Name: _____

CASE

Activity 5.5.1 Rational Rules of Thumb

Purpose

The job of a nutritionist is not an easy task. One size does not fit all. Developing a diet or ration for an animal can be challenging. There are many considerations that affect the content and quantity of the ration. Not only do you have to consider all of the characteristics of the individual animal, but you must also take into account the quality of the feeds you are using.

A ration is the total amount of feed an animal consumes in a 24-hour period. A ration needs to provide the right amount of nutrients needed by the animal during its particular life cycle stage. A diet refers to the ration without reference to a specific period of time. Diets should be based on the needs of the animal being fed and the nutrient content of the feed available. How do you know how to mix feeds to ensure your animals get the proper nutrients?

Materials

Per student:

- *Modern Livestock and Poultry Production* text
- Calculator
- Pencil
- *Agriscience Notebook*

Procedure

In this activity, you will research several key facts for balancing a ration. Use the chapter "Balancing Rations" from the *Modern Livestock and Poultry Production* textbook, as a resource to complete this activity.

Part One – Discovery

There are many considerations when developing a ration for an animal. Read pages 155–167 from "Chapter 8 – Balancing Rations" in your textbook. As you read, use the concept of definition map on *Activity 5.5.1 Student Worksheet* to record important facts and guidelines for ration development.

A concept of definition map provides you with a structure for note taking to help you organize and record the most important facts. Read the content and use the map to summarize the key points presented in the reading. These notes will help you in future activities.

Part Two – Calculations

When producers are planning how much to feed, calculations are important. Use the notes you took in Part One to practice conversion and percentage problems.

A. Conversions

Determining the amount of feed versus water in a feedstuff is an important calculation an animal producer completes when planning how much to feed. Using your notes from Part One for assistance, convert dry matter to as-fed and vise-versa in the problems in *Activity 5.5.1 Student Worksheet*. Show your work for all problems and include proper units with your final answers.

B. Determining the Percentage of a Nutrient

Determine the percentage of a nutrient in Part B of *Activity 5.5.1 Student Worksheet*. The following equation can be used for any nutrient and for conversions from as-fed to dry matter or dry matter to as-fed.

$$\frac{\%\ nutrient\ (as-fed\ basis)}{\%\ DM\ of\ feed} = \frac{\%\ nutrient\ (DM\ basis)}{100\%\ DM}$$

Remember that percentage means per 100, so 70% means 70 per 100. Therefore, if you divide 70 by 100, you get 0.70, which is a decimal. To convert percentages to decimals, simply divide by 100. A simpler method is to move the decimal two places to the left and remove the % symbol. **Example**: 15.5% = 0.155

Example: What percent crude protein (CP) does a 44% CP soybean meal contain on a dry matter basis if the DM = 89%?	**Example**: What percent CP does 49.4% CP (DM basis) contain on an as-fed basis if the DM = 89%?
$$\frac{.44}{.89} = \frac{x}{1.00}$$ $$.89x = .44$$ $$x = 49.4\%\ CP\ (DM\ Basis)$$	$$\frac{x}{89} = \frac{49.4}{100}$$ $$100x = 4361$$ $$x = 44\%\ CP\ (As\text{-}fed\ Basis)$$

C. Application Problems

Apply the knowledge you have learned to actual situations on a farm. Complete the application problems in part C of *Activity 5.5.1 Student Worksheet* for practice.
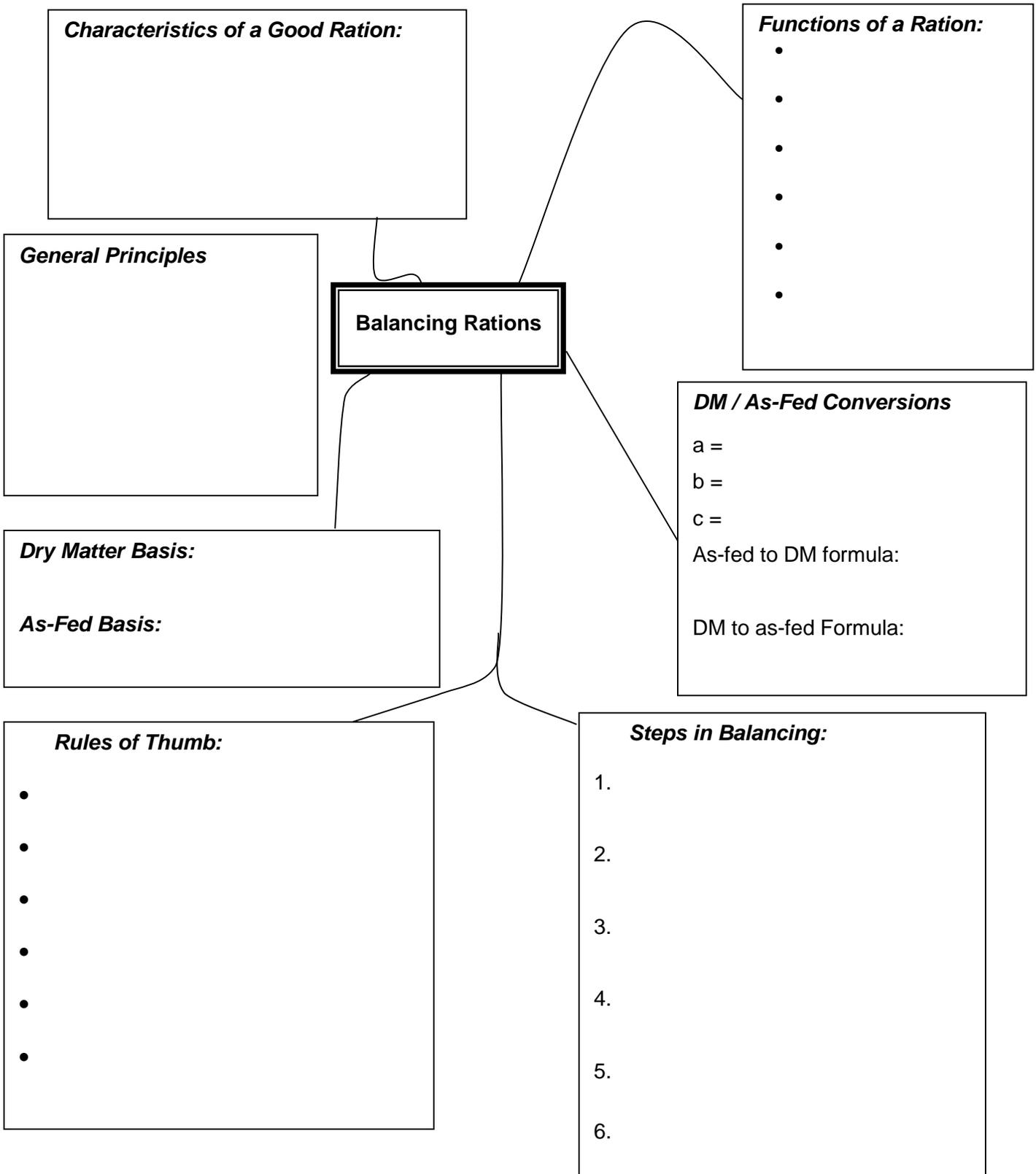
Conclusion

