# RECONSTITUTION OF SOLUTIONS

CALHOUN COMMUNITY COLLEGE

# RECONSTITUTION

- A DRUG IN POWDERED FORM IS NECESSARY WHEN A MEDICATION IS UNSTABLE AS A LIQUID FORM FOR A LONG PERIOD.
- THIS POWDERED DRUG MUST BE RECONSTITUTED OR *DISSOLVED WITH A STERILE DILUENT* BEFORE ADMINISTRATION.

# RECONSTITUTION

- THE PROCESS OF ADDING A **SOLVENT** OR **DILUENT** TO A MEDICATION IN POWDERED FORM TO DISSOLVE IT AND FORM A SOLUTION

  *EX: CRYSTAL LIGHT*

- RECONSTITUTION IS PERFORMED MOSTLY IN THE PHARMACY EXCEPT THOSE MEDICATIONS NEEDED TO BE RECONSTITUTED IMMEDIATELY BEFORE ADMINISTRATION
- SOLUTE – A POWDER OR LIQUID CONCENTRATE TO BE DISSOLVED OR DILUTED
- SOLVENT (**DILUENT**) – A LIQUID THAT IS ADDED TO THE POWDER OR LIQUID CONCENTRATE
- SOLUTION – THE LIQUID THAT RESULTS WHEN THE SOLVENT DISSOLVES THE SOLUTE

# PRINCIPLES OF RECONSTITUTION

- *YOU MUST FOLLOW* THE MANUFACTURERS DIRECTION FOR RECONSTITUTION. THEY WILL PROVIDE:
  1. THE EXPIRATION DATE
  2. TYPE OF DILUENT/SOLVENT TO USE (*STERILE WATER, STERILE NORMAL SALINE, 5% DEXTROSE & BACTERIOSTATIC WATER – SOME POWDERED MEDS FOR ORAL USE MAY EVEN BE RECONSTITUTED WITH TAP WATER*): **NEVER ASSUME THE TYPE OR AMOUNT OF DILUENT TO BE USED…**
  3. AMOUNT (ML) OF DILUENT/SOLVENT TO BE USE
  4. LENGTH OF TIME MEDICATION IS GOOD ONCE MIXED *(SEVERAL HOURS TO SEVERAL DAYS ~ SOME UP TO 14 DAYS)*
  5. WHERE TO STORE ONCE MIXED (SHELF, REFRIGERATOR, ETC)

# PRINCIPLES OF RECONSTITUTION (CON'T)

- IF NO DIRECTIONS ARE PROVIDED, USE THE PDR, YOUR POCKET DRUG GUIDE, OR CALL THE PHARMACY FOR GUIDANCE (FOLLOW FACILITY WHERE YOU ARE WORKING POLICY)
- IF A MULTI-DOSE VIAL, ONCE MIXED, YOU MUST LABEL THE MEDICATION WITH YOUR INITIALS, DATE AND TIME MIXED, EXPIRATION DATE, ALONG WITH THE FINAL CONCENTRATION AFTER MIXTURE
- *RECOGNIZE THAT AFTER THE DILUENTS IS ADDED TO THE POWDER, THERE MAY BE ADDITIONAL (DISPLACED) VOLUME TO THE SOLUTION*
  - **EX:** ADD 0.5 ML TO 2 G OF POWDERED MEDICATION TO PROVIDE APPROXIMATE VOLUME OF 1 ML (2 G/1 ML)

# DIFFERENT IV AND IM RECONSTITUTION INSTRUCTIONS

**For I.M. or I.V. Use**

CAUTION: Addition of diluent generates pressure within the vial. Vent slowly.

**For I.V. solution—Dilute with at least 5 mL Sterile Water for Injection or other approved diluent. SHAKE WELL TO DISSOLVE. See literature.**

For I.M. solution—Add 1.5 mL of an approved diluent. SHAKE WELL TO DISSOLVE.

Provides an approximate volume of 1.8 mL (280 mg per mL). For dosage and administration see literature.

