







**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**QUESTION ONE CONTINUED**

Mrs Paraffin is a currently overhydrated 60% fresh burn who keeps going back to theatre almost daily for debriding and revision. As she has been badly burnt on her neck, the anesthetist has been struggling to keep her airways clear. She is abdominally distended and is pouring diarrhoea on 1 litre of Peptamen (osmolality 300 osmol/l) given via a nasogastric tube. *Clostridium difficile* has been excluded.

1.1 Both over and underfeeding patients is an issue of critical concern in the ICU. Elaborate in detail whether either of these patients is being over or underfed or is at risk of being over or under fed. Include the consequences of underfeeding. (15)

**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

1.2 An enteral feeding company has just released a “state of the art” high fibre feed which consists of both soluble fibre (FOS) and insoluble fibre as well as *lactobacillus GG* and *reuteri*. As the other feed constituents, and the energy and macronutrient profile is appropriate, would you consider giving this feed in an attempt to resolve Mrs Paraffin diarrhoea? Elaborate. (6)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION  
EXAMINATION: NOVEMBER/DECEMBER 2014  
SUBJECT, COURSE AND CODE: DIET 360 P2**

---

- 1.3 Taking into account what you have been told about him, calculate Mr MOSF (40 years old) energy and macronutrient prescription. He weighs 65 kg and is 1.7 m tall. (9)

SCHOFIELD EQUATION (Thomas & Bishop 2007, p858)

Basal Metabolic Rate Equations

Age	Males kJ/day	Females kJ/day
10 – 17 years	$(17.7 \times W + 657) \times 4.18$	$(13.2 \times W + 692) \times 4.18$
18 - 29 years	$(15.1 \times W + 692) \times 4.18$	$(14.8 \times W + 487) \times 4.18$
30 - 59 years	$(11.5 \times W + 873) \times 4.18$	$(8.3 \times W + 846) \times 4.18$
60 – 74 years	$(11.9 \times W + 700) \times 4.18$	$(9.2 \times W + 687) \times 4.18$
75+ years	$(8.4 \times W + 821) \times 4.18$	$(9.8 \times W + 624) \times 4.18$

Metabolic Rate Adjustments

Stress Factors	
Simple starvation <sup>1</sup>	-15%
Surgery / post operative – no complications <sup>1</sup>	+5 - 15%
Surgery / post operative –complications <sup>2</sup>	+25 - 40%
Elective surgery <sup>1</sup>	+5 - 15%
Pressure ulcers: Stage I <sup>1</sup>	0 – 10%
Pressure ulcers: Stage II <sup>1</sup>	+20%
Pressure ulcers: Stage III <sup>1</sup>	+30 – 40%
Pressure ulcers: Stage IV <sup>1</sup>	+50 – 60%
Closed head injury <sup>1</sup>	+30%
Multiple trauma <sup>1</sup>	+40%
Systemic inflammatory response syndrome (SIRS) <sup>1</sup>	+50%
Sepsis <sup>1</sup>	+ 20-40%
Major burns <sup>1</sup>	+80 – 100%
Brain injury: acute and ventilated <sup>2</sup>	0 – 30%
Brain injury: during recovery <sup>2</sup>	+5 – 50%
Cerebral haemorrhage <sup>2</sup>	+30%
CVA <sup>2</sup>	+5%
COPD <sup>2</sup>	+15 – 20%
ICU: Ventilated <sup>2</sup>	0 – 10%
Leukaemia <sup>2</sup>	+25 – 34%
Lymphoma <sup>2</sup>	0 – 25%
Solid tumour <sup>2</sup>	0 – 20%
Cancer <sup>3</sup>	+10 – 45%



**DISCIPLINE OF DIETETICS & HUMAN NUTRITION  
EXAMINATION: NOVEMBER/DECEMBER 2014  
SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Physical Activity Factors: To account for the thermic effect of exercise	
Patient on ventilator (BDA 1988: Adams: 70)	-15%
Patient unconscious (BDA 1988: Adams: 70)	BMR only
Bed bound – immobile(Thomas & Bishop 2007, p73 )	+10%
Bed bound – immobile, but can move and sit up	+15 – 20%
Mobile on ward	+ 30%

Macronutrients	Requirements (g/kg/day)	
Protein	Metabolic Status	Requirement
	Normal	1 (0.87 – 1.25)
	Hypermetabolic: 0-25%	1.25 (1.0 – 1.5)
	25-50%	1.5 (1.25 – 1.87)
	>50%	1.87 (1.56 – 1.87)
	Depleted	1.87 (1.25 – 2.5)

BMR

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Stress factor

Activity factor

Total energy

Total protein (g)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

NPE to N ratio

Total CHO (g)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Mg/kg/min

Total fat

Reasoning if necessary:

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

- 1.4 His current combination of enteral and parental nutrition supplies 12500 kJ, 130 g protein and 591 g of carbohydrate. Is this appropriate for Mr MOSF who is still on the ventilator? Elaborate in detail. (7)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

- 1.5 Mr MOSF is showing signs of dehydration. Based on his blood results, identify both the type and the probable causes in his case. (4)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

