CEUTICS LAB FINAL EXAM

STUDY GUIDE

→ For an excellent explanation on procedures and agents used as well as video demonstrations, check out http://pharmlabs.unc.edu/index.htm

**Dosage Forms**

- Suspensions
- Emulsions
- Creams
- Ointments
- Suppositories
- Troches
- Pastilles
- Capsules
- Powder papers

**Agents**

- **Glycerin**: wetting agent for non-aqueous soluble solids; water soluble, a good solvent and levigating agent
- **Carbopol 940**: synthetic emulsifier for o/w systems, thickening agent, neutralized by triethanolamine
- **Triethanolamine**: emulsifier, surfactant, helps neutralize Carbopol 940 gel
- **Cherry syrup**: concentrated solution of sugar in water; may not be used if patient is diabetic
- **Simple solution**: used if the patient is diabetic instead of cherry syrup; made with sodium saccharin as the sweetener and methylcellulose as the suspending agent; can add flavor packet if for oral use
- **Flavoring**: don’t forget to bring a packet to the lab final!
- **Sodium saccharin**: an artificial sugar-free sweetener
- **Methylcellulose**: hydrophilic semi-synthetic emulsifier, suspending agent, thickener
- **Mineral oil**: suspending/levigating agent good for oleaginous bases, for example in sulfur-based ointments (1:1)
- **Acacia**: natural plant-derived gum emulsifying and thickening agent
- **Tragacanth**: natural gum emulsifier for o/w, thickener, water soluble, suspending agent, 4x as effective as acacia
- **Cetyl alcohol**: fatty alcohol that can serve to stabilize o/w emulsions by thickening it, not water soluble
- **Petrolatum**: hydrophilic protective and water-absorbent ointment base; it will absorb a large amount of water from aqueous solution of medicating substances forming a W/O type of emulsion
- **Sodium laureyl sulfate**: synthetic emulsifier for o/w, anionic surfactant, soft soap
- **Aquaphor**: absorption base; a hydrophilic ointment base that forms w/o emulsions; anhydrous base for compounding smooth, stable emulsions; highly miscible with both aqueous solutions and other oil-based substances
- **Polybase**: polyethylene glycols, hydrophobic gel, emulsifier, water soluble for suppositories
- **Gelatin**: natural emulsifier and thickening agent; insoluble in cold water but soluble in hot water, swells and softens when immersed in it, gradually absorbing from 5-10x its own weight of water for pastilles
- **Bentonite**: excellent colloidal/adsorption properties for paste formation; insoluble in water, but has property of adsorbing large quantities of water, swelling to 12x its original volume and forming highly viscous suspensions/gels and helps stabilize them; also used as an emulsifier for oil for pastilles
- **Citric acid**: chelating agent, aids detergents for pastilles
- **Tween 20**: emulsifier, nonionic surfactant for pastilles
- **Colored lactose**: when triturated with the API, it helps to determine whether the powder is homogenous; about 1 drop of dye per gram of powder; use only 200-300mg aliquots for capsules & powder paper
- **White lactose**: the most commonly used filler in solid dosage forms such as powders, tablets and capsules

**Vocabulary**

- **Emulsifier**: helps stabilize emulsions by reducing interfacial tension between two immiscible liquids; amphiphilic
- **Keratolytic**: a substance that removes dead surface skin cells by lysing keratin of the stratum corneum
- **Cream**: an emulsion, opaque, emollient properties, tend to "vanish" or disappear with rubbing
- **Oleaginous**: greasy
- **Absorption base**: contains w/o emulsion
- **Levigating agent:** If the drug will reside in the internal phase (water phase), then the levigating agent should be water soluble or miscible. Water, glycerin, alcohol, or propylene glycol would be suitable levigating agents. If the drug will reside in the external phase, then mineral oil should be used.

