Fertilizer Closed Note Exam 26 pts Name: _____

Grading: 0.5 attempt made at solving that makes sense; 0.5 pts for correct answer; 0.5 pts for correct cancelling; 0.5 for use of proper information

References:

Fertilizer Grade	Fertilizer Name
46-0-0	Urea (dry or liquid)
28-0-0	UAN (28%)
11-52-0	MAP – Mono-Ammonium Phosphate (Dry)
10-34-0	Liquid Ammonium Polyphosphate
18-46-0	DAP – Di-Ammonium Phosphate (Dry)
0-0-60	Potash (Dry or liquid)
21-0-0-24 (S)	AMS – Ammonium Sulfate

Fertilizer	Price
UAN	$232 per ton
Urea	$414 per ton
10-34-0	$450 per ton
DAP	$438 per ton
Potash	$370 per ton
MAP (Monoammonium phosphate)	$468 per ton
AMS (Ammonium sulfate)	$350 per ton

1. A customer comes to you wanting to make a fertilizer blend. He will need to put down N, P2O5, and K. He will be making a dry granular mix. He has a few options when mixing his blend for nutrients. He can either apply DAP or MAP to get P2O5. He asks you which one is cheaper. The fertilizer calculator at work says MAP is, however he disagrees with your excel sheet. So you write out a few calculations to show which one is cheaper.

a. You first explain to him that DAP and MAP have both nitrogen and P2O5 which both have value. So you have to split the cost of each between nitrogen and the P2O5. You don't know the value of the P2O5 or N so you estimate the value of one of the nutrients. To do this you find the value of N in the cheapest granular source of N – urea. This is because urea has a single nutrient so we can find the value of the nutrient. Show the calculations to find $/ pound of N in urea (2pts) ($/lb N)

$$\frac{\$414}{1\ \text{ton urea}} \times \frac{1\ \text{ton urea}}{2000\ \text{lbs urea}} \times \frac{100\ \text{lbs urea}}{46\ \text{lbs N}} = \frac{\$}{1\ \text{lb N}}$$

46-0-0

$0.45 / 1 lb N

b. You then show that you can use the price from letter (a) to estimate the value of nitrogen in one ton of DAP. Show the calculations to find the value of nitrogen in 1 ton of DAP using the value of nitrogen found in letter (a). Label answer $/ton of DAP (2pts)

18-46-0

$$\frac{2000 \text{ lbs DAP}}{1 \text{ ton DAP}} \times \frac{18 \text{ lbs N}}{100 \text{ lbs DAP}} \cdot \frac{\$0.45}{1 \text{ lb N}} = \frac{\$162}{1 \text{ ton DAP}}$$

c. You then show that you can use the price from letter (a) to estimate the value of nitrogen in one ton of MAP. Show the calculations to find the value of nitrogen in 1 ton of MAP using the value of nitrogen found in letter (a). Label answer $/ton of MAP (2pts)

11-52-0

$$\frac{2000 \text{ lbs MAP}}{1 \text{ ton MAP}} \cdot \frac{11 \text{ lbs N}}{100 \text{ lbs MAP}} \cdot \frac{\$0.45}{1 \text{ lb N}} = \frac{\$99}{1 \text{ ton MAP}}$$

d. Once we find the value of nitrogen in both fertilizers types we can **subtract** this from the total price of a ton of MAP or the price of a ton of DAP. Value is split in the price between nitrogen and phosphorus (P2O5). If we have an estimate of the value of nitrogen, the rest of the price is spent on phosphorus (P2O5).

i. What is the adjusted price of a ton of DAP without the value of nitrogen found in letter b? 1 pt (Answer $/ton DAP)

$$\frac{\$438}{1 \text{ ton}} - \frac{\$162}{1 \text{ ton}} = \frac{\$276}{1 \text{ ton}}$$

ii. What is the adjusted price of a ton of MAP without the value of nitrogen found in letter c? 1 pt (Answer $/ton MAP)

$$\frac{\$468}{1 \text{ ton}} - \frac{\$99}{1 \text{ ton}} = \frac{\$369}{1 \text{ ton}}$$

e. Once we have adjusted prices. We can calculate how much value of P2O5 for each fertilizer.

i. Use the adjusted price of DAP to find the ~~cost of one~~ pound of P2O5 ($/lb P2O5) (2pts)