- 1.6 Considering their environment, are these patients at an increased risk or decreased risk of oxidative damage? Discuss. (6)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

1.7 The anesthetist in charge of the ICU has asked for an opinion regarding the use of Intestamine. As he believes that oxidative stress is an important precipitator of multi organ system failure, he wants to enforce a protocol that all ICU patients are fed 1 litre per day for the first 2 days post admission before moving onto another enteral feed. Would you support this protocol? Discuss. (3)

[50]

---



**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**QUESTION 2**

Mr Stoned (55 years old) has been referred to you for the dietary treatment of chronic renal failure. There are no other health issues apart from frequent attacks of urinary stones. He repeatedly used Brufen (NSAIDs) in the past to control the pain associated with these attacks. Currently he is experiencing fatigue, mild nausea and a general feeling of being unwell. His appetite is reasonable but not good. There are no signs of inflammation or oedema and he is passing normal amounts of urine.

He smokes 2 to 3 packs of cigarettes per week. His mother is a diabetic and his father had a cardiac bypass 3 years ago. He is treatment naïve in that he has not been on a restricted protein diet for renal failure.

His results are below:

<b>Anthropometry</b>	<b>Results</b>	
Weight (kg)	80	
Height (m)	1.68	
Blood pressure (mmHg)	120/80	
PTH	Slightly raised	
GFR (ml/min)	50	
MAU	Raised	
		<b>Range</b>
<b>Blood values</b>		
Sodium (mmol/l)	142	133 – 146
Potassium (mmol/l)	4.5	3.5 – 5.3
Chloride (mmol/l)	105	96 – 106
Bicarbonate (mmol/l)	19	20 – 30
Urea (mmol/l)	11.6	3.3 – 6.5
Creatinine (mmol/l)	301	60 – 120
Serum Iron (umol/l)	6	9 – 32
Calcium (mmol/l)	2.26	2.1 – 2.6
Inorganic phosphate (mmol/l)	1.40	0.84 – 1.45

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.1 Based on what you know about Mr Stoned, do you think that he needs conservative management or should he be immediately started on dialysis? Discuss. (7)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.2 Mr Stoned cant believe that there is anything wrong with his kidneys. No one in his family has ever had kidney problems. List any factors that you can identify that put him at risk for renal problems. (3)

2.3 Do you think that his weight of 80 kg is his wet weight or his dry weight? Explain. (4)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.4 Work out his renal prescription.

(8)

Total energy (kJ)	
Total protein (g)	

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Protein % of Total energy	
NPE to N ratio	

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Total CHO (g)	
Mg/kg/min	
Total fat	

Reasoning or other comments if necessary:

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION  
EXAMINATION: NOVEMBER/DECEMBER 2014  
SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.5 Discuss all the probable factors impacting his serum iron levels.

(5)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.6 The doctor has prescribed iron supplements and is also considering a blood transfusion. If neither method corrects the serum iron levels what would be the next step in the treatment? Should iron supplementation be discontinued? (3)

2.7 Mr Stoned has been instructed to take Titalac (anti acid) twice per day with the iron supplement. He does not want to take it as he does not have acid reflux and from past experience he knows that it constipates him. Because Titalac contains calcium he has been told that it will protect his bones but as Mr Stoned pointed out his blood calcium levels are perfect so why supplement? Taking his blood results into consideration, would you agree with the prescription of Titalac as prescribed by the doctor? Elaborate. (7)



**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.8 You notice that there are no blood glucose results. Was this an oversight? Do you think that it is important to test blood glucose in this case? Discuss. (3)

2.9 He came back for a follow up visit one month later. He promised that he has been very diligent about limiting his protein intake and following your advice very strictly. He is quite distressed that there is so little protein to eat. At follow up he weighs 70 kg with a urea of 14 mmol/l and a creatinine of 350 mmol/l. Is this what you would have expected? Discuss. (3)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

2.10 His friend, a top class athlete, strongly believes that BCAA enhance his performance and have given him more energy and vitality. He has suggested that Mr Stoned take them so he can feel better. Would you recommend that he takes them? Show your reasoning including why they are of interest in sports nutrition and liver and renal failure. (3)

2.11 He wants to supplement with antioxidants since he has read that people with renal disease have higher levels of oxidants. Would you recommend an antioxidant supplement? Discuss. (4)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

**QUESTION 3**

Mrs Unlucki is suffering from intestinal failure (short bowel) as a consequence of radiation therapy for uterine cancer. She has been referred to you for management. Currently her BMI is 22.5 kg/m<sup>2</sup>, her TST, MUAC and MAMC are all close to the 50<sup>th</sup> percentile. Her stomach, duodenum, ileocaecal valve and colon are intact. Most of her jejunum was resected and a 110 cm of proximal ileum is left. The remaining GIT is fully functional. She is 5 days post surgery and has not stopped pouring diarrhoea and steatohepa .