- \[ \log S_T = (f_1)(\log S_1) + (f_2)(\log S_2) \]
  - \( f_1 \): percent (as a decimal) of water
  - \( \log S_1 \): solubility in water
  - \( f_2 \): percent (as a decimal) of alcohol
  - \( \log S_2 \): solubility in alcohol
  - How to use: with what’s given, solve for \( f_2 \rightarrow \) then multiply \( f_2 \times \text{total volume} = \text{amount of alcohol} \)

**Techniques**

- **MMQ:** minimum measurable quantity = 120mg
- **Punch method:** for filling capsules
- **Levigation:** process of grinding an insoluble substance to a fine powder while wet using a spatula on pill tile
- **Trituration:** process for reducing the particle size of a substance by grinding with mortar & pestle
- **M&M:** mix and make
- **Geometric proportions**
- **Wetting:** the ability of a liquid to maintain contact with a solid surface it is important in the bonding or adherence of two materials
- **Dry Gum (4:2:1) method:** 4 parts oil, 2 parts water, and 1 part gum emulsifier; “dry” because first mix oil with gum (vs. “wet” where it’s water + gum first); with trituration should produce creamy white and a crackling sound

**Heads Up**

- Always put a “Keep out of reach of children” label on everything
- Other labels you might need:
  - “For external use only” for all topicals
  - “Refrigerate” for suppositories, troches, and some suspensions
  - “Shake well” for all emulsions
- When both an oil and aqueous phase are being mixed together to make an ointment, it is helpful to heat the aqueous phase a few degrees higher than the oil phase prior to mixing. The aqueous phase tends to cool faster than the oil phase and may cause premature solidification of some ingredients.
- Be very careful when handling progesterone, do not leave the container open
- When filling capsules, the weight should be +/- 5% of the calibrated filled capsule

**Drugs**

- **Hydrocortisone:** anti-inflammatory cortical steroid
- **Metronidazole:** antibiotic
- **Sulfur:** keratolytic agent
- **Urea:** keratolytic agent
- **Glycerin:** humectant that attracts moisture from the air and hydrates the skin
- **Salicylic acid:** keratolytic agent
- **Lactic acid:** keratolytic agent
- **Coal tar:** keratolytic agent, treats psoriasis
- **LCD:** 20% coal tar, 5% tween 20, in ethyl alcohol
- **Mineral oil:** for constipation as a lubricant
- **Progesterone:** birth control
- **Isoniazid:** anti-tuberculosis agent: always given with other drugs: can’t miss a dose or else the pt will develop resistance
- **Captopril:** \( \beta \)-blocker for hypertension and renal disease
PROCEEDURES

SUSPENSIONS

60g, 10% Hydrocortisone gel (Carbopol 940)

Calculations:

<table>
<thead>
<tr>
<th>Component</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocortisone gel 10%</td>
<td>10g/100g x 60g = 6g</td>
<td></td>
</tr>
<tr>
<td>DDW</td>
<td>60mL = 60g</td>
<td></td>
</tr>
<tr>
<td>Carbopol 940 gel 0.3%</td>
<td>0.3g/100g x 60mL DDW = 180mg</td>
<td></td>
</tr>
<tr>
<td>Glycerin</td>
<td>4mL = 4g</td>
<td></td>
</tr>
<tr>
<td>Triethanolamine</td>
<td>4 drops</td>
<td></td>
</tr>
</tbody>
</table>

The script calls for 60g total. We make up 60g of the base gel (60g DDW + 180mg Carbopol + glycerin + triethanolamine) and only take out 50g of that for actual use. The remaining 10g is compensated by the second gel formed by 6g hydrocortisone + 4g glycerin (= 10g).

Procedure:
1. Weigh out 6g hydrocortisone, 180mL carbopol 940, and measure out 60mL DDW.
2. Place 180mg carbopol 940 in a glass mortar, wet with glycerin (3-5mL), and triturate.
3. Add 3-5mL DDW and triturate until all the carbopol 940 is wetted with water and the mixture appears homogeneous, not cloudy. Continue to add DDW in geometric proportions to 60mL.
4. Add 3 to 4 drops triethanolamine, triturate until a stiff gel forms. Weigh out 50g of gel.
5. Place hydrocortisone in a porcelain mortar, wet with approximately 4mL glycerin, and triturate.
6. Add the gel in geometric proportions to make final 60g of dosage form.
7. Place in a 2oz ointment jar, filling from bottom to top to finish. Label and dispense.
8. Kiss and say, “Wah lah!”

