

Animal Nutrition

name: _____

date: _____

class: _____

Welcome, teachers, to your guide for successful student completion of the Animal Nutrition Plug-and-Play Lesson. This lesson will take approximately three class periods (120 minutes total) and will enhance and expand students' knowledge of animal nutrition. These activities are meant to be flexible for you to use as needed. Before students begin this activity, they will need soybeans, nutrient testing materials (listed below), a computer with internet access, a copy of the documents in the appendix, and a writing utensil.

Note: Soybeans are available for classroom use through **GrowNextGen.org**.

Activity 1: Soybean nutrients

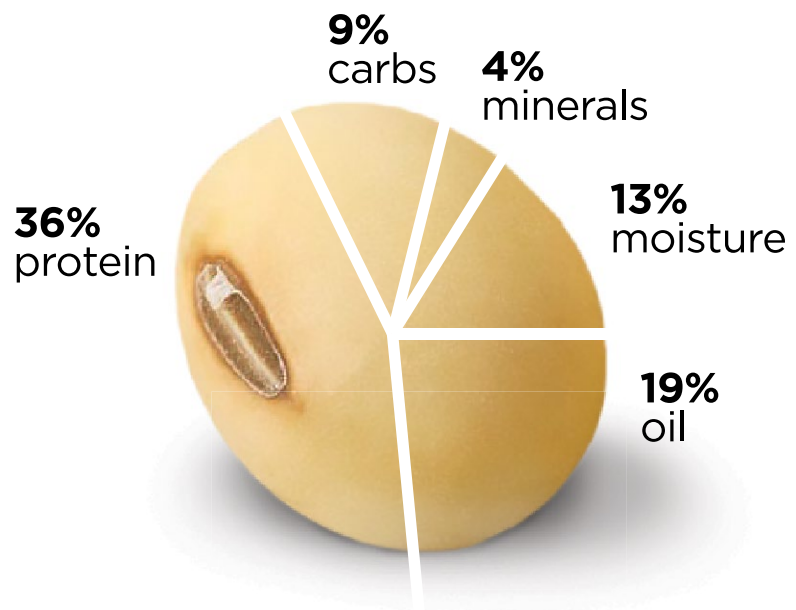
Macronutrients play a critical role in animal nutrition. **Proteins** help to build tissue and enzymes, **carbohydrates** provide fuel for the body, and **lipids** protect tissue and aid in neural development. Animal nutrition experts create feed for animals by blending different macronutrients and minerals together. Grains are a primary source for these macronutrients and soybeans are an important source of protein.

Take a look at the soybean chart below. Soybeans contain protein, lipids, and carbohydrates. Use the linked nutrient testing pdfs to test for these macronutrients in soybeans: **protein test**; **lipid test**; **carbohydrate test**. Share your results with the class. Nutrient testing documents can be found at grownextgen.org/curriculum/here-fishy-fishy.

Nutrient testing materials:

- Test tubes
- Timer
- Soybeans
- Disposable pipets
- Vortex
- Sudan III
- Biuret solution
- Distilled water
- Lugol's iodine
- P1000 micropipetter
- Beaker (250mL)
- Benedict's solution
- Stir sticks
- Test tube rack
- Microwell plates
- Corning hot plate
- Funnel
- Filter paper

What's in a soybean?



Activity 2: What's in a feed bag?

Purchasing a complete commercial feed for your animal can be confusing. Knowing how to read feed labels and selecting the most appropriate feed to meet the nutritional needs of your animal can be a challenge. Since feed is 60-80% of the total cost of raising your animal, knowing how to evaluate feed is critical to the consumer. To assist you in purchasing the right feed for your animal's nutritional needs, the feed label is required to include the following information.

All feed bags must have the following:

- Product name
- Product purpose statement (must state the animal species and animal class the feed is intended for)
- Guaranteed analysis (states levels of nutrients essential for the animal species and class)
- Ingredients in the product (must be listed in descending order by weight)
- Feeding directions (enhances the ability of the purchaser to use the product safely and effectively inline with the statement of purpose)
- Warnings and cautions of the product
- Drug ingredients
- Persons or firm responsible for the product
- Net weight of the package

Look at the sample feed label from Kalmbach Feeds below to help you understand how to read a feed label.

KALMBACH FEEDS
SINCE 1963

99999

2099MEC

KALMBACH

TARGET WEAN FIVE+

S.E.W. FORMULA ONE

Medicated

A complete swine starter feed formulated for control of swine dysentery (*vibrionic dysentery*, bloody scours or hemorrhagic dysentery); control of bacterial swine enteritis (salmonellosis or necrotic enteritis caused by *Salmonella choleraesuis*); for increased rate of weight gain and improved feed efficiency.