			Range
Blood values	Immediately post surgery	5 days later	
Sodium (mmol/l)	140	128	133 – 146
Potassium (mmol/l)	4.8	3.0	3.5 – 5.3
Chloride (mmol/l)	103	99	96 – 106
Bicarbonate (mmol/l)	25	26	20 – 30
Urea (mmol/l)	5	10	3.3 – 6.5
Creatinine (mmol/l)	100	200	60 – 120
Vitamin B <sub>12</sub> (pmol/l)	500	500	160 - 970
Vitamin A (µmol/L)	2.01	2.00	1.05 - 3.32
Iron (umol/l)	11	12	9 to 32

3.1 Define intestinal failure.

(2)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

3.2 If a choice could be made between resecting the jejunum or resecting the ileum which would be preferable to leave behind? Discuss. (4)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

3.3 Interpret the blood results below commenting on whether they were what you expected.  
Explain. (6)

Urea	
Creatinine	
Sodium	

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

Potassium	
Vitamin B <sub>12</sub>	
Vitamin A	
Iron	

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

3.4 Discuss the causes of the steatorrhea and diarrhoea in her case.

(4)



**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

3.5 Two weeks post surgery she is stable on CPN and is ready to begin enteral feeding. Which of the following two enteral feeds would you choose based on the macronutrient distribution? Substantiate your answer. (8 by ½ marks)

<b>Name of feed</b>	<b>Feed one</b>	<b>Feed two</b>
<b>Energy (kJ)</b>	630	630
<b>Energy (kCal)</b>	150	150
<b>Protein (g)</b>	5.6 (15%)	7.5 (20%)
<b>CHO (g)</b>	20 (54%)	17 (46%)
<b>Fat (g)</b>	5.1 (31%)	5.6 (34%)

**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE AND CODE: DIET 360 P2**

---

3.6 The enteral feed is being tolerated at a run rate of 40 ml per hour and is being given continuously. The enteral and parenteral feeds supply the identical amounts of energy and macronutrients. The doctor has suggested reducing the CPN by a litre. Would you agree with this? Explain (1)

3.7 She is ready to begin the intake of oral fluids. Apart from water, you have commercial ORS, fruit juice, isotonic Game and Energade available. Which of these (if any) are you going to prescribe for her and in what form? Discuss your reasons for including or excluding each fluid. (4)

ORS	
Water	
Fruit juice	
Energade	
Isotonic game	







**UNIVERSITY OF KWAZULU-NATAL**  
**SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES**  
**DISCIPLINE OF DIETETICS & HUMAN NUTRITION**  
**EXAMINATION: NOVEMBER/DECEMBER 2014**  
**SUBJECT, COURSE & CODE: DIET THERAPY – SURGICAL DIET360 - P2**

**DURATION : 3 HOURS**

**TOTAL MARKS : 100**

**External Examiner :**  
**Internal Examiner : Ms C Biggs**

**NOTE: THIS PAPER CONSISTS OF 36 PAGES AND A 27 PAGE FORMULA HANDOUT PLEASE CHECK THAT YOU HAVE ALL OF THEM**

**DO TWO (2) OUT OF THREE (3) QUESTIONS**

**STUDENT NUMBER:** \_\_\_\_\_

**QUESTION 1**

In your ICU you are managing two patients who are of particular concern regarding feeding.

Mr MOSF has been in the ICU close to a month after complicating from a gunshot abdomen and has developed sepsis and acute respiratory distress syndrome. Currently he is being fed 2 litres of Nutrison Energy via a nasogastric tube and one litre of standard central parenteral nutrition. The doctor is keen to build him up as he is not able to wean off the ventilator. His blood results are in the table below.

	<b>Before feeding</b>	<b>After feeding</b>	<b>Range</b>
Blood sugar (mmol/l)	6.5	10	
Urea (mmol/l)	5	10	3.3 – 6.5
Creatinine (mmol/l)	80	90	60 – 120
Sodium (mmol/l)	140	125	133 – 146
Potassium (mmol/l)	4	4.5	3.5 – 5.3
Bicarbonate (mmol/l)	25	22	20 – 30

Mrs Paraffin is a currently overhydrated 60% fresh burn who keeps going back to theatre almost daily for debriding and revision. As she has been badly burnt on her neck, the anaesthetist has been struggling to keep her airways clear. She is abdominally distended and is pouring diarrhoea on 1 litre

of Peptamen (osmolality 300 osmol/l) given via a nasogastric tube. *Clostridium difficile* has been excluded.

1.1 Both over and underfeeding patients is an issue of critical concern in the ICU. Elaborate in detail whether either of these patients is being over or underfed or is at risk of being over or under fed. Include the consequences of underfeeding. (15)

Mr MOSF is being overfeed ✓ because:

number of routes used ie those being fed either with EN and PN or oral and EN ✓

tracheostomy and/or long term ventilation ✓

those who spent longer than 16 days in the ICU ✓

inappropriate use of nutrient dense formulas ✓

Worsening hyperglycaemia therefore probably too much CHO ✓

Rising urea – probably too much protein ✓

Mrs Paraffin is at risk of underfeeding because:

elective procedures ✓

management of airways ✓

GI intolerance ✓

Underfeeding can result in increased:

infections especially sepsis ✓

LOS (length of stay) ✓

length of time on ventilation ✓

complications ✓

duration of antibiotic use ✓

mortality ✓

1.2 An enteral feeding company has just released a “state of the art” high fibre feed which consists of both soluble fibre (FOS) and insoluble fibre as well as *Lactobacillus GG* and *reuteri*. As the

other feed constituents, and the energy and macronutrient profile is appropriate, would you consider giving this feed in an attempt to resolve Mrs Paraffin diarrhoea? Elaborate. (6)

So there are two issues here the use of probiotics (and prebiotics) in the ICU as well as supplementation with fibre.