Notes:
- Hydrocortisone is an anti-inflammatory corticosteroid
- Glycerin acts as a wetting agent – keeps substances moist, owing to tendency to absorb water from air
- Carbopol 940: used in topical formulations, forms clear gels with water or hydroalcoholic solvents; creates clear aqueous and alcohol-based gels
  - Neutralize with triethanolamine to form a gel
  - Gel type thickener with suspending ability
  - Maintains stability of the O/W type emulsion system
- Triethanolamine: miscible in water; used as emulsifier and surfactant; a few drops used to stabilize carbopol

60 ml, Metronidazole 100mg/5ml, Cherry suspension

Calculations:

<table>
<thead>
<tr>
<th>Component</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metronidazole</td>
<td>100mg/5mLx60mL = 1200mg</td>
<td></td>
</tr>
<tr>
<td>1 tablet = 500mg</td>
<td>x 3 = 1500mg</td>
<td></td>
</tr>
<tr>
<td>Weight of all 3</td>
<td>= 2.025g</td>
<td></td>
</tr>
<tr>
<td>To find weight needed:</td>
<td>1500mg Met/ 2.025g = 1200mg/x</td>
<td>x=1.62g</td>
</tr>
<tr>
<td>Methylcellulose 1%</td>
<td>300mg + 4mL glycerin and 26mL DDW to make 30mL of suspended media</td>
<td></td>
</tr>
</tbody>
</table>

Procedure:
1. Weigh out 3 x 500mg tablets metronidazole. Place in porcelain mortar, crush to a fine powder, and weigh out 1.62g.
2. Weigh out 300mg methylcellulose 1500, place in a glass mortar, wet with 3-4mL glycerin, add 3-4mL DDW to start hydration. Continue to add DDW in geometric proportions to make final 30mL of suspended media. Set aside and allow to hydrate.
3. Place 1.62g metronidazole powder in a porcelain mortar, wet with 2-3mL glycerin, and add 2-3mL methylcellulose suspended media until fully hydrated.
4. Continue to add methylcellulose until all 30mL are added.
5. Transfer metronidazole to 2oz conical using spatula.
6. Rinse glass mortar with 5-10mL cherry syrup. Transfer to porcelain mortar and rinse and add to 2oz conical. Repeat twice.
7. Qs ad to 60mL with cherry syrup. Label and dispense.
8. Kiss and say, “Wah lah!”

**Notes:**
- Metronidazole is an antibiotic
- Methylcellulose is used as suspending and emulsifying agent to increase viscosity and promote redistribution when shaking
- This prescription is most likely for a pediatric patient who isn’t able to swallow pills easily

**EMULSIONS**

**Mineral Oil 15ml/30ml flavored**

**Calculations:**
Following the dry gum 4:2:1 method, there should be 4 parts oil, 2 parts water, 1 part gum. However, in this case, we decided to substitute the acacia gum for tragacanth gum, which is 4x more effective, therefore the ratio is now 4:2:0.1

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral Oil</td>
<td>30mL</td>
</tr>
<tr>
<td>DDW</td>
<td>30mL x 2/4 (according to ratio) = 15mL</td>
</tr>
<tr>
<td>Tragacanth</td>
<td>30mL x 0.1/4 = 750mg</td>
</tr>
<tr>
<td>Sodium saccharine</td>
<td>0.28% 0.28g/100mL x 60mL = 170mg</td>
</tr>
<tr>
<td>Flavoring</td>
<td>3.6g/200mL x 4 x 60mL = 432mg</td>
</tr>
</tbody>
</table>

**Procedure:**
1. Measure out 30mL mineral oil, 15mL DDW, and weigh out 750mg tragacanth for 4:2:0.1 ratio.
2. Place mineral oil in clean porcelain mortar. Disperse the tragacanth over the oil. Mix to disperse the oil (~20 sec). Add all 15mL DDW and triturate to form emulsion (~5 minutes).
3. Weigh out 170mg sodium saccharin and 432mg of flavoring. Dissolve sodium saccharin in ~7mL DDW, then dissolve flavor (we dissolve sodium saccharin before flavoring to look for particulates).
4. Transfer emulsion from porcelain mortar and pestle to 2oz conical, add sweetener and flavor in small aliquots, stir until homogenous.
5. Rinse flavor graduate and then porcelain mortar and pestle with 4 – 5mL DDW. Repeat 1 time and place rinses in 2oz conical.
6. Qs ad to 2oz (60mL). Transfer to 2oz amber bottle, label and dispense.
7. Kiss and say, “Wah lah!”