**Prior to Reconstitution:** Protect from Light: Store at 59° to 86°F.

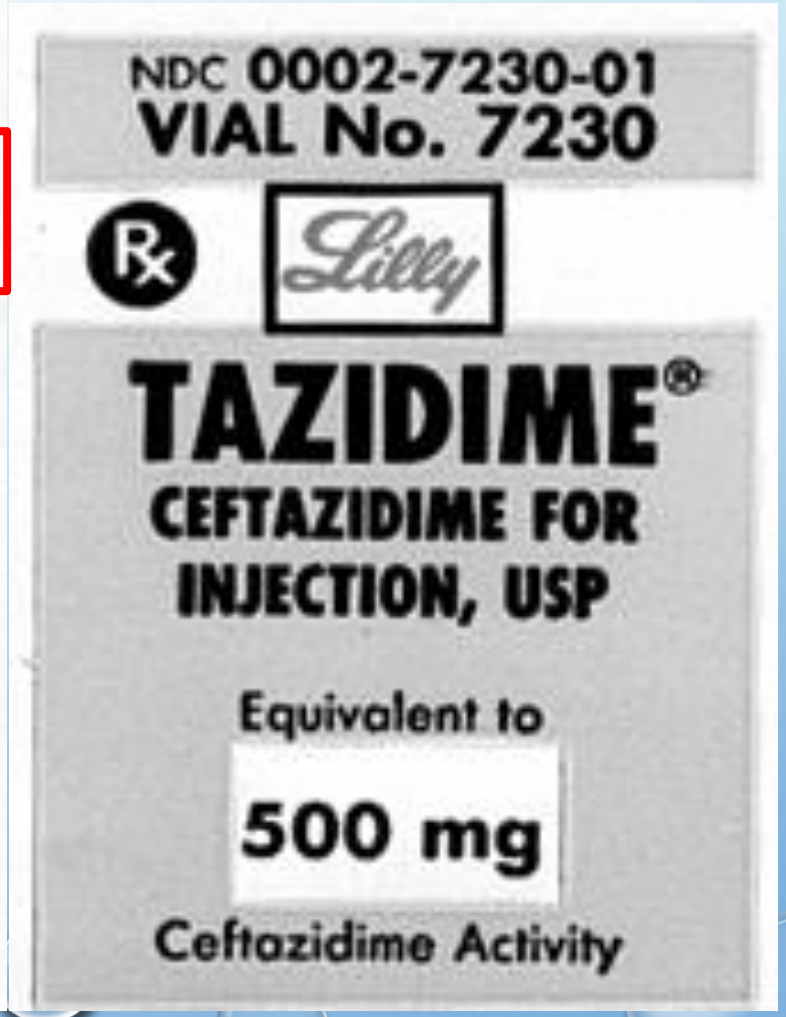
**After Reconstitution:** Store in a refrigerator and use within 7 days. If kept at room temperature, use within 24 hours. Once reconstituted, light protection is not needed.

Each vial contains: 500 mg of Ceftazidime and 59 mg of Sodium Carbonate. Sodium content: approximately 27 mg (1.2 mEq) of sodium per vial.

WV 4622 AMX

Eli Lilly & Co., Indianapolis, IN 46285, U.S.A.

Exp. Date/Control No.



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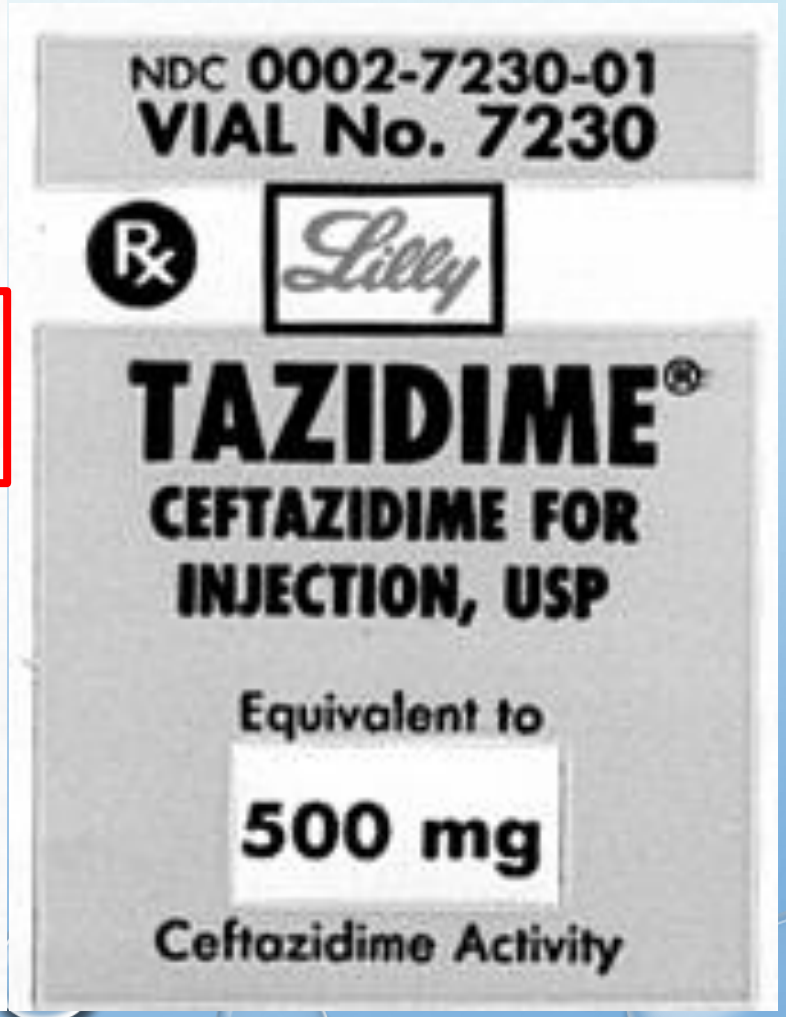