Fibre in the ICU

No well-designed studies on the effect of feeding fibre to the critically ill Not sure whether fibre helps control D in the critically ill ✓

May not be appropriate to give fibre ie she is abdominally bloated ✓

Soluble fibre can be used if persistent D and hyperosmolar agents and *C. difficile* has been excluded (which it has) as a cause but there are no large scales trials which support the use and this feed contains both types of fibre. "Soluble fibre may be beneficial to the fully resuscitated haemodynamically stable patient who is critically ill and receiving enteral nutrition who develops diarrhoea. ✓

Insoluble fibre should be avoided in all critically ill patients ✓ - she is critically ill and this feed contains both

Concern is that probiotics may cause septicaemia by bacterial translocation ✓

Supplementation may reduce diarrhoea associated with enteral feeding in critically ill: lack of "consistent outcome effect" ✓

May be effective in the treatment of *Clostridium difficile* which has been excluded so is not to be considered in this case.

Different species have different properties/effects

1.3 Taking into account what you have been told about him, calculate Mr MOSF (40 years old) energy and macronutrient prescription. He weighs 65 kg and is 1.7 m tall. (9)



## SCHOFIELD EQUATION (Thomas &amp; Bishop 2007, p858)

## Basal Metabolic Rate Equations

Age	Males kJ/day	Females kJ/day
10 – 17 years	$(17.7 \times W + 657) \times 4.18$	$(13.2 \times W + 692) \times 4.18$
18 - 29 years	$(15.1 \times W + 692) \times 4.18$	$(14.8 \times W + 487) \times 4.18$
30 - 59 years	$(11.5 \times W + 873) \times 4.18$	$(8.3 \times W + 846) \times 4.18$
60 – 74 years	$(11.9 \times W + 700) \times 4.18$	$(9.2 \times W + 687) \times 4.18$
75+ years	$(8.4 \times W + 821) \times 4.18$	$(9.8 \times W + 624) \times 4.18$

## Metabolic Rate Adjustments

Stress Factors	
Simple starvation <sup>1</sup>	-15%
Surgery / post operative – no complications <sup>1</sup>	+5 - 15%
Surgery / post operative –complications <sup>2</sup>	+25 - 40%
Elective surgery <sup>1</sup>	+5 - 15%
Pressure ulcers: Stage I <sup>1</sup>	0 – 10%
Pressure ulcers: Stage II <sup>1</sup>	+20%
Pressure ulcers: Stage III <sup>1</sup>	+30 – 40%
Pressure ulcers: Stage IV <sup>1</sup>	+50 – 60%
Closed head injury <sup>1</sup>	+30%
Multiple trauma <sup>1</sup>	+40%
Systemic inflammatory response syndrome (SIRS) <sup>1</sup>	+50%
Sepsis <sup>1</sup>	+ 20-40%
Major burns <sup>1</sup>	+80 – 100%
Brain injury: acute and ventilated <sup>2</sup>	0 – 30%
Brain injury: during recovery <sup>2</sup>	+5 – 50%
Cerebral haemorrhage <sup>2</sup>	+30%
CVA <sup>2</sup>	+5%
COPD <sup>2</sup>	+15 – 20%
ICU: Ventilated <sup>2</sup>	0 – 10%
Leukaemia <sup>2</sup>	+25 – 34%
Lymphoma <sup>2</sup>	0 – 25%
Solid tumour <sup>2</sup>	0 – 20%
Cancer <sup>3</sup>	+10 – 45%

Physical Activity Factors: To account for the thermic effect of exercise	
Patient on ventilator (BDA 1988: Adams: 70)	-15%
Patient unconscious (BDA 1988: Adams: 70)	BMR only
Bed bound – immobile(Thomas & Bishop 2007, p73 )	+10%
Bed bound – immobile, but can move and sit up	+15 – 20%
Mobile on ward	+ 30%

Macronutrients	Requirements (g/kg/day)	
Protein	Metabolic Status	Requirement
	Normal	1 (0.87 – 1.25)
	Hypermetabolic: 0-25%	1.25 (1.0 – 1.5)
		25-50%
	>50%	1.87 (1.56 – 1.87)
Depleted	1.87 (1.25 – 2.5)	

BMR	
Stress factor	

Activity factor	
Total energy	
Total protein (g)	
Protein % of Total energy	
Total nitrogen (g)	
NPE (kJ)	
NPE to N ratio	