**Notes:**
- The oil-water-emulsifying agent ratio here is: 4:2:1; this is called the dry gum method
- Tragacanth is used here instead of acacia gum, and since it is 4x more effective, the ratio is now 4:2:0.1
  - A natural gum used as an emulsifier, thickener, and stabilizer
  - Insoluble in alcohol
- Mineral oil is used as a laxative by lubricating the colon
- Sodium saccharin is 300-500x sweeter than sugar and is used as non-nutritive sweetener for diabetic patients

**120g, Cetyl Alcohol Vanishing Cream**

**Calculations:**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetyl alcohol 7%</td>
<td>7g/100g x 120g = 8.4g</td>
</tr>
<tr>
<td>Petrolatum 2%</td>
<td>2g/100g x 120g = 2.4g</td>
</tr>
<tr>
<td>Sodium lauryl sulfate 0.3%</td>
<td>0.3g/100g x 120g = 0.36g</td>
</tr>
<tr>
<td>Total solids</td>
<td>11.16g</td>
</tr>
</tbody>
</table>

Subtract to find DDW needed: 120g-11.16g = 109mL DDW
Procedure:
1. Weigh out 8.4 g cetyl alcohol and 2.4 g petrolatum and place both in a 200 or 250 mL beaker.
2. Weigh out 0.36 g sodium lauryl sulfate, dissolve in 109 mL DDW in a 150 mL beaker. Place sodium lauryl sulfate/DDW beaker on a hot plate and heat to > 70°C, but do not boil. (Should see steam.)
3. Place cetyl alcohol/petrolatum beaker on hot plate and heat to > 70°C, but do not burn.
4. Pour hot aqueous phase into hot oil phase, stir with glass rod until cool at room temperature.
5. Once cream forms, place 60 g in ointment jar, finish properly, label, and dispense.
6. Save 60 g in 2nd jar for next week for the sulfur vanishing cream.
7. Kiss and say, “Wah lah!”

Notes:
- Sodium lauryl sulfate is emulsifying agent for o/w
  - A detergent surfactant used when viscosity building and foam characteristics are of importance
  - Monovalent soft soap
- Cetyl alcohol is a fatty alcohol used as an emulsifier/thickening agent in creams and lotions for o/w
  - Insoluble in water
  - Soluble in alcohol, chloroform, ether, and vegetable oils
  - Imparts a smooth texture to skin and is thus used in creams and lotions
- Petrolatum: a hydrophilic protective and water-absorbent ointment base; it will absorb a large amount of water from aqueous solution of medicating substances forming a w/o type of emulsion

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**Sulfur 3% in vanishing cream, 60g**

Calculations:
- Sulfur 3%: 3 g/100 g x 60 g = 1.8 g
- Glycerin: 2.2 mL
- Cetyl alcohol: 60 g - 1.8 g - 2.2 mL = 56 g (from last lab)

The 2.2 mL is somewhat arbitrary and doesn’t have to be exact, here it was just to make calculations easier with a whole number

Procedure:
1. Weigh out 1.8 g sulfur and 56 g cetyl alcohol emulsion, and measure out 2.2 mL glycerin.
2. Place sulfur (1.8 g) in a glass mortar, wet powder with glycerin and triturate.
3. Remove wetted sulfur from mortar, place on a pill tile, and levigate in the cetyl alcohol emulsion in geometric proportions.
4. Place in a 2 oz ointment jar, finish properly, label and dispense.
5. Kiss and say, “Wah lah!”

Notes:
- Sulfur is a keratolytic agent
- Sodium lauryl sulfate is the emulsifying agent (from last week’s lab)
- Glycerin is a wetting agent

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**Urea 5%, glycerin 5% in aquaphor**

Calculations:
- Urea 5%: 5 g/100 g x 60 g = 3 g
- Glycerin 5%: 5 g/100 g x 60 g = 3 g
- Aquaphor: 5 g
- DDW: 5 mL
- Total: 16 g
- Petrolatum: 60 g - 16 g = 44 g

Procedure:
1. Weigh out 3 g urea, 5 g aquaphor, 44 g petrolatum, and measure out 3 mL glycerin and 5 mL DDW.
2. Place urea in a small conical graduate or beaker, dissolve in 5 mL DDW and then add 3 mL glycerin, stir until homogeneous.
3. Place the 5 g aquaphor on a pill tile and slowly levigate the aqueous phase into the aquaphor in geometric proportions (turns white).
4. Qs ad to 60g by adding petrolatum in geometric proportions.
5. Place in a 2oz ointment jar, finish properly, label and dispense.
6. Kiss and say, “Wah lah!”
7. Expires in 1 month (5/18/2010). Auxiliary labels: “Keep out of reach of children” + “For external use only”

Notes:
- Aquaphor is a hydrophilic anhydrous absorption base that absorbs water or aqueous solutions; not washable
- Glycerin is used as a humectant that attracts moisture from the air to hydrate the skin
  - Can be dissolved in water or alcohol, but not oils; many things will dissolve into glycerin easier than they do in water or alcohols so it’s a good solvent
- Urea is a keratolytic agent used for dry skin, psoriasis, calluses, etc.

