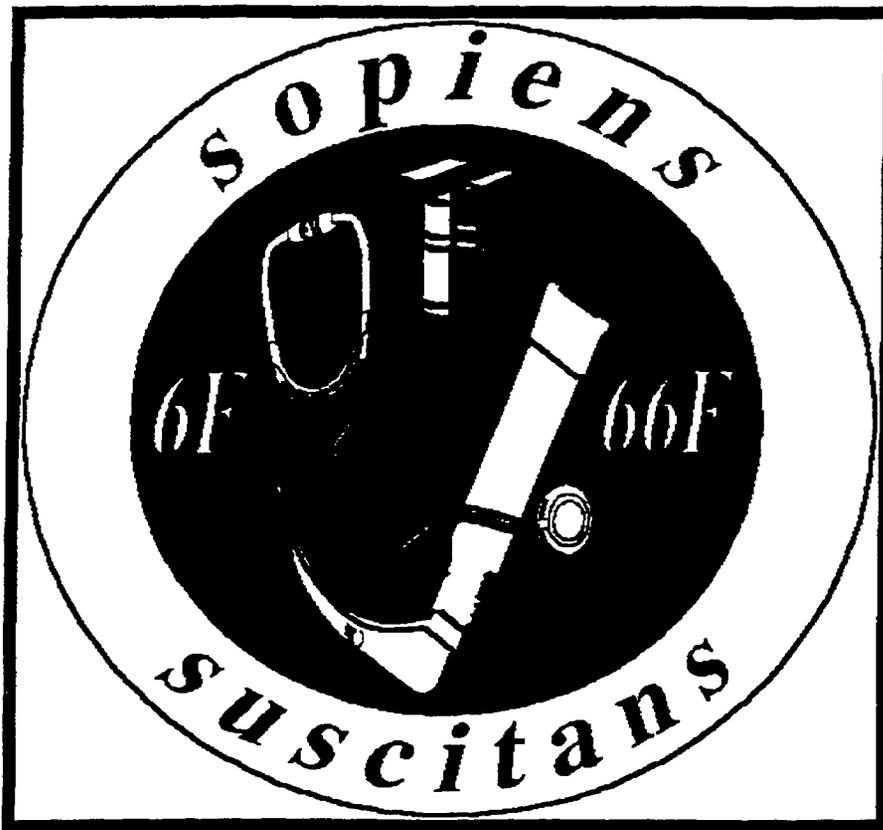


PHARMACEUTICAL
CALCULATIONS
WORKBOOK

6F-66F



U.S. ARMY GRADUATE PROGRAM
IN ANESTHESIA NURSING

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PRACTICAL EXERCISE 1

RATIO AND PROPORTION

RATIO and PROPORTION

1. Solve for "X" in the following ratio and proportion problems:

a. $\frac{5}{10} = \frac{6}{\text{"X"}}$ "X" = _____

b. $\frac{3}{\text{"X"}} = \frac{8}{12}$ "X" = _____

c. $\frac{0.5}{\text{"X"}} = \frac{5}{10}$ "X" = _____

d. $\frac{10}{1} = \frac{25}{\text{"X"}}$ "X" = _____

e. $\frac{2.2}{1} = \frac{154}{\text{"X"}}$ "X" = _____

2. Solve the following ratio and proportion problems:

a. $\frac{10 \text{ mg}}{1 \text{ ml}} = \frac{25 \text{ mg}}{\text{"x"} \text{ ml}}$ "x" = _____ ml

b. $\frac{2.2 \text{ lb}}{1 \text{ kg}} = \frac{154 \text{ lb}}{\text{"x"} \text{ kg}}$ "x" = _____ kg

c. $\frac{5 \text{ mg}}{1 \text{ ml}} = \frac{12 \text{ mg}}{\text{"x"} \text{ ml}}$ "x" = _____ ml

d. $\frac{30 \text{ ml}}{1 \text{ fl oz}} = \frac{120 \text{ ml}}{\text{"x"} \text{ fl oz}}$ "x" = _____ fl oz

e. $\frac{250 \text{ mg}}{1 \text{ ml}} = \frac{450 \text{ mg}}{\text{"x"} \text{ ml}}$ "x" = _____ ml

3. You wish to administer to a patient a dose of 15 milligrams of drug. The drug is supplied in the following concentration: 5 milligrams per 1 milliliter. Calculate the volume of the drug solution required to administer the 15-milligram dose of drug to the patient.