Total CHO (g)	
Mg/kg/min	
Total fat	

Reasoning if necessary:

Should use the stress factor for SIRS ie sepsis plus organ failure ie 50% but will accept 20 to 40% for sepsis as well – because of the hyperglycaemia they must do lower CHO and not give too much protein as urea is rising (1.5 g/kg/day) and higher fat because of the ventilator – the model will vary according to the student choices

1.4 His current combination of enteral and parental nutrition supplies 12500 kJ, 130 g protein and 591 g of carbohydrate. Is this appropriate for Mr MOSF who is still on the ventilator? Elaborate in detail. (7)

Way overfeeding ✓- results in lipogenesis, should cause increases in the RQ. ✓ as marked increases in the production of carbon dioxide ✓ which increases the breathing load ✓-

Feeding too much CHO ✓-as the mg/kg/min is 6.3 and is 80% of total energy ✓-plus the worsening hyperglycaemia ✓-

1.5 Mr MOSF is showing signs of dehydration. Based on his blood results, identify both the type and the probable causes in his case. (4)

Hyponatremic dehydration ✓ because the blood sodium levels are low, the creatinine normal and the urea raised. ✓

Probably causes include:

- Hyperglycaemia causes an osmotic shift from the intracellular compartment to the extracellular compartment ✓
- water intoxication ie drink or infuse sufficient water to cause hyponatremia ✓

1.6 Considering their environment, are these patients at an increased risk or decreased risk of oxidative damage? Discuss. (6)

Increased risk because there is increased ROS production from:

Tissue damage and inflammation (trauma, ischemia, infection) and they both have experienced this ✓

Can release iron (potent oxidant) from damaged cells both have damaged cells ✓

Can cause a disruption of the electron transport chain Circulatory shock/MI results in ischaemia followed by reperfusion (Oldham & Bowen 1998) **not given this information so no marks**

Increase in BMR (Oldham and Bowen 1998) ✓

Catecholamines released during trauma and critical illness ✓

Metabolism by the liver of many drugs ✓

Being ventilated with high concentrations of oxygen to obtain sufficient arterial oxygenation ✓ so this applies to Mr MOSF only

1.7 The anesthetist in charge of the ICU has asked for an opinion regarding the use of Intestamine. As he believes that oxidative stress is an important precipitator of multi organ system failure, he wants to enforce a protocol that all ICU patients are fed 1 litre per day for the first 2 days post admission before moving onto another enteral feed. Would you support this protocol? Discuss. (3)

Intestamin is not a feed but an antioxidant supplement which is high in glutamine (6g/100ml), antioxidants, selenium (60ug/100ml), tributyrin and zinc (4mg/100ml), vitamin E (100 mg/100 ml), vitamin C (300 mg/100ml), betacarotene (2 mg/100ml). Do not give more than 500 ml per day ✓!! Is a glutamine and antioxidant supplement only so does not contain any protein, cho etc so not sufficient ✓ glutamine should not be given to all patients in the ICU ie what about those in liver failure or head injury – what about those in renal failure who should not get vitamin A and C supplements ✓

## QUESTION 2

Mr Stoned (55 years old) has been referred to you for the dietary treatment of chronic renal failure. There are no other health issues apart from frequent attacks of urinary stones. He repeatedly used Brufen (NSAIDS) in the past to control the pain associated with these attacks. Currently he is experiencing fatigue, mild nausea and a general feeling of being unwell. His appetite is reasonable but not good. There are no signs of inflammation or oedema and he is passing normal amounts of urine.

He smokes 2 to 3 packs of cigarettes per week. His mother is a diabetic and his father had a cardiac bypass 3 years ago. He is treatment naïve in that he has not been on a restricted protein diet for renal failure.

His results are below:

<b>Anthropometry</b>	<b>Results</b>
Weight (kg)	80
Height (m)	1.68
Blood pressure (mmHg)	120/80
PTH	Slightly raised
GFR (ml/min)	50

MAU	Raised	
		Range
<b>Blood values</b>		
Sodium (mmol/l)	142	133 – 146
Potassium (mmol/l)	4.5	3.5 – 5.3
Chloride (mmol/l)	105	96 – 106
Bicarbonate (mmol/l)	19	20 – 30
Urea (mmol/l)	11.6	3.3 – 6.5
Creatinine (mmol/l)	301	60 – 120
Serum Iron (umol/l)	6	9 – 32
Calcium (mmol/l)	2.26	2.1 – 2.6
Inorganic phosphate (mmol/l)	1.40	0.84 – 1.45

2.1 Based on what you know about Mr Stoned, do you think that he needs conservative management or should he be immediately started on dialysis? Discuss. (7)

The question here was when would someone need to begin dialysis.