→ CREAMS & OINTMENTS (DERMALS)

## Salicylic acid 6%, lactic acid 6% in petrolatum

**Calculations:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salicylic acid 6%</td>
<td>6g/100g x 60g =</td>
<td>3.6g</td>
</tr>
<tr>
<td>Lactic acid 6%</td>
<td>6g/100g x 60g =</td>
<td>3.6g</td>
</tr>
</tbody>
</table>

*However, pure lactic acid is expensive, so we used the aqueous solution in this lab, which is 85% (w/v) lactic acid.*

**To calculate volume of LA:** 85g/100mL = 3.6g/x  
\[ x = \frac{3.6g}{4.2} \]

- **Aquaphor:** 4g
- **Total:** 11.8g
- **Petrolatum:** 60g-11.8g = 48.2g

**Procedure:**

1. Weigh out 3.6g salicylic acid, measure out 4.2mL lactic acid, and weigh out 4g aquaphor and 48.2g petrolatum.
2. Place salicylic acid on a pill tile, add lactic acid solution and slowly wet the powder. Levigate to reduce particle size of the salicylic acid. Collect mixture into a pile on the side of the pill tile.
3. Place the 4g aquaphor on pill tile, spread thinly on the tile. Slowly incorporate aqueous mixture of salicylic acid and lactic acid into aquaphor.
4. Once homogeneous, add petrolatum in geometric proportions.
5. Once homogeneous, place in 2oz ointment jar, finish, label and dispense.
6. Kiss and say, “Wah lah!”
7. Expires in 1 month (5/18/2010). Auxiliary labels: “Keep out of reach of children” + “For external use only”

Notes:
- Salicylic acid is used as a keratolytic agent
- Aquaphor absorbs aqueous phase and emulsifies; we used because the oily petroleum and aqueous salicylic acid don’t mix
- Use 1:1 ratio of lactic acid to aquaphor

## Coal tar 2%, sulfur 5% in petrolatum

**Calculations:**

*L.C.D. we used in this lab is the equivalent of coal tar 2%. LCD (a liquid) is composed of 20% coal tar, 5% tween 20, and EtOH*

<table>
<thead>
<tr>
<th>Component</th>
<th>Calculation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal tar 2%</td>
<td>2g/100g x 60g =</td>
<td>1.2g</td>
</tr>
<tr>
<td>Sulfur 5%</td>
<td>5g/100g x 60g =</td>
<td>3g</td>
</tr>
<tr>
<td>Tween 20</td>
<td>0.3g</td>
<td>0.3g</td>
</tr>
<tr>
<td>EtOH</td>
<td>We don’t count in calculations because it will evaporate</td>
<td></td>
</tr>
</tbody>
</table>

For vol of coal tar: 20g/100mL=1.2g/x  
\[ x = \frac{1.2g}{x \text{mL}} \]

- **Mineral oil (1:1 ration w/sulfur):** 3mL
- **Total:** 7.5g
- **Petrolatum:** 60g-7.5g = 52.5g

**Procedure:**

1. Measure out 6mL LCD, weigh out 3g sulfur, 52.5g petrolatum.
2. Prepare a large ring of petrolatum on one half of the pill tile. Pour all 6mL LCD into the center of the ring. Allow to evaporate.
3. Place sulfur on the other half of the pill tile, wet with mineral oil (about 3mL), levigate to reduce particle size.
4. Once ethanol has evaporated, levigate the tar and tween 20 into the petrolatum.
5. Slowly add petrolatum into wetted sulfur, continue adding petrolatum in geometric proportions.
6. Once homogeneous, place in 2oz ointment jar, finish, label and dispense.
7. Kiss and say, “Wah lah!”
8. Expires in 1 month (5/18/2010). Auxiliary labels: “Keep out of reach of children” + “For external use only”

Notes:
- Sulfur is a keratolytic agent
- Coal tar is an irritant that interchelates into DNA to interfere and breaks up cells
- Composition of L.C.D.: 20% Coal tar, 5% Tween 20 in EtOH
- Mineral oil is the levigating agent to get sulfur into the petrolatum; use 1:1 ratio of mineral oil to sulfur
- Tween 20 emulsifies water-soluble particles into petrolatum
- Sulfur is keratolytic
- LCD = Liquour Carbonis Detergent