“X” = _____ milliliters

4. A patient is administered 5 capsules. Each capsule contains 250 milligrams of a particular drug. Calculate the total number of milligrams of drug the patient received in the 5 capsules.

“X” = _____ milligrams of drug

5. A patient is to receive 20 milligrams of drug for each pound he weighs. The patient weighs 50 pounds. Calculate the number of milligrams of drug the patient should receive.

“X” = _____ milligrams of drug

6. A patient is to receive 750 milligrams of a particular drug. The drug is supplied in a solution labeled 250 milligrams per 1 milliliter. Calculate the volume of the solution required to supply the 750 milligrams of drug.

“X” = _____ milliliters of solution

7. A patient is to receive 30 milligrams of a particular drug. The drug is supplied in a solution labeled 50 milligrams per milliliter of solution. Calculate the volume of drug solution required to supply the 30 milligrams of drug.

“X” = _____ milliliters of solution

8. You desire to administer a dose of 750 milligrams of drug to patient. The drug is supplied in a tablet. Each tablet contains 250 milligrams of the drug. Calculate the number of tablets that you must give to the patient in order to administer the required dose.

“X” = _____ tablets

PRACTICAL EXERCISE 2

THE METRIC SYSTEM

THE METRIC SYSTEM

1. Convert as indicated:

- a. 500 milligrams = _____ gram
 - b. 6,000 milligrams = _____ grams
 - c. 60 milligrams = _____ gram
 - d. 325 milligrams = _____ gram
 - e. 0.6 gram = _____ milligrams
 - f. 0.008 gram = _____ milligrams
 - g. 1 mg = _____ micrograms (mcg)
 - h. 0.025 mg = _____ mcg
 - i. 2.06 liters = _____ milliliters
 - j. 0.5 ml = _____ cc
 - k. 857 milliliters = _____ liter
-

2. A patient is administered six doses of lidocaine. Each dose contained 100 milligrams. State the amount of lidocaine (in grams) the patient received in the six doses.

ANSWER: _____ gram of lidocaine

3. A particular medication contains 15 milligrams of drug in each milliliter of solution. Calculate the amount of the drug contained in a 30-milliliter multiple-dose vial of the medication.

ANSWER: _____ milligrams

4. A vial of highly concentrated sodium chloride solution contains 146 milligrams of sodium chloride in each milliliter of solution. The vial contains 40 milliliters of the solution. Calculate the amount of sodium chloride contained in the vial.

ANSWER: _____ grams

5. A one (1) milliliter vial of 1:1000 epinephrine solution contains 1 milligram of epinephrine. A patient is administered 0.4 milliliter of the 1:1000 epinephrine solution. Calculate the amount of epinephrine the patient was administered (express this amount in micrograms).

ANSWER: _____ micrograms

PRACTICAL EXERCISE 3

CONVERSIONS

CONVERSIONS

1. Perform the following conversions:

- a. 1 pint = _____ milliliters
- b. 2.2 pounds = _____ kilogram(s)
- c. 72 inches = _____ centimeters
- d. 1 fluid ounce = _____ milliliters
- e. 168 cm = _____ inches
- f. 154 pounds = _____ kilograms
- g. 22 kilograms = _____ pound(s)
- h. 178 pounds = _____ kilograms
- i. 150 milliliters = _____ fluid ounces
- j. 10 pounds = _____ kilograms
- k. 98.6° F = _____ Celsius
- l. 38 ° C = _____ Fahrenheit

2. A patient weighs 182 pounds. Express this weight in kilograms.

ANSWER: _____ kilograms

3. A patient is 190.5 cm tall. Express this height in inches.

ANSWER: _____ inches

PRACTICAL EXERCISE 4

SOLUTIONS

SOLUTIONS

1. Fill-in the blanks:

- a. 5% = _____ grams of drug per 100 milliliters of solution.
 - b. 15% = _____ grams of drug per 100 milliliters of solution.
 - c. 0.2% = _____ gram of drug per 100 milliliters of solution.
 - d. 0.002 % = _____ gram of drug per 100 milliliters of solution.
 - e. 2½ % = _____ grams of drug per 100 milliliters of solution.
-

