2. A 72yo, 96 lb, 5' 2" female receives a colon resection after a diagnosis of obstructive colon cancer. She is to be placed on TPN while her bowel heals. Labs are:

sodium	132 mEq/L	normal range 135 – 150 mEq/L
potassium	3.2 mEq/L	normal range 3.5 – 5.0 mEq/L
chloride	99 mEq/L	normal range 100 – 106 mEq/L
bicarbonate	29 mEq/L	normal range 24 – 30 mEq/L
BUN	3 mg/dL	normal range 8 – 20 mg/dL
creatinine	0.5 mg/dL	normal range 0.6 – 1.2 mg/dL
glucose	101 mg/dL	normal range 70 – 110 mg/dL, fasting
calcium	7.8 mEq/L	normal range 8.5 – 10 mEq/L
phosphate	3.1 mg/dL	normal range 2.6 – 4.5 mg/dL
magnesium	1.4 mEq/L	normal range 1.8 – 2.5 mEq/L
preablumin	< 7.0 mg/dL	normal range 16 – 40 mg/dL (acute nutritional status)
albumin	2.1 g/dL	normal range 3.5 – 5 g/dL (long-term nutritional status)
trigycerides	125 mg/dL	desired range < 200 mg/dL (if these are high need to limit fat calories)

Calculate her nutritional needs using both the pre-set volume and the pump methods.

Analysis of patient situation:
- **She is hospitalized and S/P (status post: this means that she is just after experiencing…) surgery and thus needs a low stress adjustment of around 1.2.**
- **Her ABW = 43 kg and IBW = 50 kg, so a feed weight could be anything from 44-50 kg. Since she is underweight, most pharmacists would choose a feed weight higher than 44 kg. In this case I shall choose a feed weight in the middle of the range.**
- **Most of her electrolyte values are on the lower end of the average range. One of the things that could cause this would be overhydration after surgery (not difficult to do with such a small individual) causing dilution of her blood and therefore her serum electrolyte concentrations. If her kidneys are in good shape, this will correct itself pretty quickly (i.e., within a few days) as long as the amount of fluid going into her slows down. It would be useful to know her blood pressure, urine output, and other signs of volume status in order to determine a good volume for her TPN. In the absence of such information it would be prudent to go on the low side with volume, because of the effect of age on kidney function.**
- **Her calculated creatinine clearance is anywhere from 34 – 70 ml/min/ depending upon whether you correct the serum creatinine to 1.0 [(140-72)(44)/(85)(1.0) = 34 ml/min] or you leave it as it is [(140-72)(44)/(85)(0.5) = 70 ml/min]. Notice that the ABW was used in these calculations instead of the IBW – this is because creatinine is a byproduct of muscle breakdown and she can only break down muscle that she has (44 kg). If we were to use the IBW of 50 kg, we would be assuming that she has 6 kg more muscle than she really has.**
- **Her albumin is low so her calcium needs to be corrected to reflect this and determine whether she needs extra calcium or is probably fine to receive the recommended daily amount. Her corrected calcium is (4.0 – 2.1)(0.8) + 7.8 = 9.3 mEq/L, which is in the normal range. Her calcium and albumin may actually be higher; as mentioned previously, if she is volume overloaded then her labs will appear lower than they actually are secondary to dilution.**
- **Most of her lab values are a bit on the low side, but will correct within the next few days if this is due to post-surgical overhydration and if her kidneys are in good enough shape to excrete the excess volume. There is no reason at this point to go low or high on administration of any of the electrolytes.**
- **Her chloride is low and her bicarb is high, so she is somewhat alkalotic. You will therefore want to give sodium as the chloride salt, rather than the acetate salt.**
- **Her triglycerides are OK, so don't need to restrict fat amount at this time.**

TPN Worksheet using pre-set volumes   age: _72_   sex: _F_

height: __157_ cm   ABW: __44_ kg   IBW: _50_ kg   feed weight: _47_ kg
anything 44-60 would be fine here

Targets:
1. Daily fluid needs.
>20 kg: 1500ml + (20 ml)(W - 20 kg) *2040*   calculated target: _1410 - 2040_ ml/day
30 - 35 ml/kg/day *1410 – 1645*   *I will stay low so choose target volume of 1500 ml/day*

2. Protein requirements.
normal, unstressed individual: 0.8g/kg/day   calculated target: _47 - 56_ 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: _1500_ kcals/day
$BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ *1070*
activity factors: confined to bed: 1.2 , out of bed: 1.3 *1283*
stress factors: surgery: 1.2 ; infection: 1.4; trauma: 1.5; burns: 1.7 *1540*
TDE = (BEE) (activity factor) (stress factor)

Amounts:
4. Total TPN volume   _1500_ ml/day;   volume for each TPN: _1000_ ml/bag; # bags/day: _1.5_

5. Protein Volume choose one:
27.5g in 500ml 5.5% AA   42.5g in 500ml 8.5% AA   50g in 500ml 10% AA   or
41 g/day   *64 g/day*   *either are outside recommendations – will go high*
10% AA calculated volume: _____ ml   *since this gives her <1.4 g/kg/day – not excessive*

