Calculations TPN Exam

Name: _____

A 41yo, 160 lb, 5' 6" female is admitted for bowel rest after surgical repair to a perforated duodenum. She is to be placed on TPN. Labs are:

sodium	137 mEq/L	normal range 135 – 150 mEq/L
potassium	3.7 mEq/L	normal range 3.5 – 5.0 mEq/L
chloride	100 mEq/L	normal range 100 – 106 mEq/L
bicarbonate	31 mEq/L	normal range 24 – 30 mEq/L
BUN	13 mg/dL	normal range 8 – 20 mg/dL
creatinine	0.7 mg/dL	normal range 0.6 – 1.2 mg/dL
glucose	110 mg/dL	normal range 70 – 110 mg/dL, fasting
calcium	7.8 mEq/L	normal range 8.5 – 10 mEq/L
phosphorus	4.4 mg/dL	normal range 2.6 – 4.5 mg/dL
magnesium	1.7 mEq/L	normal range 1.8 – 2.5 mEq/L
albumin	1.6 g/dL	normal range 3.5 – 5 g/dL (long-term nutritional status)
trigycerides	40 mg/dL	desired range < 200 mg/dL

Calculate her nutritional needs. Your pharmacy has a **pump** to which are attached these stock solutions: 10% amino acids, 70% dextrose, 20% intravenous fat emulsion, and sterile water for injection.

Analysis of patient situation:
- She is around 124% of IBW. You do not want to feed her at her actual body weight, nor is it reasonable to feed her at ideal body weight since healing will increase her caloric needs slightly. It would be reasonable in this situation to select a feed weight about halfway between her ideal and actual body weight. Rounding the feed weight to a whole kilogram (rather than a tenth of a kg) will make your computations a bit more straightforward.
- She is post-surgical so has mild to moderate tissue repair needs. Additionaly, her albumin shows long-term nutritional deficiency, so use a protein target of 1.5 g/kg/day.
- She is hospitalized, confined to bed, and has had recent surgery, so choose the stress factors associated with those conditions when you do your non-protein calorie calculations.
- Her creatinine clearance is good, so she has no underlying renal dysfunction; she also has no other known disease states which would compromise volume status, so do not be concerned about fluid restriction.
- Her triglycerides are OK, so don't need to restrict fat amount.

When you are deciding how to dose the electrolytes (problem 8 on the worksheet):
- Her sodium is on the low side, so you may want to choose a number at the higher end of the recommended range.
- Her chloride is low and bicarbonate high, suggesting metabolic alkalosis, so give all sodium as the chloride salt.
- You correct her calcium for her very low albumin and find a Ca_{corr} of 9.7 mEq/L. Because this number is at the high end of the normal serum concentration range for calcium (see labs above), it would be best to select a calcium dose at the lower end of the dosing range that you calculate (i.e., closer to 2 mEq/1000 calories than to 5 mEq/1000 calories)..
- Her phosphorus is at the high end of normal, so it's fine to go at the lower end of the dosing range for that electrolyte.
- Her magnesium serum concentrations are low so dose on the high side of the suggested range.

Use the TPN worksheet on the following page to determine what will go into her TPN. Please **show your work**. You may use the back side of this page or the TPN worksheet if you need more room to show how you derived your answers and include any explanation of your decision-making you think I might need to know. If you do not show your work, I will take off points when your calculated amount does not appear logical. If your calculated numbers are not logical, but you show your calculations and explain any decision-making you think I should know about, then I may be able to award partial credit.

In general, you will lose a maximum of one point per numbered problem done incorrectly. However, if you erroneously calculate a fluid or electrolyte dose that could potentially harm a patient, then you will automatically fail the exam and will need to retake it.

TPN Worksheet using pump age: _____ sex: ____

height: _____cm ABW: _____kg IBW: _____ kg feed weight: _____ kg

Targets:
1. Daily fluid needs.
>20 kg: 1500mL + (20 mL)(W - 20 kg), or calculated target: _____ mL/day
30 - 35 mL/kg/day

2. Protein requirements.
normal, unstressed individual: 0.8g/kg/day calculated target: _____g protein/day
hospitalized patient: 1-1.2g/kg/day
stressed patient: 1.5-2g/kg/day

3. Non-protein calories
$BEE_{men} = 66.67 + 13.75(W) + 5.0(H) - 6.76(A)$ calculated target: _____kcals/day
$BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$
activity factors: confined to bed: 1.2, out of bed: 1.3
stress factors: surgery: 1.2; infection: 1.4; trauma: 1.5; burns: 1.7
TDE = (BEE) (activity factor) (stress factor)

Amounts:
4. Total TPN volume _____ mL

5. Protein Volume

10% AA calculated volume: _____ mL

6. Dextrose volume (3.4 kcals/g) 4 mg/kg/min = _____ g/day

D70W calculated volume: _____ mL

7. Fat volume (9 kcals/g; 2 kcals/mL)

20% lipid calculated volume: _____ mL plus sterile water volume: _____ mL

Electrolytes:
8. Daily electrolyte needs total kcals/day from fat and dextrose: _____ (___ % fat)

	amt/1000 calories	(amt)(# daily cals)/1000	amount/bag
sodium	40-50 mEq	_____	_____
potassium	40mEq	_____	_____
magnesium	8-12mEq	_____	_____
calcium	2-5 mEq	_____	_____
phosphate	15-25mmol	_____	_____

9. Calculate the volume of each electrolyte solution that you will add volume to add
sodium chloride 23.4% (4mEq/mL) _____ mL
sodium acetate 16.4% (2mEq/mL) _____ mL
potassium phosphate: 3mmol phosphate/mL, 4.4 mEq potassium/mL _____ mL
potassium chloride 2mEq/mL _____ mL
magnesium sulfate 4mEq/mL _____ mL
calcium gluconate 10% (0.465mEq/mL) _____ mL
  vitamins,etc ____20.0____ mL
  total: _____ mL

infusion rate: _____ mL/hr