Active Drug Ingredients

Carbadox	50 g/ton
----------	----------

Guaranteed Analysis

Crude Protein (Min.)	23.0%
Lysine (Min.)	1.8%
Crude Fat (Min.)	5.0%
Crude Fiber (Max.)	2%
Calcium (Ca) (Min.)	0.80%
Calcium (Ca) (Max.)	0.95%
Phosphorus (P) (Min.)	0.7%
Salt (NaCl) (Min.)	1.25%
Salt (NaCl) (Max.)	1.75%
Selenium (Se) (Min.)	0.5 ppm
Zinc (Zn) (Min.)	2,500 ppm

Ingredients

Feeding Oatmeal, Dried Whey, Plant Protein Products, Dried Skim Milk, Spray Dried Animal Plasma, Grain Products, Lactose, Fish Meal, Animal and Vegetable Fat, Dicalcium Phosphate, Monocalcium Phosphate, Calcium Carbonate, dl-Methionine, L-Lysine, Choline Chloride, Vitamin A Supplement, Vitamin E Supplement, Artificial Sweetener and Flavor, D-Activated Animal Sterol (Source of Vitamin D-3), Niacin, Vitamin B-12 Supplement, Riboflavin, d-Calcium Pantothenate, Erythroquin (a preservative), Mequindione Sodium Bisulfite Complex (Source of Vitamin K Activity), d-Biotin, Folic Acid, Bacillus licheniformis, Bacillus subtilis, Thiamine Mononitrate, Pyridoxane Hydrochloride, Zinc Sulfate, Zinc Oxide, Ferrous Sulfate, Manganese Sulfate, Copper Sulfate, Ethylenediamine Dihydrochloride, Cobalt Sulfate, Selenium Yeast, and Sodium Selenite.

WARNING
Do not feed to swine within 42 days before slaughter. Not for use in pregnant swine or swine intended for breeding purposes

CAUTION: Do not use in feeds containing *bestonite*.

Feeding Directions
Feed during the initial 7 days after weaning to pigs that weigh 5 to 10 lbs. at 10 to 16 days of age.

Manufactured by
KALMBACH FEEDS, INC.
UPPER SANDUSKY, OHIO 43351

Net Weight - 50 LBS. (22.7 Kg.) - BULK - Shown on Invoice

311320-277-1

A. Our lot number - important tracking information.

B. Our product code – use for ordering.

C. Name or Title of Product.

D. Indicates this product is a medicated feed.

E. Purpose statement: species, class, medication reason, etc.

F. Type and amount of medication.

G. Nutritional Guarantees – minimum and/or maximum values that the product must meet if tested by approved laboratory methods.

H. Ingredients in the feed. Can be listed as individual ingredients or collective terms for a group of AAFCO* approved ingredients.

I. **Warning and caution statements** are required the FDA. Withdrawal or unsafe feeding instructions are listed here. *This feed has a 42 day withdrawal*

J. Recommended feeding directions for this product

K. Manufacturer responsible for feed.

L. KFI code for internal use only.

M. Net weight of package.

* AAFCO = Association of American Feed Control Officials. This organization sets standard guidelines for all feed companies to follow for labeling products.



Complete the following chart using the information from Joy Dog Food.

JOY BASIC BLEND

Guaranteed analysis

Crude Protein	21.0% min
Crude Fat	9.0% min
Crude Fiber	5.5% max
Moisture	10.0% max

Ingredients

Ground Yellow Corn, Wheat Middlings, Meat and Bone Meal, Corn Gluten Feed, Soybean Meal, Animal Fat (preserved with mixed tocopherols and citric acid), Natural Flavors, Corn Gluten Meal, Salt, Calcium Propionate (preservative), Potassium Chloride, Minerals (Zinc Sulfate, Ferrous Sulfate Monohydrate, Copper Sulfate, Manganese Sulfate, Calcium Iodate, Sodium Selenite), Vitamins (Vitamin A Acetate, D-Activated Animal Sterol (source of Vitamin D3), Choline Chloride, Vitamin E Supplement, Niacin, Calcium Pantothenate, Riboflavin, Pyridoxine Hydrochloride, Thiamine Mononitrate, Menadione Sodium Bisulfite Complex, Folic Acid, Biotin, Vitamin B12 Supplement).