Reasons to begin dialysis include:

hyperkalemia unresponsive to treatment – blood potassium levels normal (see blood results) ✓

severe metabolic acidosis – bicarb is slightly low not severely deranged. ✓

fluid overload – no signs of fluid overload ✓

pericarditis (inflammation of the pericardium) – no signs of inflammation as yet. ✓

uraemia – GFR is above 12.5 ml/min ie is 50 ✓ and passing normal amounts of urine. ✓

so no he should not be started on dialysis. ✓

2.2 Mr Stoned cant believe that there is anything wrong with his kidneys. No one in his family has ever had kidney problems. List any factors that you can identify that put him at risk for renal problems. (3)

Smoking ✓, stones ✓, brufen ✓

2.3 Do you think that his weight of 80 kg is his wet weight or his dry weight? Explain. (4)

Dry weight ✓ as the serum sodium levels are normal ✓, there is no evidence of oedema ✓, and his bp is normal. ✓

2.4 Work out his renal prescription. (8)

This became a problem – because they were told to choose between conservative and dialysis I expected them to use the conservative guidelines ie 0.8 g/kg/day – I have discouraged the use of 0.6 g/kg/day. However the notes do say the following remembering that the question said that the GFR was 50 ml/min to make it clear that he did not need dialysis.

0.8 g/kg/day in adults with diabetes or without diabetes and a GFR <30 ml/min/ 1.73 m<sup>2</sup> (GFR categories G4-G5), with appropriate education (KDIGO 2012 Clinical Practice Guidelines for the Evaluation and Management of Chronic Kidney Disease. Volume 3 Issue 1 January 2013 <http://www.kidney-international.org>. Official Journal of the International Society of Nephrology).

Avoid an intake of >1.3 g/kg/day in adults with CKD at risk of progression (KDIGO 2012 Clinical Practice Guidelines for the Evaluation and Management of Chronic Kidney Disease. Volume 3 Issue 1 January 2013 <http://www.kidney-international.org>. Official Journal of the International Society of Nephrology).

So I had to accept answers of 0.8 to 1.3 for protein.

#### Calculating renal equations

Actual body weight (kg)	80
Height (m)	1.68
BMI	✓28.3

Ideal body weight	✓70.5
-------------------	-------

Protein in g/kg IBW	0.8
Protein	✓56.4
Ng	9.0
Protein %	9
Protein energy	958.8
Non protein energy	9616.2
NPE:Ng2	✓1065.6

Energy	✓10575
--------	--------

Carbohydrate %	55
Carbohydrate Kj	5816.25
Carbohydrate g	✓342
mg/kg/min	✓3.0

Fat %	36
Fat g	✓100.0



Total E 100

2.5 Discuss all the probable factors impacting his serum iron levels. (5)

As this is to be related to the patient marks were only given for those this patient would have experienced.

Result of:

Decreased erythropoietin production in kidney (often major cause) ✓

Results in failure of bone marrow to produce RBC hence anaemia

GI bleeding ✓

Frequent blood sampling (which happens during dialysis mainly)

some blood remains in the dialyser after haemodialysis

Increased destruction of RBC due to circulating uremic waste products and due to alterations of intracellular concentrations of calcium ions ✓

(determines erythrocyte deformability)

anorexia, N, V ✓

restricted protein diet(not been on a low protein diet as yet)

Decreased iron absorption ✓

salicylate medications eg aspirin **ie not Brufen**

2.6 The doctor has prescribed iron supplements and is also considering a blood transfusion. If neither method corrects the serum iron levels what would be the next step in the treatment? Should iron supplementation be discontinued? (3)

If not effective or no longer effective then an erythropoiesis-stimulating agent ie ESA is given which may or may not be in combination with iron supplementation. ✓ ESA may increase the need for iron as it increases the manufacture of RBC so no supplementation should not be discontinued. ✓ ESA is usually recommended when Hb is between 9.0–10.0 g/dl so the likelihood is strong that it is necessary. ✓

2.7 Mr Stoned has been instructed to take Titalac (anti acid) twice per day with the iron supplement. He does not want to take it as he does not have acid reflux and from past experience he knows that it constipates him. Because Titalac contains calcium he has been told that it will protect his bones but as Mr Stoned pointed out his blood calcium levels are perfect so why

supplement? Taking his blood results into consideration, would you agree with the prescription of Titalac as prescribed by the doctor? Elaborate. (7)

No he should not take the Titalac twice per day with iron as the iron and calcium will bind ✓ and the Titalac needs to be taken with each meal not twice per day ✓. **These first two marks are compulsory**

Yes he does need Titalac as although the ca and p are normal ✓ he is in compensated balance as the pth is elevated ✓ – this means that the kidney is unable to remove phosphorus so the P levels go up ✓ ca binds with p which drops the P back to normal but drops ca too low which triggers the rise in PTH ✓ which then leaches calcium out the bones therefore needs to take titalac which binds p in the gut and so prevents its absorption and also acts as a calcium supplement. ✓

2.8 You notice that there are no blood glucose results. Was this an oversight? Do you think that it is important to test blood glucose in this case? Discuss. (3)

Def an oversight – his blood sugar levels needed to be checked as he has a FH of diabetes ✓ – undiagnosed diabetes leads to RF ✓ – insulin resistance associated with RF ✓

