1. 8 points. Balance a ration for energy and protein for a beef heifer using ingredients provided below. The requirements are expressed on a DM basis. Provide the ration on a DM basis first and then on an as fed basis.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>DM, %</th>
<th>ME, Mcal/kg</th>
<th>CP, %</th>
<th>Ca, %</th>
<th>Ration, DM basis %</th>
<th>Ration, As-fed basis %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass hay</td>
<td>88</td>
<td>2.05</td>
<td>7</td>
<td>.4</td>
<td>69.57%</td>
<td>69.04%</td>
</tr>
<tr>
<td>Corn</td>
<td>89</td>
<td>3.2</td>
<td>9.5</td>
<td>.04</td>
<td>20.47%</td>
<td>20.08%</td>
</tr>
<tr>
<td>Protein supplement</td>
<td>80</td>
<td>3.2</td>
<td>42</td>
<td>2.5</td>
<td>9.97%</td>
<td>10.88%</td>
</tr>
<tr>
<td>Requirements</td>
<td>2.4</td>
<td>11</td>
<td>.30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grass \[2.05 \times \frac{.8}{2.4} \rightarrow 69.57\%\]

Corn \[3.2 \times \frac{.35}{1.15} \rightarrow 30.43\%\]

\[x = SBM \quad (30.43 - x) \times \text{corn}\]

\[11 = .07(69.57) + .095(30.43 - x) + .42x\]

\[4.87 + 2.89 - .095x + .42x\]

\[11 = 7.76 + .325x\]

\[3.24 = .325x\]

\[x = 9.97\% = \text{SBM}\]

so corn = 20.46

Does the ration meet the Ca requirement of the heifer? *Show your work.*

Hay \[.6957 \times .4 = .278\]

Corn \[.2046 \times .04 = .008\]

Protein supplement \[.0977 \times .035 = .0032\]

\[.288 \text{ so no. It does not meet the calcium requirement}\]
2. 8 points. Balance a ration for growing pigs using the ingredients in the table. The requirements are 14% protein, .65% Ca and .5% P. Your fixed ingredients are 25% Pacific coast barley and 1% mineral/vitamin/antibiotic premix. I have performed the first balancing step for you and determined that you need 62.25% corn and 11.75% SBM to have the ration balanced for protein. Now balance for P and Ca and then rebalance for protein. Show your final ration in the last column!!

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Protein, %</th>
<th>Ca, %</th>
<th>P, %</th>
<th>Ration, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>9.0</td>
<td>.05</td>
<td>.31</td>
<td>60.06</td>
</tr>
<tr>
<td>SBM</td>
<td>49.0</td>
<td>.29</td>
<td>.71</td>
<td>12.175</td>
</tr>
<tr>
<td>Barley</td>
<td>10.5</td>
<td>.05</td>
<td>.38</td>
<td>25.0</td>
</tr>
<tr>
<td>Dical</td>
<td>--</td>
<td>24.0</td>
<td>19.0</td>
<td>7.70</td>
</tr>
<tr>
<td>Limestone</td>
<td>--</td>
<td>38.0</td>
<td>--</td>
<td>1.07</td>
</tr>
<tr>
<td>Min/Vit/AB</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Fixed = 26.00  
Non Fixed = 74.00

\[ x = \text{Dical} \quad (62.25 - x) = \text{Corn} \]

\[
\begin{align*}
.03 & = .0071(11.75) + .0031(62.25-x) + .0038(25) + .19x \\
& + .0834 + .19 - .0031x + .095 + .19x \\
& + .3664 + .1869x
\end{align*}
\]

\[ x = .70 \quad Ca_{25} - .70 = 61.55 \]

**Calcium**

\[ x = \text{Limestone} \quad (61.55 - x) = \text{Corn} \]

\[
\begin{align*}
.65 & = .0029(11.75) + .0005(61.55 - x) + .0005(25) + .29(1.70) + .38x \\
& + .034 + .03 - .0005x + .0125 + .188 + .38x \\
& + .2445 + .3795x
\end{align*}
\]

\[ x = 1.07 \quad \text{of Limestone} \quad 61.55 - 1.07 = 60.48 \]

**Rebalance for protein**

\[ x = \text{SBM} \quad 72.23 - x = \text{Corn} \]

\[
\begin{align*}
14 & = .09(72.23 - x) + .49x + .35(1.05) \\
& + .50 - .09x + .49x + 2.63
\end{align*}
\]

\[ x = 12.175 \]
3. 6 points. What is the crude protein and undegraded intake protein (UIP) content of the following dairy ration:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Ration, DMB</th>
<th>CP, % of DM</th>
<th>UIP, % of CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage</td>
<td>45</td>
<td>0.15 : 6.75</td>
<td>0.22 : 1.485</td>
</tr>
<tr>
<td>Corn/Barley mix</td>
<td>42</td>
<td>0.10 : 4.20</td>
<td>0.44 : 1.848</td>
</tr>
<tr>
<td>Protein supplement</td>
<td>10</td>
<td>0.28 : 2.8</td>
<td>0.50 : 1.400</td>
</tr>
<tr>
<td>Mineral/vit supplement</td>
<td>3</td>
<td>0 : 0</td>
<td>4.733 : UIP</td>
</tr>
</tbody>
</table>

4. 8 points. What form(s) of energetic loss is(are) accounted for when determining:

a. digestible energy from gross energy:
   - Fecal loss

b. metabolizable energy from digestible energy:
   - Urinary loss
   - Gaseous loss

c. net energy from metabolizable energy:
   - Heat loss or heat increment

Thinking about the answers to the questions above, why is the TDN system not a suitable energy system for forages, but is more suitable for concentrates?