# THINK TIME

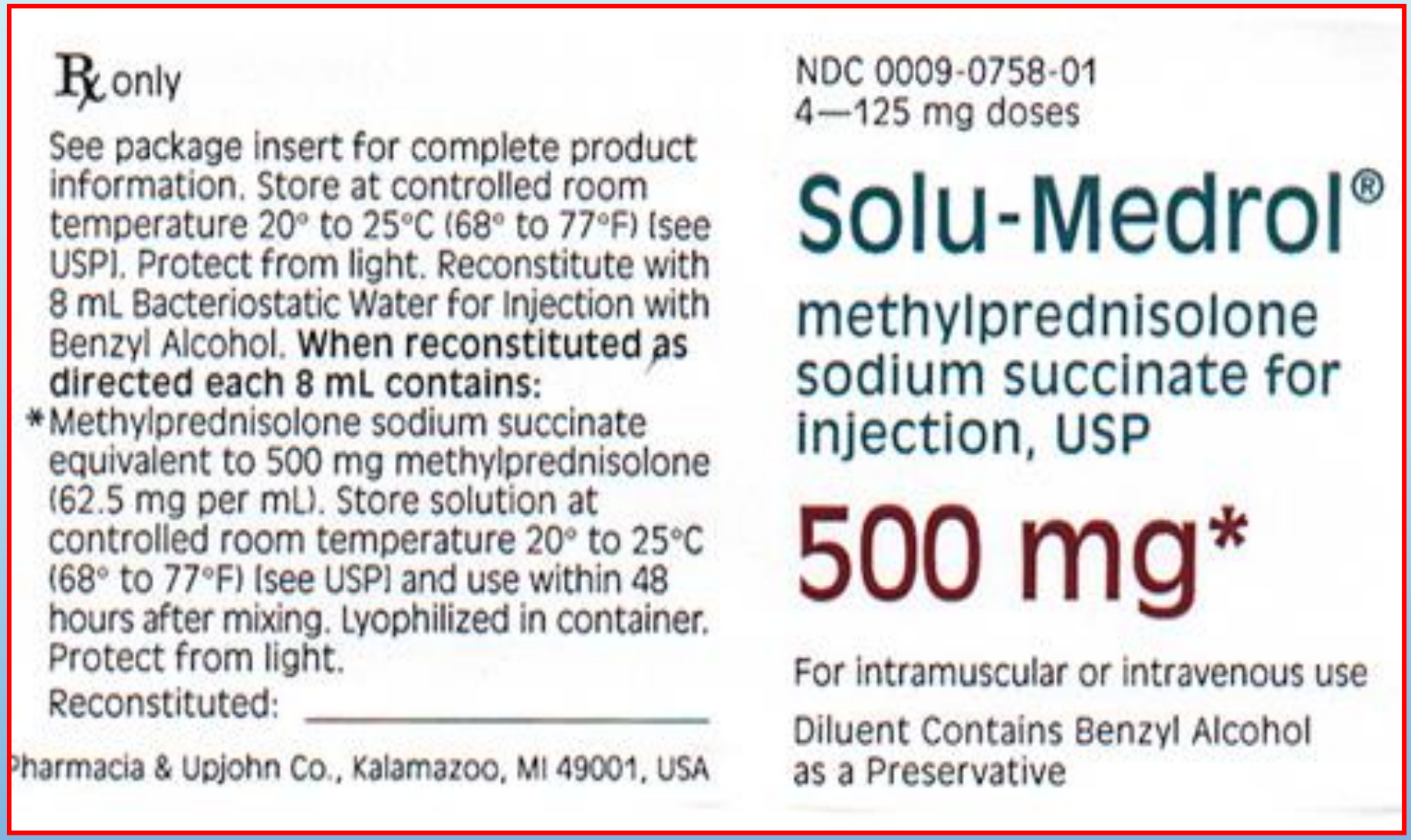
1. WHAT IS THE TOTAL DOSAGE STRENGTH OF TAZIDIME IN THE VIAL? _____
2. HOW MUCH DILUENT IS ADDED TO THE VIAL TO PREPARE THE MEDICATION FOR IM USE? _____
3. WHAT DILUENT IS RECOMMENDED FOR RECONSTITUTION FOR IM ADMINISTRATION? _____
4. WHAT IS THE FINAL CONCENTRATION OF THE SOLUTION PREPARED FOR IM ADMINISTRATION? _____
5. HOW LONG DOES THE MEDICATION RETAIN ITS POTENCY AT ROOM TEMPERATURE? _____ IF REFRIGERATED? _____
6. 400 MG IM Q 8 HRS IS ORDERED. HOW MANY ML WILL YOU GIVE?