JOY SUPER MEAL

Guaranteed analysis

Crude Protein	30.0% min
Crude Fat	20.0% min
Crude Fiber	3.0% max
Moisture	10.0% max

Ingredients

Chicken Meal, Brewers Rice, Chicken Fat (Preserved With Mixed Tocopherols And Citric Acid), Corn Gluten Meal, Pearled Barley, Oat Groats, Dried Beet Pulp, Natural Flavors, Dried Egg Product, Dicalcium Phosphate, Dried Brewers Yeast, Canola Oil, Fish Meal, Potassium Chloride, Salt, Dried Pumpkin, Minerals (Zinc Sulfate, Zinc Oxide, Zinc Protein, Ferrous Sulfate Monohydrate, Iron Protein, Copper Sulfate, Copper Protein, Manganese Sulfate, Manganese Protein, Calcium Iodate, Sodium Selenite), L-Lysine, DL-Methionine, Vitamins (Vitamin A Supplement, Vitamin D-3 Supplement, Vitamin E Supplement, Niacin, Calcium Pantothenate, Riboflavin, Pyridoxine Hydrochloride, Thiamine Mononitrate, Menadione Sodium Bisulfite Complex, Folic Acid, Biotin, Vitamin B-12 Supplement), Choline Chloride, L-Ascorbyl-2-Polyphosphate, Yucca Schidigera Extract.

Product information	Joy Basic Blend (50-pound bag)	Joy Super Meal (50-pound bag)
Crude protein (min)	21%	30%
Pounds of protein	10.5	15
Crude fat (min)	9%	20%
Pounds of fat	4.7	10
Crude fiber (max)	5.5%	3%
Pounds of fiber	2.8	1.5
Main ingredient	Ground yellow corn	Chicken meal
Dog activity recommendation	Adult dogs	Highly active dogs

Things to consider:

- Fat is energy-dense, providing almost 2.25 times as much energy, pound per pound, than carbohydrates or protein. Carbohydrates (fiber) and protein provide 4 calories/gram, whereas fats provide 9 calories/gram.
- The volume of stool is directly related to the amount of indigestible ingredients in the pet food. Some level of indigestible fiber from healthy sources is good, since fiber helps clean the digestive tract, stabilize blood sugar and maintain good weight. However, if the ingredient list includes a high amount of indigestible fiber, a lot of the food that goes in your dog's mouth passes right through his system and comes out the other end.

- Which pet food product will deliver more calories per pound? How can you determine this?

Joy Super Meal will provide more calories per pound than Joy Basic Blend. Joy Basic Blend provides 898.6 calories/pound with a ratio of 2:1: ½ Protein: Fat: Fiber, whereas Joy Super Meal provides 1,415.1 calories/pound with a ratio of 3:2:½ Protein: Fat: Fiber. Joy Super Meal has a higher protein and fat content, allowing for more calories per pound than Joy Basic Blend. To determine the calories per pound of pet food, determine the protein, fat, and fiber per pound of dog food, convert to grams and then multiply by calorie content (Protein 4 cal/g, Fat 9 cal/g, Fiber 4 cal/g).

- Which pet food product will your pet need to consume more of to maintain its body condition? What factors help you to determine this?

Your pet will need to consume a greater volume of Joy Basic Blend (898.6 calories/pound) due to its lower caloric content per pound. Joy Basic Blend has a lower ratio of protein to fat than Joy Super Meal.

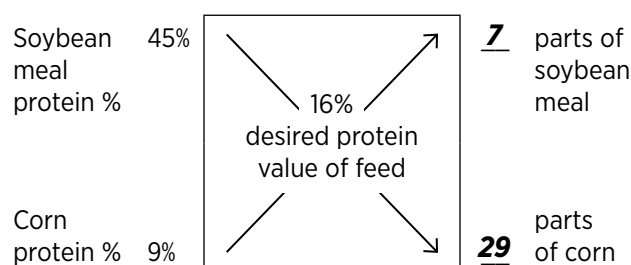
- As a consumer, which product is the most economical choice for your pet? How many pounds of dog food would you need of each product in order to reach your goal of 900 calories of pet food per day? If the Joy Basic Blend is three-quarters of the price of the Joy Super Meal, which is the most economical choice? Which choice will leave you with less clean-up in the yard?

You will need to feed 1 pound of Joy Basic Blend per day and only ½ of a pound of Joy Super Meal. Over a period of 50 days, you will feed the entire bag of Joy Basic Blend and only ½ of the bag of Joy Super Meal. If the cost of the Joy Basic Blend is only 75% of the cost of Joy Super Meal, you will pay out the same amount of money per time frame to feed each product. However, your pet will consume ½ more pet food product, leaving you with more clean-up later on.