2. Fill-in the blanks:

- a. 1:100 = 1 gram of drug per _____ milliliters of solution.
 - b. 1:250 = 1 gram of drug per _____ milliliters of solution.
 - c. 1:1000 = 1 gram of drug per _____ milliliters of solution.
 - d. 1:10,000 = 1 gram of drug per _____ milliliters of solution.
 - e. 1:100,000 = 1 gram of drug per _____ milliliters of solution.
-

3. Fill-in the blanks:

- a. 1% = _____ milligrams of drug per 1 milliliter of solution.
- b. 2.5% = _____ milligrams of drug per 1 milliliter of solution.
- c. 0.5% = _____ milligrams of drug per 1 milliliter of solution.
- d. 0.1% = _____ milligrams of drug per 1 milliliter of solution.
- e. 0.05% = _____ milligrams of drug per 1 milliliter of solution.

4. Fill in the blanks:

a. 1:1000 = _____ milligrams of drug per 1 milliliter of solution.

b. 1:250 = _____ milligrams of drug per 1 milliliter of solution.

c. 1:500 = _____ milligrams of drug per 1 milliliter of solution.

d. 1:10,000 = _____ milligram(s) of drug per 1 milliliter of solution.

e. 1:100,000 = _____ milligram(s) of drug per 1 milliliter of solution.

5. A patient has been administered 0.5 milliliters of 1:1000 epinephrine solution. Calculate:

a. The number of milligrams of epinephrine the patient received.

ANSWER: _____ milligrams of epinephrine

b. The number of micrograms of epinephrine the patient received.

ANSWER: _____ micrograms of epinephrine

6. You are supplied with the following 50-milliliter vial of lidocaine hydrochloride:



a. State the percentage strength of the provided solution:

ANSWER: _____

b. State the number of milligrams of lidocaine that are contained in 1 milliliter of the solution:

ANSWER: _____

c. Calculate the amount of lidocaine that is contained in the vial:

ANSWER: _____

d. Two (2) milliliters of the lidocaine solution have been administered to a patient. Calculate the amount of lidocaine that was administered in milligrams to the patient.

ANSWER: _____

7. A patient is to receive 300 milligrams of a drug. The drug is supplied in a 2% solution. Calculate the volume of drug in cc required to supply the 300 milligrams of drug.

ANSWER: _____

8. You are planning to use 3cc of 1.5% lidocaine with 1:200,000 concentration of epinephrine in an epidural test dose. How many micrograms of epinephrine and how many mg of lidocaine will the patient be receiving?

ANSWER: _____ mg lidocaine

ANSWER: _____ mcg epinephrine

9. You wish to administer a dose of 4 micrograms of epinephrine to a patient who is under general anesthesia. In supply you have epinephrine solution labeled 1:100,000. Calculate the volume of the 1:100,000 solution required to supply the 4 micrograms of epinephrine.

ANSWER: _____

10. You desire to administer to a patient a dose of 0.3 milligram of epinephrine. The epinephrine is supplied in a solution labeled 1:1000. Calculate the volume of the 1:1000 solution required to administer the specified dose.

ANSWER: _____

11. You are planning to administer 75mg of hyperbaric lidocaine with 0.2 mg of epinephrine. You have 5% hyperbaric lidocaine ampules with 1:1000 solution of epinephrine. Calculate the volume of the lidocaine and epinephrine in milliliters.

ANSWER: _____

12. The maximum dose of lidocaine you can administer to a patient is 5 mg/kg. Your Patient weighs 60 kg. You have 0.5% lidocaine. Calculate the maximum amount, in milliliters, of 0.5% lidocaine you can administer to this patient.

ANSWER: _____

- 13 You are planning to administer 14mg of 1% tetracaine for spinal (Subarachnoid) anesthesia. Calculate, in cc's, the amount of tetracaine you need to administer.

ANSWER: _____

14. You have 20mg lyophilized (dry) tetracaine. How many cc's of 10 % dextrose solution do you have to add in order to reconstitute tetracaine as a 1% solution?

ANSWER: _____

PRACTICAL EXERCISE 5

DILUTIONS OF DRY POWDERS AND SOLUTIONS

DILUTIONS OF POWDERS AND SOLUTIONS

1. Thiopental sodium (Pentothal) is supplied as a 2.5% solution. You wish to administer a dose of 250 milligrams of thiopental to a patient. Calculate the volume of the 2.5% solution required to supply a 250-milligram dose of the drug.