   _____

# THINK TIME ANSWERS

1. WHAT IS THE TOTAL DOSAGE STRENGTH OF TAZIDIME IN THE VIAL? 500 MG
2. HOW MUCH DILUENT IS ADDED TO THE VIAL TO PREPARE THE MEDICATION FOR IM USE? 1.5 ML
3. WHAT DILUENT IS RECOMMENDED FOR RECONSTITUTION FOR IM ADMINISTRATION? APPROVED DILUENT
4. WHAT IS THE FINAL CONCENTRATION OF THE SOLUTION PREPARED FOR IM ADMINISTRATION? 280 MG/ML
5. HOW LONG DOES THE MEDICATION RETAIN ITS POTENCY AT ROOM TEMPERATURE? 24 HOURS IF REFRIGERATED? 7 DAYS
6. 400 MG IM Q 8 HRS IS ORDERED. HOW MANY ML WILL YOU GIVE?

   $\frac{400\ MG}{280\ MG} \times 1\ ML = 1.42\ ML = 1.4\ ML$




- ORDER: SOLU-MEDROL 200 MG IV Q 6 H

# RECONSTITUTION DRUG ORDER

- FIRST, TO FILL THE ORDER, HOW MUCH AND WHAT TYPE OF DILUENT MUST YOU ADD? _____
- SECOND, WHAT IS THE SUPPLY DOSAGE OF THE RECONSTITUTED SOLU-MEDROL? WHEN ADDING 8 ML OF DILUENT, THE SUPPLY DOSAGE IS _____ MG/ML
- THIRD, WHAT IS THE RESULTING TOTAL VOLUME OF THIS RECONSTITUTED SOLUTION? THE TOTAL VOLUME IS _____.

  (YOU KNOW THIS BECAUSE 62.5 MG/ML × _____= 500 MG).
- FINALLY, HOW MANY FULL DOSES OF SOLU-MEDROL ARE AVAILABLE IN THIS VIAL? THE VIAL CONTAINS 500 MG AND THE ORDER IS FOR 200 MG. THERE ARE _____ FULL DOSES IN THE VIAL. A RECONSTITUTION LABEL IS NEEDED.

# RECONSTITUTION DRUG ORDER ANSWERS

- FIRST, TO FILL THE ORDER, HOW MUCH AND WHAT TYPE OF DILUENT MUST YOU ADD? 8 ML OF BACTERIOSTATIC WATER
- SECOND, WHAT IS THE SUPPLY DOSAGE OF THE RECONSTITUTED SOLU-MEDROL? WHEN ADDING 8 ML OF DILUENT, THE SUPPLY DOSAGE IS 62.5 MG/ML
- THIRD, WHAT IS THE RESULTING TOTAL VOLUME OF THIS RECONSTITUTED SOLUTION? THE TOTAL VOLUME IS 8 ML

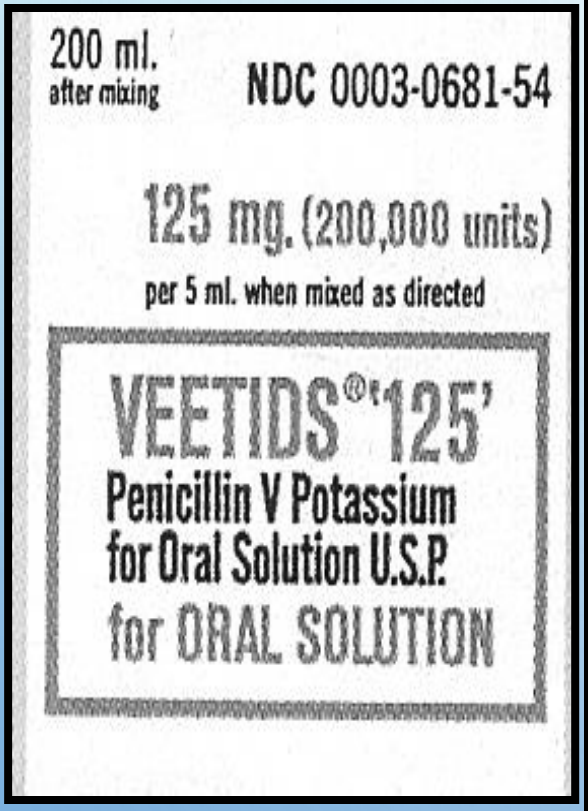
  (YOU KNOW THIS BECAUSE 62.5 MG/ML × 8 ML = 500 MG).
- FINALLY, HOW MANY FULL DOSES OF SOLU-MEDROL ARE AVAILABLE IN THIS VIAL? THE VIAL CONTAINS 500 MG AND THE ORDER IS FOR 200 MG. THERE ARE 2 FULL DOSES IN THE VIAL. A RECONSTITUTION LABEL IS NEEDED.