Activity 3: Calculate feed recipes

Protein is one of the 6 essential nutrients (carbohydrates, protein, fat, vitamins, minerals and water) in an animal's diet. Proteins are composed of various combinations of up to 22 amino acids. Amino acids are the building blocks of proteins and are classified as either essential or nonessential in an animal's diet. Most animals can synthesize the nonessential amino acids. However, the essential amino acids cannot be synthesized and must be supplied to animals in their diet. Animals must consume protein to help grow new tissues, such as muscle, as well as to repair old tissues. Proteins also help animals with weight gain, gestation, milk production, growth, and overall wellness. Soybean meal is an important source of vegetable protein in most livestock diets with its high crude protein content of 44 to 50% and balanced essential amino acid composition.

Make a feed recipe by blending different ingredients together to create a 16% protein feed ration. It is important to know the right ratio of ingredients required for the feed. For example, soybean meal is 45% protein and corn is 9% protein. Calculate the amounts of each ingredient needed to get a 16% protein ration by using the Pearson square below.



- To use the Pearson square to determine the parts of each ingredient, find the difference in the desired protein value of the feed to be created from the chosen ingredients. In this example, to determine the parts of corn to be used in the recipe, find the difference of the desired protein value from the soybean meal protein value. Place your answer in the chart below.

Answer: (Soybean Meal Protein %) 45 - (Desired Protein %) 16 = 29 parts of corn

- To determine the parts of soybean meal, find the difference in protein value of the desired feed from the corn protein value. Place your answer in the chart below.

Answer: (Desired Protein %) 16 - (Corn Protein %) 9 = 7 parts of soybean meal

3. Calculate how many parts you will need in your feed mix by adding up the parts of soybean meal and corn for your feed recipe that you just determined.

Answer: 29 + 7 = 36 parts

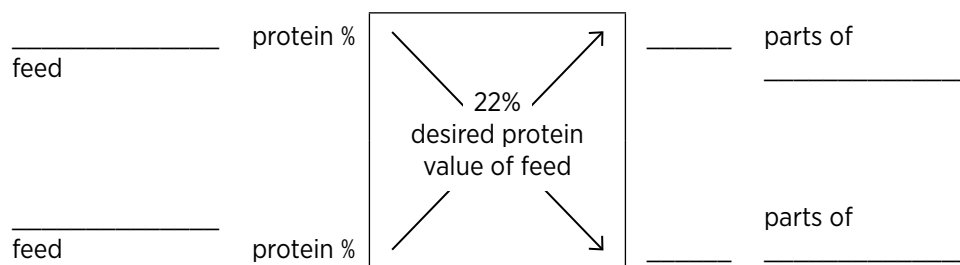
Animals will also need a vitamin and mineral mix added to their feed. Calculate it as 1 part of the feed ration to be added to the corn and soybean meal parts to complete your feed ration.

Ingredient	Protein value	Volume (equal parts)	Volume (%)
Soybean meal	45%	7	19%
Corn	9%	29	78%
Vitamins & minerals	0%	1	3%

4. What are the percentages of soybean meal and corn in this feed recipe used to create a 16% feed ration?

Corn = 78%
Soybean Meal = 19%

5. Create a 22% desired protein feed ration using the Pearson Square method below. Choose between the following possible ingredients to create your feed recipe. Fill in the the Pearson Square and the chart below to demonstrate your work.



Possible feed ingredient options:

- Corn (9%)
- Alfalfa (22%)
- Distiller's grains (25%)
- Soybean meal (45%)
- Soybean hulls (12%)
- Barley (14%)
- Wheat middlings (16%)
- Cottonseed (21%)
- Oats (12%)

Ingredient	Protein value	Volume (equal parts)	Volume (%)
Vitamins and minerals	0%	1	

Possible answers include:

- **Corn (9% Protein), 13, 35% + Soybean Meal (45% Protein), 23, 62% + Minerals (0%), 1, 3%**
- **Soybean Meal (45% Protein), 23, 72% + Barley (14% Protein), 8, 25% + Minerals (0% Protein), 1, 3%**
- **Distiller's Grains (25%), 3, 22% + Soybean Hulls (12% Protein), 10, 71% + Minerals (0% Protein), 1, 7%**
- **Soybean Meal (45% Protein), 23, 68% + Oats (12% Protein), 10, 29% + Minerals (0% Protein), 1, 3%**