ANSWER: _____ milliliters

2. You are supplied with a Thiopental Anesthesia Kit which contains the following: one 5-gram bottle of thiopental sodium for injection and one 250-milliliter bottle of sodium chloride injection. You wish to administer 3mg/kg of Thiopental to a 154 pound patient. Calculate the volume of the prepared solution you must administer to the patient.

ANSWER: _____ milliliters

3. You are planning to perform a regional (Bier Block) block using 40cc of 0.5% lidocaine. You have 2% lidocaine and 0.9% Sodium Chloride solution. Calculate the respective volumes of 2% lidocaine and 0.9% Sodium Chloride solutions to be mixed to make 40cc of 0.5% lidocaine.

ANSWER: _____ milliliters of 2.0% lidocaine solution

ANSWER: _____ milliliters of 0.9% Sodium Chloride Solution

4. You were called to place an epidural catheter for a laboring woman on Labor and Delivery. You wish to make 20cc of 0.125% bupivacaine solution. You have 0.5% bupivacaine and 0.9% Sodium Chloride Solutions available. Calculate the respective volumes each of 0.5% bupivacaine and 0.9% Sodium Chloride solutions you have to Mix to make the desired volume and strength of solution.

ANSWER: _____ cc 0.5% bupivacaine solution

ANSWER: _____ cc 0.9% Sodium Chloride solution

5. You wish to perform an axillary (brachial plexus) regional block using 40cc of 0.25% bupivacaine solution. You have available 0.75% bupivacaine and 0.9% Sodium Chloride Solution. How many milliliters of each solution do you need to mix in order to make the desire volume and strength of solution?

ANSWER: _____ milliliters of 0.75% Bupivacaine soln

ANWSER: _____ milliliters of 0.9% Sodium Chloride soln

6. You wish to make 60cc of mixture consisting of 2 mcg/cc of Fentanyl citrate and 0.0625 % bupivacaine to use for a labor epidural. You have available 0.25% Bupivacaine and 0.9% Sodium Chloride Solutions. Calculate the volumes of 0.25% Bupivacaine and 0.9% Sodium Chloride Solutions to be mixed to make 60cc of 0.0625% Bupivacaine.

ANSWER: _____ milliliters of 0.25% Bupivacaine soln

ANSWER: _____ milliliters of 0.9% Sodium Chloride soln

-
7. Fentanyl citrate is supplied as 50 mcg/cc solution. How many cc's each of 0.9 % Sodium Chloride Solution and fentanyl citrate must you mix to make 60cc of Fentanyl citrate 2 mcg/cc solution.

ANSWER: _____ cc 0.9 % Sodium Chloride soln

ANSWER: _____ cc 50 mcg/cc Fentanyl citrate

8. You believe your patient has received "too much narcotic" during general anesthesia. You wish to titrate IV push Naloxone (Narcan) in 40 mcg doses at a time (40 mcg/cc). You have available an ampule of Naloxone (0.4 mg/cc) and a 10cc ampule of 0.9 % Sodium Chloride solution. How would you mix them to make a 40 mcg/cc concentration of Naloxone?

ANSWER: _____ cc 0.9% Sodium chloride soln

ANSWER: _____ cc 0.4 mg/cc Naloxone

PRACTICAL EXERCISE 6

DOSAGE CALCULATIONS

DOSAGE CALCULATIONS

1. Your patient is experiencing urticaria secondary to morphine received in the Recovery Room. You want to administer 40 mg of Diphenhydramine (Benadryl). You have available ampules of Diphenhydramine labeled 50 mg/ml. Calculate the volume of drug solution needed to supply the 40 mg of drug.

ANSWER: _____ milliliters of solution

2. You are a CRNA on call. You are paged to administer anesthesia for an emergency appendectomy. You plan to use succinylcholine for rapid sequence induction and intubation. Intubating dose of succinylcholine is 1.5 mg/kg. Your patient weighs 200 pounds. Succinylcholine is supplied in 20 mg/cc solution. How many milliliters of succinylcholine do you need to administer?

ANSWER: _____ milliliters of Succinylcholine

3. You are planning to use Fentanyl citrate as an analgesic for your patient who is undergoing hemicolectomy. You wish to administer 3 mcg/kg initially. Fentanyl is supplied in 50 mcg/cc solution. Your patient weighs 110 pounds. How many milliliters of fentanyl do you have to administer?