2.9 He comes back for a follow up visit one month later. He promises that he has been very diligent about limiting his protein intake and following your advice very strictly. He is quite distressed that there is so little protein to eat. At follow up he weighs 70 kg with a urea of 14 mmol/l and a creatinine of 350 mmol/l. Is this what you would have expected? Elaborate. (3)

**Even though he was overweight the diet that was planned did not compensate for weight loss – a weight loss of approximately 10% in one month is a red flag for risk of malnutrition which I expected them to recognize. Many thought that this was acceptable and what they had planned – I have no idea why as we have been over this compliance problem endlessly in class.**

No if he was following the diet his urea and creatinine should have gone down ✓ – he could be telling the truth and getting his protein correct but the weight loss is huge ✓ so he is not eating enough energy and breaking down muscle protein to supply energy ✓

2.10 His friend, a top class athlete, strongly believes that BCAA enhance his performance and have given him more energy and vitality. He has suggested that Mr Stoned take them so he can feel better. Would you recommend that he takes them? Show your reasoning including why they are of interest in sports nutrition and liver and renal failure. (3)

No as given instead of the protein he is allowed to eat and already struggling with the limits, ✓ no evidence that they work even though BCAA levels seem to be lowered in renal failure. ✓

Major difference between BCAA's and other AA's is that BCAA's are not degraded in the liver but are used preferentially by the skeletal muscle, heart and kidney. ✓

2.11 He wants to supplement with antioxidants since he has read that people with renal disease have higher levels of oxidants. Would you recommend an antioxidant supplement? Discuss. (4)

**We have gone over the basic contents on antioxidant supplements in class including a detailed practical on Intestamine**

No because should take no more than 100 mg of vitamin C ✓ and

Elevated vitamin A levels in serum and liver ✓

High vitamin A levels may increase PTH secretion ✓

Therefore may increase metabolic bone disease ✓

No vitamin A supplements unless very low intake

### **QUESTION 3**

Mrs Unlucki is suffering from intestinal failure (short bowel) as a consequence of radiation therapy for uterine cancer. She has been referred to you for management. Currently her BMI is 22.5 kg/m<sup>2</sup>, her TST, MUAC and MAMC are all close to the 50<sup>th</sup> percentile. Her stomach, duodenum, ileocaecal valve and colon are intact. Most of her jejunum was resected and a 110 cm of distal terminal ileum is left. The remaining GIT is fully functional. She is 5 days post surgery and has not stopped pouring diarrhoea and steatorrhoea .

			<b>Range</b>
<b>Blood values</b>	<b>Immediately post surgery</b>	<b>5 days later</b>	
Sodium (mmol/l)	140	128	133 – 146
Potassium (mmol/l)	4.8	3.0	3.5 – 5.3
Chloride (mmol/l)	103	99	96 – 106
Bicarbonate (mmol/l)	25	26	20 – 30
Urea (mmol/l)	5	10	3.3 – 6.5
Creatinine (mmol/l)	100	200	60 – 120
Vitamin B <sub>12</sub> (pmol/l)	500	500	160 - 970
Vitamin A (µmol/L)	2.01	2.00	1.05 - 3.32
Iron (umol/l)	11	12	9 to 32

3.1 Define intestinal failure. (2)

“Intestinal failure is defined as the critical reduction of functional gut mass to less than the amount that is minimally necessary for adequate digestion and absorption to satisfy nutrient and fluid requirements, ✓ requiring the use of parenteral nutrition” ✓

3.2 If a choice could be made between resecting the jejunum or resecting the ileum which would be preferable to leave behind? Discuss. (4)

Loss of the ileum is less tolerated than the loss of the jejunum especially if more than 100 cm. Ileum adapts better ✓ and can “compensate for absorptive functions of the jejunum, but the jejunum does not have the same potential for adaption and cannot develop the specialist functions of the ileum, namely bile salt and vitamin B12 absorption” ✓ (Shaw & Lawson Clinical Paediatric Dietetics 2007 pg 134 to 135)

Transit time is slower in ileum so slows down mucosal passage ✓ (Shaw & Lawson Clinical Paediatric Dietetics 2007 pg 135)

Ileum can absorb against an osmotic gradient ie better absorption vs the jejunum ✓ (Shaw & Lawson Clinical Paediatric Dietetics 2007 pg 135)

3.3 Interpret the blood results below commenting on whether they were what you expected. Explain. (6)

Urea	High from acute kidney injury from the loss of fluid ✓.1/2
Creatinine	High from acute kidney injury from the loss of fluid ✓ 1/2 .
Sodium	Low from the diarrhoea ✓
Potassium	Low from the diarrhoea, ileum and colon absorb electrolytes ✓
Vitamin B <sub>12</sub>	normal – yes because although the distal/terminal ileum is resected this deficiency will only occur 2 to 5 years post surgery and she is in a good nutritional status. ✓
Vitamin A	normal – lots of stores of fat soluble vitamins as well even though they are absorbed in the terminal ileum ✓
Iron	Normal – yes as the duodenum is still intact so can absorb ✓