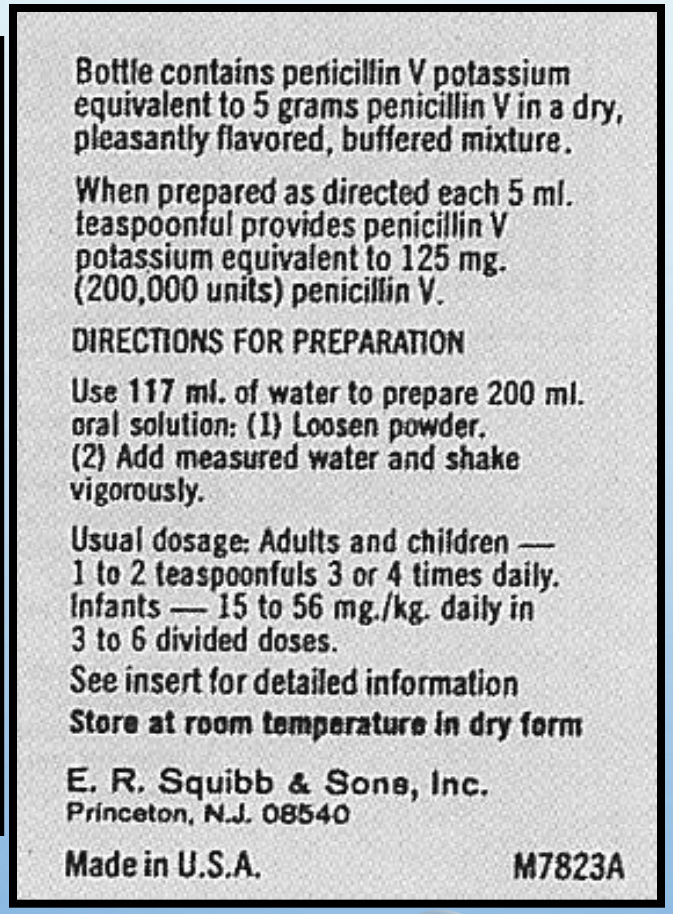
# RECONSTITUTION DOSAGE CALCULATION

- CALCULATE ONE DOSE.
  - ***STEP 1.*** **CONVERT** - NO CONVERSION IS NECESSARY
    - ORDER: *SOLU-MEDROL 200 MG IV Q.6H*
    - SUPPLY: *62.5 MG/ML*
  - ***STEP 2.*** **THINK**
    - YOU WANT TO GIVE MORE THAN 1 ML.
  - ***STEP 3.*** **CALCULATE**

$$\frac{D}{H} \times Q = \frac{200\,mg}{62.5\,mg} \times 1mL = 3.2\,mL$$ given IV q 6 h