1. What are three characteristics of a good ration?

2. Why should the amount of feed provided equal or slightly exceed the feed intake per day of an animal?

3. Why is the amount of dry matter in a ration important?

4. Would a ration with 30% dry matter be suitable for a 120lb Suffolk ewe who consumes 12 pounds of feed per day?

Balancing Rations Concept of Definition Map

Characteristics of a Good Ration:

Functions of a Ration:
-
-
-
-
-
-

General Principles

Balancing Rations

DM / As-Fed Conversions

a =

b =

c =

As-fed to DM formula:

DM to as-fed Formula:

Dry Matter Basis:

As-Fed Basis:

Rules of Thumb:
-
-
-
-
-
-

Steps in Balancing:

1.

2.

3.

4.

5.

6.

A. Conversions – Dry Matter and As-Fed

1. If corn silage contains 78% moisture, what percentage of dry matter (DM) does it contain?

   Answer: _____

2. How many pounds of dry matter are in 100 pounds of corn silage with 78% moisture?

   Answer: _____

Explain how you derived your answer:

3. How many tons of dry matter are in 125 tons of the corn silage with 78% moisture?

   Answer: _____

4. A ration calls for 32.6 pounds of alfalfa hay on an as-fed basis. The alfalfa hay has 91.3 percent dry matter. How many pounds of dry matter are in the hay on a 100% dry matter basis?

   Answer: _____

5. A cow is fed 18 lbs of DM per day. The ration is 54% DM. How many pounds of as-fed feed will she consume in one day?

   Answer: _____

6. A horse needs 12 pounds of fresh orchard grass on a dry matter basis. Fresh orchard grass is 23% DM. How many pounds of fresh orchard grass must the horse consume per day?

   Answer: _____

B. Determining the Percentage of a Nutrient

1. What percent CP does a 45.2% CP (DM basis) cottonseed meal contain on an as-fed basis if the DM = 91%?

   Answer: _____

2. Complete the following table. Please show your work in the space provided below.

	%DM	% CP As-fed Basis	%CP DM Basis
a.	89.0	51.0	_____
b.	91.0	_____	53.0
c.	_____	4.0	13.0

   a.

   b.

   c.

3. On a DM basis, a feed has 16% CP and 3100 kcal/kg of metabolizable energy (ME). What are the CP and ME on an as-fed basis? Dry matter of the feed is 85%.

Show your work in the space provided.
   CP: ME:

   Answers: CP = _____%   ME = _____kcal/kg

C. Application Problem

Perennial ryegrass hay contains 9% CP on a DM basis. Therefore, 1 lb of hay provides .09 lbs of CP on a DM basis. How many pounds of dry matter are required to provide 1.5 lbs of CP?
Show your work in the space provided.

   Answer: _____

The perennial ryegrass hay above contains 90% DM. How many pounds of hay would you need to feed to provide the 1.5 lbs of CP on an as-fed basis? (How much hay would you have to put in front of an animal?) Show your work in the space provided.

Answer: _____

A cow will eat 2.5% of her body weight in good quality hay on a DM basis. How many pounds of hay would a 1000 lb Pinzgauer cow eat on a DM basis?
Show your work in the space provided.

Answer: _____

The Pinzgauer cow needs 1.5 pounds of CP per day. Could your cow meet her CP requirements eating the ryegrass? Why or why not? Use your answers from above to help determine your answer.