Because it mistakenly overestimates the energy available in forages since there is greater amount of gas and heat loss in forages. Since there is not as much gas or heat production from grain, a more accurate value can be reached.

5. 4 points. Explain why we need have two energy requirements (NE-gain and NE-maintenance) for growing beef cattle but only have a NE-lactation value as the energy requirement for lactating dairy cattle.

For growing beef cattle it is necessary to have both NEg
and NEm to determine energy going into maintenance of that animal and any left over for gain. But in the dairy cow, all energy is going into lactation which represents a number very similar to NEm in beef cattle. No energy is being used for growth of the dairy cattle (in fact, usually in negative energy balance)
6. 4 points. What determines the maintenance energy requirement of an animal (we multiply this factor by .077 Mcal to calculate the NE m requirement). Why is this factor associated with maintenance energy requirement?

\[ \text{kg/m}^2 \text{per surface area} \]
This is the amount of heat loss relative to an animal.
This factor takes into account the heat loss for Net Energy maintenance.

7. 6 points. Many nutritionists (including Hunt) feel exogenous enzymes will be used in the future as feed additives to enhance the digestibility of feeds. Thinking about the mechanisms which regulate feed intake, what effect would we expect these additives to have on the growth performance (daily gain and efficiency of gain) of:

a. A pig fed an all concentrate ration.
   Efficiency will go up but average daily gain will stay same

b. A beef steer fed a ration of 75% low quality forage and 25% concentrate.
   Both efficiency and average daily gain will go up. Intake will also go up.

8. 2 points. Name a gut peptide which acts as a satiety hormone; tells the animal it has had enough to eat.
   Cholecystokinin
   (Bonnes)

9. 4 points. Give an example of a positive associative effect and an example of a negative associative effect.
   ① Corn and Soybean meal = Positive associative effect
   ② Starting to change over to a grain diet from a forage. This nutrient of grain/forage has negative associative effect.

10. 5 points. What does IFN stand for? List three criteria by which IFN classifies feeds.
    International Feed Name
    ① Name = genus species, common name
    ② Cutting
    ③ Grade

11. 3 points. Generally, energy ingredients have less than this level of crude protein 18%, and less than this level of NDF 35%.

12. 2 points. I indicated in lecture that fiber content (ADF) is not a reliable indicator of the energy value of a particular cutting of alfalfa; which cutting (1st, 2nd, etc) of alfalfa would that be?
    1st cutting and 2nd cutting
13. 10 points. Match the right column with the left column. Each forage species on the left will have an a, b, or c (these are the only letters which may be used more than once).

- **a**: Cool-season grass  
  a. Orchardgrass  
  b. Warm season perennial grass  
  c. Warm season annual grass  
  d. Causes vasoconstriction when fungus infested  
  e. Adapted to wet soils  
  f. Drought tolerant grass  
  g. Horse lovers, less dust and mold  
  h. Low production, early maturity, fire prone  
  i. Very productive, good regrowth  
  j. Identified by a “W” on the leaf

- **b**: Tall fescue  
- **c**: Downy brome  
- **d**: Crested wheatgrass  
- **e**: Sorghum-sudan  
- **f**: Reed canary  
- **g**: Corn  
- **h**: Timothy  
- **i**: Switchgrass  
- **j**: Smooth brome

14. 4 points. Birdsfoot trefoil is a better legume for grazing than most varieties of alfalfa. Give one animal reason and one agronomic reason why this is true.  

- **One animal reason**: It is less obat causing to cattle (safe)  
- **One agronomic reason**: It is not killed by grazing so doesn’t have to be resowed as much

15. 4 points. Someone is trying to sell you their barley. They tell you their barley is superior as it has 12.5% protein whereas most barley grown in your area is 10.5 to 11% protein. What do you think; is this probably a good barley or not? Explain your answer!  

No, because though it may have a higher protein content, there is a smaller energy content. Since barley is going to be primarily used for energy, it would definitely not be a better barley.

16. 3 points. What is meant by “heaving”, as in the case of what might happen to alfalfa? What causes this?  

This is the expulsion or partial expulsion of a root from the ground. Frost in fall causes this by causing the ground to expand and contract, thereby elevating the plant and then receding, thus leaving the root exposed.

17. 2 points. Name a good drought tolerant legume; has drought tolerance but generally poor quality forage.

Sainfoin
18. 2 points. Which popular legume propagates by stolons?

**White Clover**

19. 2 points. This specie of forage legume is a biennial because of poor disease resistance and sometimes may contain harmfully high levels of phyto-estrogens (nevertheless, I like this legume)?

**Red Clover**

20. 4 points. Name the active ingredient in Bloat'Guard. Why (or how) is this ingredient effective in reducing bloat?

**Poloxalene**
It stops the ruminal fluid from frothing thereby stopping the trapping of **CHL** in that froth thus causing bloat.

21. 5 points. You are comparing orchardgrass and red clover which where harvested at approximately the same stage of maturity.

Which would suspect will have the highest fiber (NDF) content?

**Orchardgrass**

Which would suspect would have the highest energy value; why?

Red clover because less fiber therefore more non structural carbohydrates = easier to convert into energy fiber quality? For animal

22. 4 points. Name a protein ingredient which is:

plant origin = **Soybean Meal**

animal origin = **Meat and bone meal**

**Pre Vet 00**

Van Der Weel

**RESERVED**