# MORE SAMPLES




**First,** to fill the order, how much and what type of diluent must you add?

_____

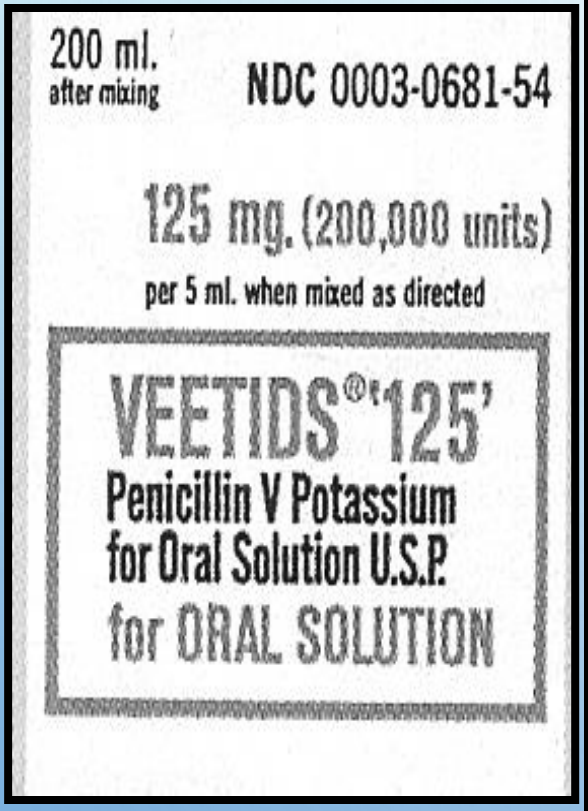
_____

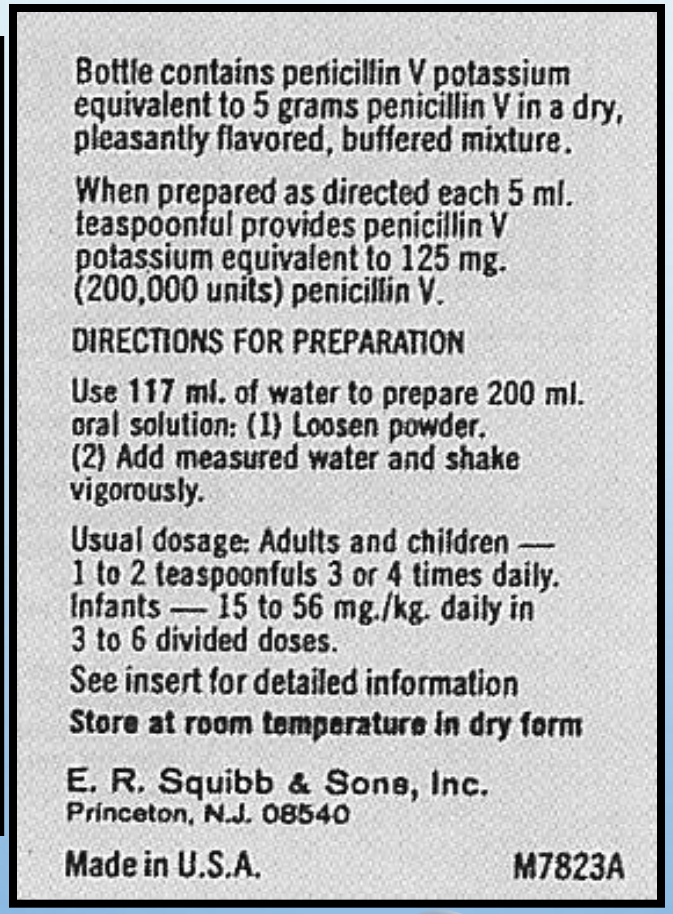
**Second,** what is the supply dosage of the reconstituted PCN V?

_____

**Third,** what is the resulting total volume of this reconstituted solution? The total volume is _____

# MORE SAMPLES ANSWERS




**First,** to fill the order, how much and what type of diluent must you add? 117 ml of water

**Second,** what is the supply dosage of the reconstituted PCN V? 125 mg/5mL

**Third,** what is the resulting total volume of this reconstituted solution? The total volume is 200 mL


1. What is the total strength of Zithromax in this vial? _____
2. How much diluent is added to the vial to prepare the drug for use? _____
3. What diluent is recommended for reconstitution? _____
4. What is the final concentration of the prepared solution for administration?

_____


## ANSWERS

1. What is the total strength of Zithromax in this vial? 500 mg
2. How much diluent is added to the vial to prepare the drug for use? 4.8 mL
3. What diluent is recommended for reconstitution? Sterile Water
4. What is the final concentration of the prepared solution for administration?

   100 mg/mL


CAUTION—Federal (U.S.A.) law prohibits dispensing without prescription.

For I.M. or I.V. Use

**Dosage**—See literature.

To prepare solution add 2 mL Sterile Water for Injection or 0.9% Sodium Chloride Injection. Provides an approximate volume of 2.2 mL (225 mg per mL)

SHAKE WELL Protect from Light

**Prior to Reconstitution:** Store at Controlled Room Temperature 59° to 86°F (15° to 30°C)

**After Reconstitution:** Store in a refrigerator. For Storage Time - See Accompanying Literature. If kept at room temperature, use within 24 hours.

Lyophilized

WV 4520 AMX

Eli Lilly & Co., Indianapolis, IN 46285, U.S.A.

Exp. Date/Control No.

1. What is the total strength of Kefzol in this vial? _____
2. How much diluent is added to the vial to prepare the drug for use? _____
3. What diluent is recommended for reconstitution? _____
4. What is the final concentration of the prepared solution for administration?

   _____
5. How long with the reconstituted material retain its potency at room temperature? _____


ANSWERS

1. What is the total strength of Kefzol in this vial? 500 mg
2. How much diluent is added to the vial to prepare the drug for use? 2 mL
3. What diluent is recommended for reconstitution? Sterile Water
4. What is the final concentration of the prepared solution for administration? 225 mg/mL
5. How long with the reconstituted material retain its potency at room temperature? 24 hours

# RECONSTITUTION OF NON-INJECTABLE SOLUTIONS

- ENTERAL FEEDINGS – NUTRITION ADMINISTERED VIA THE GASTROINTESTINAL TRACT (NG TUBE, J TUBE OR G TUBE) MAY BE FULL STRENGTH OR DILUTED.