18-46-0

$$\frac{\$276}{1 \text{ ton DAP}} \times \frac{1 \text{ ton DAP}}{2000 \text{ lbs DAP}} \times \frac{100 \text{ lbs DAP}}{46 \text{ lbs } P_2O_5} = \frac{\$0.30}{1 \text{ lb } P_2O_5}$$

ii. Use the adjusted price of MAP to find the cost of one pound of P2O5 ($/lb P2O5) (2pts)

11-52-0

$$\frac{\$369}{1 \text{ ton MAP}} \times \frac{1 \text{ ton MAP}}{2000 \text{ lbs MAP}} \times \frac{100 \text{ lbs MAP}}{52 \text{ lbs } P_2O_5} = \frac{\$0.35}{1 \text{ lb } P_2O_5}$$

2. You are given the attached soil test by the same customer. You will now design a dry blend for him based on NDSU recommendations using Urea, potash, and either DAP or MAP (pick whichever is cheapest)

a. **How much nitrogen is in the soil? 1 pt** 71 lb/acre

b. **What phosphorus test was used? 1 pt**

Olsen

The farmer is going to plant barley and is from a cool moist part up the state (northeast). You pull up the NDSU table:

Table 4-1. Barley, malting grade, in cooler, moister climates in North Dakota*.

Total available N**, pounds per acre	Soil Test P, ppm					Soil Test K, ppm				
	VL	L	M	H	VH	VL	L	M	H	VH
	0-3	4-7	8-11	12-15	16+	0-40	41-80	81-120	121-150	151+
	Pounds P_2O_5 per acre					Pounds K_2O per acre				
150	78	60	52	26	0	90	60	45	30	0

* Generally west and south of the Missouri River. see Figure 1.

**Total available N includes residual soil nitrate-N to a 2-foot depth, previous crop N credit, and supplemental N from fertilizers, manures or other sources. N rate is 120 pounds/acre in long-term (six years or more continuous) no-till systems.

From this table you see that you will need 150 pounds of **TOTAL** Nitrogen (the farmer isn't no till)

c. **Assume this is the same phosphorus test used in 2b. How much P2O5 do you need to add based on the chart and your soil test? 1 pt**

60 lbs/acre

d. **How much K2O do you need to add based on your soil test and the chart? 1 pt**

30 lbs/acre

e. **How much Potash do you put down? 2 pts**

$$\frac{30\text{ lbs } K_2O}{1\text{ acre}} \times \frac{100\text{ lbs Potash}}{60\text{ lbs } K_2O} = \frac{50\text{ lbs Potash}}{1\text{ acre}}$$ (lb/acre)

f. **How much DAP or MAP do you put down? (pick the cheapest option form question 1) 2 pts**

$$\frac{60\text{ lbs } P_2O_5}{1\text{ acre}} \times \frac{100\text{ lbs DAP}}{46\text{ lbs } P_2O_5} = \frac{130.43\text{ lbs DAP}}{1\text{ acre}}$$

Urea

g. **How much Nitrogen do you put down? 2 pts**

$$\frac{130.43\text{ lbs DAP}}{1} \times \frac{18\text{ lbs N}}{100\text{ lbs DAP}} = \frac{23.48\text{ lbs N}}{1\text{ acre}}$$

71 lbs in soil

$$150 - 23.48 - 71 = \frac{55.522\text{ lbs N}}{1\text{ acre}} \times \frac{100\text{ lbs Urea}}{46\text{ lbs N}} = \frac{120.7\text{ lbs Urea}}{1\text{ acre}}$$

Review $1 = 100\%$

3. Write 0.00054 as a percent 1 pt

$.054\%$

4. Write 33,000,000% as a number 1 pt

330,000

5. If a calf weighs 1400 pounds and sold for $2000, how much did it bring per cwt ($/cwt)? 1 pt

$\frac{\$2000}{1400 lbs} \times \frac{100 lbs}{1 cwt} = \boxed{\frac{\$142.86}{1 cwt}}$

6. The market says that 400 pound calves brought $169/cwt. How much does a 400 pound calf sell for? ($) 1 pt

$\frac{\$169}{1 cwt} \times \frac{4 cwt}{1} = \boxed{\$676}$

$\frac{\$1.69}{1 lb} \times \frac{400 lbs}{1} = \boxed{\$676}$

Nutrients In The Soil	
0-6"	71 lb/ac
Oxygen	6 ppm
	122 ppm
0-6"	100 lb/ac
0-6"	50 lbs/ac
	2.9 ppm
	0.37 ppm
	4.1 ppm
	2.5 ppm
	0.77 ppm
	553 ppm
	1000 ppm
	23 ppm
	4.10%