ANSWER: _____ milliliters of Fentanyl citrate

- 4 The dose of metoclopramide is 0.1 mg/kg of body weight. The patient who is to receive the drug weighs 175 pounds. Calculate the amount of drug the patient is to receive.

ANSWER: _____ milligrams of Metoclopramide

5. Sufentanil is supplied as 50 mcg/cc. You have available an ampule of Sufentanil which contains 100 mcg. You desire to make sufentanil in 10 mcg/cc concentration. Calculate the volume of 0.9% Sodium Chloride solution you need to add to the 100 mcg Sufentanil to make 10mcg/cc concentration of Sufentanil.

ANSWER: _____ milliliters of Sodium Chloride soln

6. You are planning to administer spinal (subarachnoid) anesthesia for a patient who will undergo knee arthroscopy. You wish to have 10 cc of Ephedrine in a concentration of 5 mg/cc on hand to treat possible hypotension. You have available ampules of Ephedrine supplied as 50 mg/cc and also 0.9% sodium chloride solution. Calculate the volume of each required to make a final 10 cc volume of ephedrine in a 5 mg/cc concentration.

ANSWER: _____ milliliters of Sodium Chloride soln

ANSWER: _____ milliliters of Ephedrine 50 mg/cc

7. A pediatric patient who weighs 56 pounds is having a tonsillectomy. You wish to administer 0.01 mg/kg of Glycopyrrolate to this patient. Glycopyrrolate (Robinul) is supplied as 0.2 mg/cc. How many milliliters of Glycopyrrolate will you administer?

ANSWER: _____ milliliters Glycopyrrolate 0.2 mg/cc

8. Your patient has a history of post-general anesthesia nausea/vomiting. You are planning to use Droperidol 0.625 mg IV push. Your Patient weighs 70 kg. Droperidol is supplied as 2.5 mg/cc. How many cc's will you be administering?

ANSWER: _____ cc(s) Droperidol

9. Your patient weighs 200 pounds and has a history of hypertension. You want to administer 500 mcg/kg of esmolol during general anesthesia induction. Esmolol is supplied as 10 mg/ml. Calculate how many milliliters you will be administering.

ANSWER: _____ milliliters Esmolol 10 mg/ml

10. Mr. Jones (weight =195 pounds) is scheduled to undergo craniotomy. You are planning to use 0.25 mcg/kg/hr of Sufentanil infusion as part of your general anesthetic. You have available a 100 cc bag of 0.9 % Sodium Chloride soln and a 2cc ampule of Sufentanil (50 mcg/cc). If you mixed these two items; 1) What would be the concentration of the final solution and, 2) How many milliliters per hour (ml/hr) will you be administering to Mr. Jones?

ANSWER: _____ mcg Sufentanil/cc Sodium Chloride soln

ANSWER: _____ milliliters/hour solution

11. Your patient is 2 years old. You decided to administer 20 mg/kg of Methohexital per rectum in the preoperative holding area. Methohexital is supplied as 500 mg of powder. Calculate the volume of 0.9% Sodium Chloride to add to 500 mg powder to make a 10% solution.

ANSWER: _____ cc 0.9% Sodium Chloride soln

13. The above patient (question #12) weighs 11 kg. Calculate the volume of 10% Methohexital solution you will administer (per rectum).

ANSWER: _____ cc 10% Methohexital soln

13. Your patient is hypertensive. After discussing the problem with your staff anesthesiologist, you decide to administer a Nitroglycerin infusion at 1 mcg/kg/min. If you mixed 50 mg of Nitroglycerin with 250 milliliters of 5% Dextrose soln (D5W) how many milliliters per hour will you be administering to this patient? (weight = 245 pounds)

ANSWER: _____ milliliters/hour Nitroglycerin

14. Your patient is undergoing an ankle surgery under spinal (subarachnoid) anesthesia. However, he does not want to know what the surgeons are doing. You decide to administer a Propofol infusion at 100 mcg/Kg/min. Your Patient weighs 170 pounds. Propofol is supplied as 10 mg/ml. How many cc's of Propofol will the patient be receiving in a one hour period.