# CONTINUOUS FULL STRENGTH FEEDING ORDERS

- ORDER: NEPRO 400 ML TO INFUSE OVER 8 HRS FOLLOWED BY 100 ML WATER AFTER EACH FEED. DETERMINE THE RATE IN ML PER HOUR.
  - $\frac{400\ ML}{8\ HR} = \_\_\_\_\_\ ML/HR$
- ORDER: ENSURE 1200 ML TO INFUSE OVER 24 HRS FOLLOWED BY 250 ML WATER AFTER EACH FEED. DETERMINE THE RATE IN ML PER HOUR.
  - $\frac{1200\ ML}{24\ HR} = \_\_\_\_\_\ ML/HR$

# CALCULATING SOLUTIONS

- **STEP ONE:** PREPARE SOLUTIONS OF SPECIFIC STRENGTH, DETERMINE AMOUNT OF SOLUTE:
- D X Q = X

D (DESIRED SOLUTION STRENGTH)

Q (QUANTITY OF DESIRED SOLUTION)

X (AMOUNT OF SOLUTE)

**ORDER: 1/3 STRENGTH ENSURE 900 ML VIA NG TUBE OVER 8 HRS**

1/3 X 900 ML = AMOUNT OF SOLUTE

900/3 = 300 ML

*YOU NEED 300 ML OF THE SOLUTE (ENSURE)*

# CALCULATING SOLUTIONS

- **STEP TWO:** DETERMINE AMOUNT OF SOLVENT NEEDED:
- Q - S = X

Q (QUANTITY OF DESIRED SOLUTION )

(S) AMOUNT OF LIQUID SOLUTE

S (AMOUNT OF SOLVENT)

**ORDER: 1/3 STRENGTH ENSURE 900 ML VIA NG TUBE OVER 8 HRS**

Q (900 ML) - S (300 ML) = S (600 ML)

*THEREFORE, YOU WOULD ADD 600 ML OF WATER TO 300 ML OF ENSURE TO MAKE 900 ML OF 1/3 STRENGTH ENSURE.*

# SOLUTION CALCULATION (EXAMPLE)

- ORDER: ¼ STRENGTH ISOMIL 12 OZ VIA NASOGASTRIC TUBE OVER 6 HOURS .
- CONVERT OZ TO ML : _____ ML
- AMOUNT OF **SOLUTE** (ISOMIL): _____ **ML**
- AMOUNT OF **SOLVENT** (WATER): _____ **ML**
- HOW MANY ML /HR WILL YOU ADMINISTER THE ISOMIL?
  - (12 OZ) ____ ML DIVIDED BY 6 = ____ ML PER HOUR

# SOLUTION CALCULATION ANSWER

- ORDER: ¼ STRENGTH ISOMIL 12 OZ VIA NASOGASTRIC TUBE OVER 6 HOURS .
- CONVERT OZ TO ML : 12 X 30 ML = 360 ML
- AMOUNT OF **SOLUTE** (ISOMIL): ¼ OF 360 = **90 ML**
- AMOUNT OF **SOLVENT** (WATER): 360-90 = **270 ML**
- HOW MANY ML /HR WILL YOU ADMINISTER THE ISOMIL?
  - (12 OZ) 360 ML DIVIDED BY 6 = 60 ML PER HOUR

# SOLUTION CALCULATION (EXAMPLE)

- ORDER: 2/3 STRENGTH ENSURE 6 OZ P.O. Q 4 H FOR 24 HRS.
- CONVERT OZ TO ML: _____ ML
- THE ORDER READS ADMINISTER 2/3 STRENGTH ENSURE 6 OZ EVERY 4 HOURS FOR 24 HOURS (24 ÷ 4 = 6 TIMES YOU WILL ADMINISTER 6 OZ)
  - WHAT IS THE TOTAL ML YOU WILL ADMINISTER IN 24 HOURS? _____
- AMOUNT OF SOLUTE (ENSURE): _____ ML
- AMOUNT OF SOLVENT (WATER): _____ ML

# SOLUTION CALCULATION ANSWER

- ORDER: 2/3 STRENGTH ENSURE 6 OZ P.O. Q 4 H FOR 24 HRS.
- CONVERT OZ TO ML: 6 X 30 ML = 180 ML
- THE ORDER READS ADMINISTER 2/3 STRENGTH ENSURE 6 OZ EVERY 4 HOURS FOR 24 HOURS (24 ÷ 4 = 6 TIMES YOU WILL ADMINISTER 6 OZ)
  - WHAT IS THE TOTAL ML YOU WILL ADMINISTER IN 24 HOURS? 180 ML X 6 (HOURS) = 1080 ML
- AMOUNT OF SOLUTE (ENSURE): 2/3 OF 180 = 120 ML
- AMOUNT OF SOLVENT (WATER): 180 – 120 = 60 ML

- THE PHYSICIAN ORDERS AMPICILLIN 500 MG IM EVERY 6 HOURS FOR A PATIENT WITH PNEUMONIA.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? _____
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? _____
- HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? _____

ANSWERS

- THE PHYSICIAN ORDERS AMPICILLIN 500 MG IM EVERY 6 HOURS FOR A PATIENT WITH PNEUMONIA.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 3.5 ML
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 250MG/ML
- HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? $\frac{500\ MG}{250\ MG} \times 1\ ML = 2\ ML$