6. Dextrose volume (3.4 kcals/g)   choose one   3.5 mg/kg/min = _237_ g/day = 158 g/bag
100g in D20W 500ml   250g in D50W 500ml   350g in D70W 500ml   or
have to do 20% since 50% would be too high. (100 g/bag)(1.5 bags/day)(3.4 kcals/g) = 510 kcals CHO
D70W calculated volume: _____ ml   *1500 kcals – 510 kcals CHO = 990 kcals to give as fat*

7. Fat volume (9 kcals/g)   choose one**:**
 550kcals/500ml 10% lipid   900kcals/ 500ml of 20% lipid   or

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

Electrolytes:
8. Daily electrolyte needs   total amt of kcals/day from fat and dextrose: *510 + 900 = 1410 kcals* (64% fat)

	amt/1000 calories	(amt)(# daily cals)/1000		amount/bag	
sodium	40-50 mEq	63 – 79	divide	48	mEq
potassium	40mEq	63	each	42	mEq
magnesium	8-12mEq	13 – 19	by 1.5	10	mEq
calcium	2-5 mEq	3 – 8	to get	3.3	mEq
phosphate	15-25mMol	24 – 39	amt/bag	18	mMol

chalk test: (18)(2) + 3.3 = 39.3;so OK

9. Calculate the volume of each electrolyte solution that you will add   volume to add
sodium chloride 23.4% (4mEq/ml)   12.0   ml
sodium acetate 16.4% (2mEq/ml)   0.0   ml
potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml   6.0   ml
potassium chloride   2mEq/ml   7.8   ml
magnesium sulfate 4mEq/ml   2.5   ml
calcium gluconate 10% (0.465mEq/ml)   7.1   ml

infusion rate: _63_ ml/hr   *1500 ml ÷ 24 hrs = 63 ml/hr*

TPN Worksheet using pump   age: 72   sex: F

height: 157 cm   ABW: 44 kg   IBW: 50 kg   feed weight: 47 kg
                                                                    anything 44-60 would be fine here

Targets:
1. Daily fluid needs.
>20 kg: 1500ml + (20 ml)(W - 20 kg) *2040*   calculated target: 1410 - 2040 ml/day
30 - 35 ml/kg/day *1410 – 1645*   *I will stay low so choose target volume of 1500 ml/day*

2. Protein requirements.
normal, unstressed individual: 0.8g/kg/day   calculated target: 47 - 56 g protein/day
hospitalized patient: 1-1.2g/kg/day   *I will choose 56 g/day to reflect stress level*
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: 1500 kcals/day
BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A) *1070*
activity factors: confined to bed: 1.2 , out of bed: 1.3 *1283*
stress factors: surgery: 1.2 ; infection: 1.4; trauma: 1.5; burns: 1.7 *1540*
TDE = (BEE) (activity factor) (stress factor)

Amounts:
4. Total TPN volume   1500 ml/day;   volume for each TPN: 1500 ml/bag; # bags/day: 1

5. Protein Volume choose one:
27.5g in 500ml 5.5% AA   42.5g in 500ml 8.5% AA   50g in 500ml 10% AA   or

10% AA calculated volume: 560 ml   *(56 g/day)(100 ml/10 g) = 560 ml*

6. Dextrose volume (3.4 kcals/g)   choose one   3.5 mg/kg/min =   237 g/day
100g in D20W 500ml   250g in D50W 500ml   350g in D70W 500ml   or

D70W calculated volume: 340 ml   *(237 g/day)(100 ml/70 g) = 339 ≈ 340ml*
                                                          (340 ml)(70 g/100 ml)(3.4 kcals/g) = 809 kcals from CHO
7. Fat volume (9 kcals/g)   choose one**:**   *1500 kcals – 809 CHO kcals = 691 kcals to give as fat*
550kcals/500ml 10% lipid   900kcals/ 500ml of 20% lipid   or
          (691 kcals fat)(1 g fat/9 kcals)(100 ml/20 g fat) = 384 ml 20% fat
20% lipid calculated volume: 384 ml   plus   sterile water volume: 157 ml
          1500ml – 560ml AA – 340 ml CHO – 384 ml fat = 216 ml remaining
Electrolytes: *59 ml given as e'lytes so 157 given as water*
8. Daily electrolyte needs   total amt of kcals/day from fat and dextrose: *809 + 691 = 1500 kcals (46% fat)*

	amt/1000 calories	(amt)(# daily cals)/1000	amount/bag	
sodium	40-50 mEq	60 – 75	68	mEq
potassium	40mEq	60	60	mEq
magnesium	8-12mEq	12 – 18	16	mEq
calcium	2-5 mEq	3 – 8	4.65	mEq
phosphate	15-25mMol	23 – 38	30	mMol

                                          chalk test: (30)(2) + 5 = 65 ÷ 1.5 ≈ 43/L so OK
9. Calculate the volume of each electrolyte solution that you will add   volume to add

sodium chloride 23.4% (4mEq/ml)	17.0	ml
sodium acetate 16.4% (2mEq/ml)	0.0	ml
potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml	10.0	ml
potassium chloride 2mEq/ml	8.0	ml
magnesium sulfate 4mEq/ml	4.0	ml
calcium gluconate 10% (0.465mEq/ml)	10.0	ml
vitamins	10.0	ml
total:	59	ml

infusion rate: 63 ml/hr