ANSWER: _____ cc Propofol

15. You decide to use Atracurium 0.3 mg/kg to facilitate intubation during general anesthesia. The patient weighs 160 pounds. Atracurium is supplied as 10 mg/ml. How many cc's will you be administering?

ANSWER: _____ cc Atracurium

16. Your patient seems to be very anxious in the preoperative holding area. After establishing an IV line, you give him 2 mg of Midazolam IV push. Midazolam is supplied as 5 mg/ml. How many milliliters of Midazolam did the patient receive?

ANSWER: _____ ml Midazolam

17. You decide to use Mivacurium (supplied as 2 mg/cc) to facilitate intubation. Your patient weighs 50 pounds. Calculate the volume of Mivacurium you need to administer during induction of this patient. The induction dose is 0.2 mg/kg.

ANSWER: _____ cc Mivacurium

18. At the end of surgery you wish to reverse your patients neuromuscular blockade (paralysis) by using 0.03 mg/kg of Neostigmine and 0.02 mg/kg of Atropine. Neostigmine is supplied as 1 mg/ml and Atropine is supplied as 0.4 mg/ml. this patient weighs 40 pounds. Calculate the volume (in ml) of each drug you'll be administering to acheive the above doses for this pediatric patient.

ANSWER: _____ milliliters of Neostigmine

ANSWER: _____ milliliters of Atropine

APPENDIX A

ANSWERS TO PRACTICAL EXERCISES 1 THROUGH 7

PRACTICAL EXERCISE ANSWERS

PRACTICAL EXERCISE 1.

1. A. 12
 B. 4.5
 C. 1
 D. 2.5
 E. 70
2. A. 2.5
 B. 70
 C. 2.4
 D. 4
 E. 1.8
3. 3
4. 1250
5. 1000
6. 3
7. 0.6
8. 3

PRACTICAL EXERCISE 2.

1. A. 0.5
 B. 6
 C. 0.06
 D. 0.325
 E. 600
 F. 8
 G. 1000
 H. 25
 I. 2060
 J. 0.5
 K. 0.857
3. 450 mg
4. 5840 mg
5. 400 micrograms (mcg)

PRACTICAL EXERCISE 3

1. A. 480
 B. 1
 C. 183
 D. 30
 E. 66
 F. 70
 G. 48.4
 H. 81
 I. 5
 J. 4.5
 K. 37
 L. 100.4
2. 82.7 kilograms
3. 75 inches

PRACTICAL EXERCISE 4

1. A. 5 gm
 B. 15 gm
 C. 0.2
 D. 0.002
 E. 2.5
2. A. 100
 B. 250
 C. 1000
 D. 10,000
 E. 100,000
3. A. 10
 B. 25
 C. 5
 D. 1
 E. 0.5
4. A. 1 mg
 B. 4 mg
 C. 2 mg
 D. 0.1 mg
 E. 0.01 mg
5. A. 0.5 mg
 B. 500 mcg
6. A. 1%
 B. 10 mg
 C. 500 mg (or 0.5 gm)
 D. 20 mg
7. 15 cc
8. 45 mg lidocaine
 15 mcg epinephrine
9. 0.4 cc
10. 0.3 cc
11. 1.5 cc lidocaine
 0.2 mg epinephrine
12. 60 cc
13. 1.4 cc
14. 2 cc

PRACTICAL EXERCISE 5

1. 10ml
2. 10.5ml
3. 10cc of 2% lidocaine & 30cc of 0.9% NaCl sol
4. 5cc of 0.5% bupivacaine & 15cc of 0.9% NaCl sol
5. 13.3cc of 0.75% bupivacaine & 26.7cc of NaCl sol
6. 15cc of 0.25% bupivacaine & 45cc of NaCl sol
7. 57.6cc of 0.9% NaCl sol & 2.4cc of fentanyl
8. 9cc of 0.9% NaCl sol & 1cc of naloxone

PRACTICAL EXERCISE 6

1. 0.8ml
2. 6.8cc
3. 3cc
4. 8mg
5. 8cc
6. 9ml of NaCl sol & 1ml of ephedrine
7. 1.27ml
8. 0.25cc
9. 4.5cc
10. 1mcg/cc of sufenta
11. 5cc
12. 2.2cc
13. 33.4cc/hr
14. 46.4cc
15. 2.2cc
16. 0.4ml
17. 2.3cc
18. 0.5cc of neostigmine & 0.9cc of atropine

