iodine Gargle BPC — (quantity)
- 'For external use — not to be swallowed'
- Directions: dilute one part with a stated quantity of warm water before use

Precautions

- The gargle is a concentrate — always dilute before use as directed; do not use undiluted.
- Dissolve iodine only in the concentrated KI solution, never directly in plain water.
- Store protected from light in an amber container.

Result

Iodine Gargle BPC was prepared as a clear, concentrated antiseptic solution and submitted in a correctly labelled container.

Experiment 7 (b)

Chlorhexidine Mouthwash (IP)

Aim

To prepare and submit Chlorhexidine Mouthwash IP, used for its antiplaque/antiseptic action in oral hygiene.

Requirements

- Chlorhexidine gluconate solution (20% w/v), Alcohol (or a suitable flavouring/solubilising agent), Flavouring agent, Purified water
- Beaker, glass rod, measuring cylinder, amber prescription bottle

Theory / Principle

Chlorhexidine gluconate is a broad-spectrum antiseptic active against a wide range of oral bacteria. It is supplied as a concentrated aqueous solution and is simply diluted with purified water (with the aid of a flavouring/solubilising agent) to the official low concentration (typically 0.2% w/v chlorhexidine gluconate) suitable for use as a mouthwash, since higher concentrations cause mucosal irritation and reversible tooth staining on prolonged use.

Formula

Ingredient	Quantity	Category / Use
Chlorhexidine gluconate solution (20% w/v)	1 mL	Antiseptic (gives 0.2% w/v final)
Flavouring agent (e.g. peppermint water)	q.s.	Palatability
Purified water	to 100 mL	Vehicle

Procedure

1. Measure the required volume of concentrated chlorhexidine gluconate solution into a graduated beaker.
2. Add the flavouring agent and mix.
3. Dilute gradually with purified water to the final required volume, stirring throughout to ensure uniform mixing.
4. Transfer the finished mouthwash to a clean, dry prescription bottle.

Labelling

- Chlorhexidine Mouthwash IP — 0.2% w/v — (quantity)
- 'For external use only — do not swallow'
- Directions: rinse the mouth with the stated volume for the stated time, twice daily

Precautions

- Measure the concentrate accurately — chlorhexidine mouthwash strength is critical for both efficacy and safety.
- Avoid using with anionic agents (e.g. ordinary soap/toothpaste surfactants) immediately before/after use, as these can inactivate chlorhexidine.
- Dispense with clear directions not to swallow the preparation.

Result

Chlorhexidine Mouthwash IP of the official strength was prepared and submitted in a correctly labelled container.

Experiment 8

Compendium of Marketed Dosage Forms

As recommended in the syllabus, each student must compile a compendium (portfolio) of marketed dosage forms as a continuous-assessment exercise, in addition to the twelve compounding experiments above.

Guidelines

- Collect at least 10–12 marketed products, one representing each major dosage form category studied (solution, syrup, powder/granule, suppository, ointment/cream, gargle/mouthwash, etc.).
- For each product, record: brand name, generic name and strength, manufacturer, dosage form and pack size, composition (active + key excipients where declared), storage conditions, and shelf life.
- Compare the labelled information against pharmacopoeia (IP/BP/USP) labelling requirements discussed in Part A.3 (labelling) and note any additional patient-information elements used on commercial packaging.
- Attach a photograph or the original carton/label/leaflet (where permitted) for each product in the compendium.

Result

A compendium of marketed dosage forms was compiled, evaluated against pharmacopoeia labelling standards, and submitted for assessment.