→ SUPPOSITORY & PASTILLES/TROCHES

**Progesterone 100mg suppository**

Calculations:
*Using the trial method, the TA’s had found the average weight of 1 suppository to be 2.3g prior to this lab. We make 7 although only 6 are asked to give extra room for error and have enough to fill the mold.*

<table>
<thead>
<tr>
<th>Total suppositories</th>
<th>2.3gx7 = 16.1g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progesterone</td>
<td>100mgx7 = 0.7g</td>
</tr>
<tr>
<td>Polybase</td>
<td>16.1g-0.7g = 15.4g</td>
</tr>
<tr>
<td>Mineral oil (just enough for thin lubrication)</td>
<td></td>
</tr>
</tbody>
</table>

Procedure:
1. Clean & lubricate suppository mold with mineral oil (need to lubricate with something of opposite phase)
2. Weigh out 15.4g polybase and 0.7g progesterone.
3. Place polybase in a small evaporating dish. Heat to melt, then remove from heat.
4. Add progesterone, stir w/stirring rod until homogenous.
5. Pour & fill 6 suppository molds, round top of each suppository to allow for cooling.
6. Scrape off excess polybase & make ends flat.
7. Remove from mold, wrap in aluminum foil, label, and dispense.
8. Kiss and say, “Wah lah!”

Notes:
- Polybase is made up of polyethylene glycols and is water soluble
- Progesterone is insoluble in water, hence the need for polybase
- Rectal/vaginal administration has the advantage of avoiding first pass metabolism

**Isoniazid 60mg flavored pastilles**

Calculations:

<table>
<thead>
<tr>
<th>Gelatin 16%</th>
<th>15g x 0.16g = 2.5g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerin 58%</td>
<td>15g x 0.58 = 8.7mL</td>
</tr>
<tr>
<td>DDW 7%</td>
<td>15g x 0.07 = 1.05mL (but use 2.5mL to account for evaporation)</td>
</tr>
<tr>
<td>Bentonite 1.5%</td>
<td>15g x 0.015 = 0.225g</td>
</tr>
<tr>
<td>Sodium saccharine 2%</td>
<td>15g x 0.02 = 0.3g</td>
</tr>
<tr>
<td>Acacia 1.5%</td>
<td>15g x 0.015 = 0.225g</td>
</tr>
<tr>
<td>Citric acid 2.5%</td>
<td>15g x 0.025 = 0.375g</td>
</tr>
<tr>
<td>Flavor 2.5%</td>
<td>15g x 0.025 = 0.375g</td>
</tr>
<tr>
<td>Isoniazid 60mg/pastille x 15 pastilles = 0.9 g</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15g</td>
</tr>
</tbody>
</table>

We make up enough for 15 although only 12 are asked, to make sure to have enough for filling the molds.
Procedure:
1. Weigh out correct amounts of gelatin, bentonite, acacia, sodium saccharine, citric acid, and flavoring.
2. Pulverize gelatin in a mortar to reduce particle size before weighing out final 2.4 g gelatin mass.
3. Place 2.5 mL DDW in small evaporating dish and heat on hot plate. Place glycerin in small beaker and heat (just warm a little).
4. Once DDW is hot, add gelatin and stir to dissolve. Once gelatin dissolves, add warm/hot glycerin. Stir until homogenous.
5. Once all glycerin is added, add powders with stirring and pour into molds while still warm.
6. Clean mold for dispensing. Label across mold and dispense.

Notes:
- Drug interactions with isoniazid: rifampin, solmeterol, tamsulosin, statins, erythromycin, etc.
- Acacia is a natural plant-derived gum used as a thickening/suspending agent and emulsifier
- Bentonite is insoluble in water or acids, but has property of adsorbing large quantities of water, swelling to ~12 x its original volume and forming highly viscous suspensions/gels and helps stabilize them; also used as an emulsifier for oil
- Gelatin: insoluble in cold water, but swells and softens when immersed in it, gradually absorbing from 5-10 times its own weight of water; soluble in hot water or hot mixtures of glycerin and water; can be used as an emulsifying agent

Capsules & Powder Papers
Instructions were given in a separate handout from Dr. Koch labeled “Laboratory Notes for Capsules and Powder papers.”