

Instructions:

Complete Question 1 (required) and 12 other questions from the 15 options.

All questions carry equal credit (10 points per question), except Question 1 (5 points)

The exam has a total of 125 points

Show working and units in any calculations

Time allowed: 1 hr 48 minutes

Question 1 (Required)

For one forage species you are familiar with, state:

Common name (0)

a) Latin name (1)

b) Name of one variety (1)

Write one key point on each of the following:

c) The most distinguishing feature to identify the species (1)

.....
.....

d) The main advantage/benefit of this species (1)

.....
.....

e) The biggest disadvantage/limitation with this species (1)

.....
.....

Question 2

Nitrogen, sulphur and phosphorous are all anions with contrasting chemistry that influences their importance in agriculture.

a) Which is the most important anion in determining the short-term (1-2 month) growth of forages?

b) Which is the most important anion in determining the long-term (1-2 year) growth of forages?

c) Which anion is the least limiting to forage growth in USA?

d) Which anion is the most soluble and volatile?

e) Which anion has the greatest potential to accumulate in soil?

Question 3

Complete the following Table by giving the most significant characteristic that defines each of the following groups; give one representative forage species for each row.

	Advantage	Disadvantage	representative species
C4 grasses			
C3 grasses			
Legumes			
Forb (non-grass, non-legume)			

Question 4

Complete the sentence with the most appropriate keyword from the following list: (protein, ergovaline hemicellulose, energy, rotation length, utilization, palatability, lactic acid, nitrate, prussic acid, dry matter, osmotic adjustment, residual mass)

- a) Rotational (or MIG) grazing is defined by the frequency and intensity of grazing events. Grazing frequency is measured by the, and grazing intensity is measured by the
- b) Physiological responses of forages to drought can include leaf rolling, stomatal closure, changed cell wall elasticity and
- c) The concentration of high quality forage is typically in the range 15-25%
- d) Non-toxic endophyte infected grasses have most of the benefits of endophyte infection but are free of

Question 5

A farmer from south-east Ohio has a 5 acre field, currently in tall fescue, that he wants to improve with better species for his cow-calf grazing operation (soil phosphate 10 ppm, pH=5.7)

- a) What would you recommend he does to the field prior to planting (and why)?

- b) What forage(s) do you recommend should be planted (and why)?

- c) By what method and at what time of the year should the field be planted (and why)?

- d) How should the field be managed in the first year after planting?

- e) Is there any other information you suggest the farmer consider prior to starting this operation?

Question 6

Following harvest and once in the silo or bunker, there are 4 main stages involved in silage fermentation. Write 1 sentence (2 sentences for (c)) describing the approximate duration and main processes during each of the following phases:

- a) aerobic (2)

- b) lag phase (2)

- c) fermentation phase (the key phase – 2 sentences required) (4)
 - (i)

 - (ii)

- d) stable phase (2)

Question 7 – multi-choice. Circle the only correct answer

- 7.1 LAB are critical for silage making. LAB is the abbreviation for:
- lactic acid, acetic acid, butyric acid
 - lysergic and butyric acids
 - lactic acid bacteria
 - legumes and bacteria
- 7.2 The Latin name for white clover is:
- Trifolium repens*
 - Trifolium pratense*
 - Trifolium ambiguum*
 - Medicago sativa*
- 7.3 ADF is the abbreviation for:
- all digested fiber
 - acid detergent fiber
 - acid detergent forage
 - abomasum-digested fiber
- 7.4 The difference between the ADF and NDF value of a forage is mainly due to:
- lignin
 - protein
 - water soluble carbohydrates
 - hemicellulose
- 7.5 A fertilizer labeled with the numbers 6-15-40 contains:
- 6% N
 - 6% NO_3^-
 - 15% NH_4^+
 - 6% P_2O_5
- 7.6 Bermuda grass pasture is established by planting sprigs (stolons) because:
- This is cheaper than other methods
 - This is the only way to maintain the genetic integrity of the pasture
 - Most Bermuda grass varieties do not produce seed
 - This method is the most reliable
- 7.7 The typical pH of silage is
- 2-3
 - 3-4
 - 4-5
 - 5-6
- 7.8 Bypass protein is the protein which:
- is bypassed during grazing
 - is digested during rumination
 - is not digested, and passes through the animal
 - is protected from digestion in the rumen and is digested in the intestine
- 7.9 In Ohio frost seeding is best done in:
- December
 - February
 - April
 - June
- 7.10 The toxicity of tall fescue endophyte is due to:
- ergovaline
 - dicoumarol
 - Mg deficiency
 - Low protein

Question 8

- a) Why do legumes generally have more protein than grasses?

- b) What is bypass protein?

- c) In Ohio, the highest forage protein values are usually found in first and second cut alfalfa - What range of protein concentrations are typically found in first and second cut alfalfa?

- d) In Ohio, the lowest forage protein values are usually found in late-winter tall fescue - What range of protein concentrations are typically found in late-winter tall fescue?

- e) What is a typical forage protein concentration in livestock feed?

Question 9

There are a huge number of species found growing in forage crops that are designated weeds.
Give the common name of one weed you are familiar with.

- a) Briefly describe why this species is a weed.

- b) Briefly describe the conditions or circumstances where this weed is typically found

- c) Briefly describe the lifecycle of that species

- d) Briefly describe one management strategy to reduce or control that weed

- e) Give one beneficial factor that the weed might have.

Question 10

- a) Give 4 reasons why forage-based farming systems might be more sustainable than traditional cropping systems
- b) In addition to the reasons in a) give 4 reasons why grazing-based livestock systems might be more sustainable than containment livestock systems.
- c) Give 2 factors that would make forage-based farming systems unsustainable

Question 11

The following Table summarizes examples of advantages and disadvantages of the main forage establishment methods. Complete the Table with TWO (2) examples in each of the six empty cells

	Advantages	Disadvantages
Full cultivation		
No-till (direct) drilling		
Frost seeding		

Question 12

Forages are unique in the diversity of options that are available and ways these can be used. In class we considered several of the less common options that are available to farmers. For the following table, give an example of one forage species in each of the categories, describe its main advantage and disadvantage

Category	Advantage?	Disadvantage?
Brassica crop		
Brown mid-rib summer annual crop		
winter stockpile		
Forage forb (‘weed’)		
cool season annual (small grain)		

Question 15

In 5 sentences describe how information gained from HCS412 might be useful in your future career.

a)

b)

c)

d)

e)