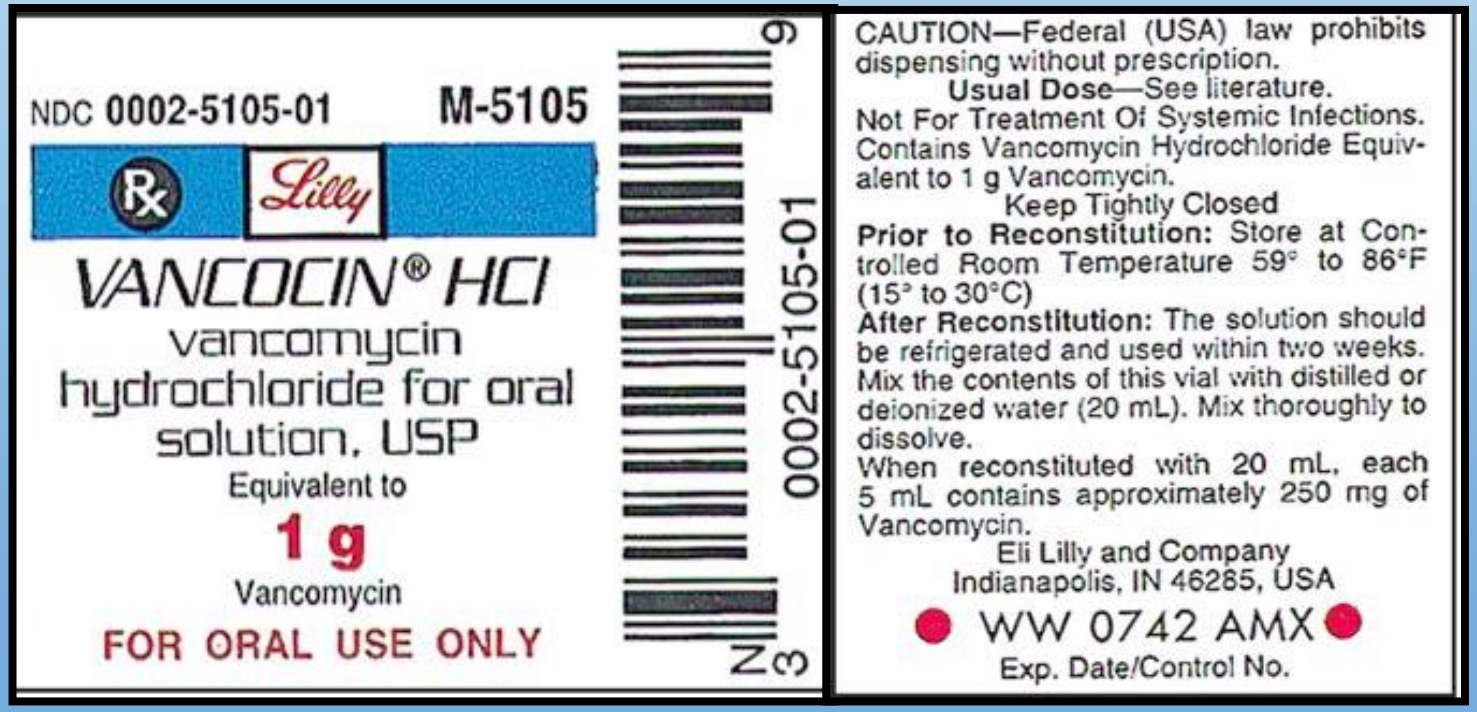
- THE PHYSICIAN ORDERS ANCEF 500 MG IM EVERY 12 HOURS FOR A PATIENT WITH CELLULITIS.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? _____
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? _____
  HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? _____

# ANSWERS

- THE PHYSICIAN ORDERS ANCEF 500 MG IM EVERY 12 HOURS FOR A PATIENT WITH CELLULITIS.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 2.5 ML
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 330 MG/ML
- HOW MANY MILLILITERS WILL THE NURSE ADMINISTER?

$$\frac{500\ \text{MG}}{330\ \text{MG}} \times 1\ \text{ML} = 1.51 = 1.5\ \text{ML}$$

- VANCOCIN 1000 MG ORAL EVERY 6 HOURS HAS BEEN ORDERED FOR A PATIENT WITH COLITIS.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? _____
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? _____
- HOW MANY MILLILITERS WILL THE NURSE ADMINISTER? _____



## ANSWERS

- VANCOCIN 1000 MG ORAL EVERY 6 HOURS HAS BEEN ORDERED FOR A PATIENT WITH COLITIS.
- HOW MUCH DILUENT WILL BE ADDED TO THE BOTTLE? 20 ML
- WHAT IS THE CONCENTRATION AFTER RECONSTITUTION? 250 MG/5ML
- HOW MANY MILLILITERS WILL THE NURSE ADMINISTER?

$$\frac{1000\ \text{MG}}{250\ \text{MG}} \times 5\ \text{ML} = 20\ \text{ML}$$