3.4 Discuss the causes of the steatorrhea and diarrhoea in her case. (4)

significant loss of absorptive surface in general, ✓ fluid and bile salt malabsorption from less terminal ileum results in mild steatorrhea and cholerrheic diarrhoea. ✓ Unabsorbed nutrients. ✓ Gastric hypersecretion as Gastric acid inactivates pancreatic enzymes and deconjugates bile salts - results in acidic D ✓

3.5 Two weeks post surgery she is stable on CPN and is ready to begin enteral feeding. Which of the following two enteral feeds would you choose based on the macronutrient distribution? Substantiate your answer. (4)

Name of feed	Feed one	Feed two
Energy (kJ)	630	630
Energy (kCal)	150	150
Protein (g)	5.6 (15%)	7.5 (20%)
CHO (g)	20 (54%)	17 (46%)
Fat (g)	5.1 (31%)	5.6 (34%)

Would choose Feed one ✓ although somewhat low in protein (20 to 30% is guideline) ✓ it meets the criteria for fat ie 31% (30 to 40%) and there is massive steatorrhea ✓ and CHO ie 54% (50 to 60%) ✓

3.6 The enteral feed is being tolerated at a run rate of 40 ml per hour and is being given continuously. The enteral and parenteral feed supply the identical amounts of energy and macronutrients. The doctor has suggested reducing the CPN by a litre. Would you agree with this? Explain (1)

Although getting a litre from EN not all will be absorbed to would not be appropriate to decrease the CPN by the same amount. ✓ they needed to calculate that they were getting a litre in enterally

3.7 She is ready to begin the intake of oral fluids. Apart from water, you have commercial ORS, fruit juice, isotonic Game and Energade available. Which of these (if any) are you going to prescribe for her and in what form? Discuss your reasons for including or excluding each fluid. (4)

ORS	Yes but standard is too low in salt so use WHO recipe ✓
Water	Yes as colon intact ✓
Fruit juice	Diluted half and half with water to improve tolerance ✓ <sup>1/2</sup>
Energade	Diluted half and half plus ½ teaspoon salt ✓ <sup>1/2</sup>
Isotonic game	Diluted half and half plus ½ teaspoon salt as isotonic and hypertonic can cause issues ✓

3.8.1 She has tolerated fluids and small frequent amounts of solids (mash and boiled fish) and is now ready to move onto a greater variety of food eaten in larger amounts. Using the following exchanges, plan an appropriate meal plan for her taking into consideration her diagnosis and progress. The diet can planned for any culture but please label clearly whether you are planning a diet for an Indian, White or Black African. (25)

The common mistake was not planning small enough more frequent meals as they seem to be obsessed with 3 meals and 3 snacks per day. Also many used sugar although the notes clearly say no sugar because of dumping and we did a practice run planning a gastrectomy diet. See notes below. The patient is not eating sufficient orally as yet so cant start playing around with sugar.

Give small frequent amounts of oral food

May need to give 1 to 2 teaspoons every hour or half hour

May be able to start with larger quantities ie 1 to 2 tablespoons

Use a light diet that is mainly protein and starch (both are lower in osmolality)

Eg steamed fish and mash, 1 tablespoon of each. No simple sugars – these may be tried once the patient is eating sufficient orally and is tolerating well.

Increase the size of meals as tolerated

Initially avoid fats (no fats) and especially fried foods (fried food is more difficult to digest)

May need MCT's as first form of fats (15 ml 3 to 4 times per day according to Lykins & Stockwell, 1998)

May tolerate fat added to foods such as cream or butter to mash in small quantities

Get the fat content as high as possible without aggravating D (<30g/day)

Avoid water insoluble fibre (nuts, skins, pips, seeds)

Use foods rich in water soluble fibre eg strained oats

Initially avoid very hot or very cold foods (stimulates peristalsis)

As conventional foods increase so EN decreases

After several months may be able to stop enteral feeds and be tolerating 6 to 8 small meals per day

Some recommend separating liquids and solids by 30 to 60 minutes (Short bowel syndrome: a nutritional and medical approach. Khurshed N. Jeejeebhoy. JAMC • 14 MAI 2002; 166 (10); Lykins & Stockwell, 1998). Others claim that it makes no difference (Etiology and Initial Management of Short Bowel Syndrome. ALAN L. BUCHMAN GASTROENTEROLOGY 2006;130:S5-S15). I would initially separate liquids and solids and then challenge.

Type of exchange	Number	Type of exchange	Number
Meat	9	Vegetables	2
Starch/sugar	9	Beverages high kJ	3
Fat	2		
Fruit	3		

Student Number: \_\_\_\_\_

Exchanges	Number	Actually planned
Meat	9	
Starch/sugar	9	
Fat	2	
Fruit	3	
Vegetables	2	
Beverages	At least 3	

Planned the correct number of exchanges	Yes	No	
Correct amounts/foods for each exchange	Yes	No	
Small frequent meals	Yes	No	
Liquids separated from solids	Yes	No	

Avoided very cold or very hot foods	Yes	No	
Avoided sugar containing foods	Yes	No	
Avoided food not allowed on the light diet	Yes	No	

Breakfast

Snack

Lunch

Snack

Supper

Final comment and mark: