3. A 80yo, 86 lb, 5' 0" female with pneumonia and dementia is refusing to eat. She is to be placed on TPN while her infection resolves, in the hope that she will begin eating again. Labs are:

sodium	135 mEq/L	normal range 135 – 150 mEq/L
potassium	4.4 mEq/L	normal range 3.5 – 5.0 mEq/L
chloride	104 mEq/L	normal range 100 – 106 mEq/L
bicarbonate	26 mEq/L	normal range 24 – 30 mEq/L
BUN	26 mg/dL	normal range 8 – 20 mg/dL
creatinine	0.6 mg/dL	normal range 0.6 – 1.2 mg/dL
glucose	123 mg/dL	normal range 70 – 110 mg/dL, fasting
calcium	8.5 mEq/L	normal range 8.5 – 10 mEq/L
phosphate	3.7 mg/dL	normal range 2.6 – 4.5 mg/dL
magnesium	2.1 mEq/L	normal range 1.8 – 2.5 mEq/L
albumin	2.0 g/dL	normal range 3.5 – 5 g/dL (long-term nutritional status)

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

Analysis of patient situation:
- **She is hospitalized, probably dehydrated (her BUN:creatinine ratio is 26:0.6, which is > 20:1 – often indicative of volume depletion) and has an active infection. This will give her a stress factor of around 1.4**
- **Her ABW = 39 kg and IBW = 45 kg, so a feed weight could be anything from 40-45 kg. Moat pharmacists would go for somewhere in between. I will select a feed weight of 42 kg.**
- **Her calculated creatinine clearance is anywhere from 28 – 46 ml/min/ depending upon whether you correct the serum creatinine to 1.0 [(140-80)(39)/(85)(1.0) = 28 ml/min] or you leave it as it is [(140-80)(39)/(85)(0.5) = 46 ml/min]. Again, similar to the last patient, you will use her lean body mass, which is in this case her ABW, for the creatinine clearance calculations. Since use of either equation will give you a number indicative of chronic renal insufficiency (i.e., loss of more than half her kidney function), you will want to be careful not to overhydrate her. As indicated previously, other indications of volume and kidney status would be useful.**
- **Her albumin is low, but her baseline calcium seems higher than you would expect. This may be because she is volume depleted, so her electrolytes may appear more concentrated than they really are, or because she has very good intake of calcium through her diet. Her calcium corrects to around 10.1, which could be falsely high (because of hemoconcentration of electrolytes secondary to intravascular volume depletion) or high for another reason. At any rate, we won't want to add lots of extra calcium to her TPN**
- **Her chloride and bicarb are fine. There is not reason to give her acetate rather than chloride salts.**

TPN Worksheet using pre-set volumes   age: 80   sex: F

height: 152 cm   ABW: 39 kg   IBW: 45 kg   feed weight: 42 kg
anything 39-45 would be fine here

Targets:
1. Daily fluid needs.
>20 kg: 1500ml + (20 ml)(W - 20 kg) *1940*   calculated target: 1260 - 1940 ml/day
30 - 35 ml/kg/day *1260 – 1365*   *I will select 1300 since she will get 500ml extra of fat – this keeps total volume within the guidelines*

2. Protein requirements.
normal, unstressed individual: 0.8g/kg/day   calculated target: 55 - 63 g protein/day
hospitalized patient: 1-1.2g/kg/day   *I will choose 1.3 – 1.5 g/kg/day for mild - moderate stress*
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: 1640 kcals/day
$BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ *975*
activity factors: confined to bed: 1.2 , out of bed: 1.3   *1170*
stress factors: surgery: 1.2; infection: 1.4 ; trauma: 1.5; burns: 1.7   *1638*
TDE = (BEE) (activity factor) (stress factor)

Amounts:
4. Total TPN volume   1300 ml/day;   volume for each TPN: 1000 ml/bag; # bags/day: 1.3

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
36 g/day   *55 g/day*   *65 g/day*
10% AA calculated volume: _____ ml

6. Dextrose volume (3.4 kcals/g)   choose one   3.5 mg/kg/min = 212 g/day = 163 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)(1.3 bags/day)(3.4 kcals/g) = 442 kcals CHO
D70W calculated volume: _____ ml   *1640 kcals – 442 kcals CHO = 1198 kcals to give as fat*
this is a dilemma – she gets too many fat calories if we use D20W (67% fat) but too much sugar with D50W (5.4 mg/kg/min); either way could be chosen and would depend upon the pharmacist's personal judgement
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: *442 + 900 = 1342 kcals* (67% fat)

	amt/1000 calories	(amt)(# daily cals)/1000		amount/bag	
sodium	40-50 mEq	54 – 67	*divide*	48	mEq
potassium	40mEq	54	*each*	35	mEq
magnesium	8-12mEq	11 - 16	*by 1.3*	10	mEq
calcium	2-5 mEq	3 – 7	*to get*	2.3	mEq
phosphate	15-25mMol	20 – 34	*amt/bag*	18	mMol

chalk test: (18)(2) + 2 = 38 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   4.3   ml
magnesium sulfate 4mEq/ml   2.5   ml
calcium gluconate 10% (0.465mEq/ml)   5.0   ml

infusion rate: 54 ml/hr   *1300 ml ÷ 24 hrs = 54 ml/hr*

TPN Worksheet using pump   age: _80_   sex: _F_

height: __152_ cm   ABW: __39_ kg   IBW: _45_ kg   feed weight: _42_ kg
                                                    anything 39-45 would be fine here

Targets:
1. Daily fluid needs.
>20 kg: 1500ml + (20 ml)(W - 20 kg) *1940*   calculated target: __1400_ ml/day
30 - 35 ml/kg/day *1260 – 1365*   *range: 1260 - 1940*

2. Protein requirements.
normal, unstressed individual: 0.8g/kg/day   calculated target: _59_ g protein/day
hospitalized patient: 1-1.2g/kg/day   *I will choose 1.4 g/kg/day for mild - moderate stress*
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: __1640_ kcals/day
$BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ *975*
activity factors: confined to bed: 1.2 , out of bed: 1.3   *1170*
stress factors: surgery: 1.2; infection: 1.4 ; trauma: 1.5; burns: 1.7   *1638*
TDE = (BEE) (activity factor) (stress factor)

Amounts:
4. Total TPN volume   _1400_ ml/day;   volume for each TPN: _1400_ 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: _590_ ml   *(59 g/day)(100 ml/10 g) = 590 ml*

6. Dextrose volume (3.4 kcals/g)   choose one   3.5 mg/kg/min = __212_ g/day; max 242 g/day
100g in D20W 500ml   250g in D50W 500ml   350g in D70W 500ml   or
                                    will choose 220 g/day since allows more sugar but not max
D70W calculated volume: _315_ ml   *(220 g/day)(100 ml/70 g) = 314 ≈ 315ml*
                                        (315 ml)(70 g/100 ml)(3.4 kcals/g) = 750 kcals from CHO
7. Fat volume (9 kcals/g)   choose one**:**   *1640 kcals – 750 CHO kcals = 890 kcals to give as fat*
550kcals/500ml 10% lipid   900kcals/ 500ml of 20% lipid   or
        (890 kcals fat)(1 g fat/9 kcals)(100 ml/20 g fat) = 494 ml 20% fat
20% lipid calculated volume: _494_ ml   plus   sterile water volume: _0_ ml
        1400ml – 590ml AA – 315 ml CHO – 494 ml fat = 1 ml remaining; e'lytes will dilute this a bit, but as you
                                    can see it will be a very concentrated solution

Electrolytes:
8. Daily electrolyte needs   total amt of kcals/day from fat and dextrose: *750 +890 = 1640 kcals (54% fat)*

	amt/1000 calories	(amt)(# daily cals)/1000	amount/bag	
sodium	40-50 mEq	66 – 82	76	mEq
potassium	40mEq	66	66	mEq
magnesium	8-12mEq	13 – 19	16	mEq
calcium	2-5 mEq	5 – 8	5	mEq
phosphate	15-25mMol	24 – 41	27	mMol

                                        chalk test: (27)(2) + 5 = 59 ÷ 1.4 ≈ 42/L so OK
9. Calculate the volume of each electrolyte solution that you will add   volume to add
sodium chloride 23.4% (4mEq/ml)   19.0   ml
sodium acetate 16.4% (2mEq/ml)   0.0   ml
potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml   9.0   ml
potassium chloride   2mEq/ml   13.0   ml
magnesium sulfate 4mEq/ml   4.0   ml
calcium gluconate 10% (0.465mEq/ml)   10.8   ml
vitamins   10.0   ml
                                                            total: 66   ml

infusion rate: _58_ ml/hr