

Name _____

Lab Day _____

AS 212 ANIMAL NUTRITION

Final Examination

Monday, December 13, 2004 9:00 – 11:30 p.m.

(or)

Wednesday, December 15, 2004 3:00 – 5:30 p.m.

Questions 1 and 2 are compulsory. Answer these and three (3) other questions. Points for each question are shown in parentheses. Total points = 200.

QUESTION 1 (60 points)

- (a) What general aspect of nutrition has the greatest influence on reproductive performance of female animals? (2 points)
- (b) Name the principal nutrient sources of energy and nitrogen supplied to the sheep fetus and indicate how these nutrients are acquired from the maternal circulation. (8 points)
- (c) What is the role of brown adipose tissue in many neonatal animals? (4 points)

- (d) Graphically illustrate the concept of allometric growth of body components, using the three major carcass tissues as examples. Be sure to label the axes.



(3 points)

- (e) _____ is a whey protein in cow's milk which is also part of an enzyme complex that catalyzes the mammary synthesis of _____. (4 points)

- (f) The lipids in forages and grains consumed by lactating dairy cows are rich in polyunsaturated fatty acids, but the concentration of these fatty acids in milk fat is very low. Explain why. (5 points)

- (g) When a sled dog is in training its most important additional nutritional requirement is for _____, the magnitude of which can be estimated from daily measurements of _____ and _____. (6 points)

- (h) Why is metabolic body weight ($BW^{3/4}$) used to predict maintenance energy requirements in dogs but not in cats? (4 points)

- (i) Name two dietary causes of founder (laminitis) in horses. (4 points)

- (j) Which has the greater calcium requirement – a laying hen or a rapidly growing broiler chicken of similar body weight? Briefly explain your answer. (5 points)
- (k) Why does supplementary feeding of cereal concentrates to grazing dairy cows not always result in the expected increase in milk yield? (5 points)
- (l) Briefly discuss two metabolic effects of the immune cytokine, tumor necrosis factor- α , that contribute to the growth check experienced by young animals suffering from infectious disease. (5 points)
- (m) Outline the predisposing factors and sequence of metabolic events that lead to hepatic lipidosis (fatty liver) in cats. (5 points)

QUESTION 2 (50 points)

- (a) (i) Last summer, students at the University of Georgia repeated our quail trial in a building without adequate air-conditioning. Explain why in their trial the concentration of dietary protein required to maximize growth rate of young chicks of both high and low genotypes was significantly greater than in our trial. (6 points)

- (ii) A research group in the department has repeated the AN SC 212 lamb growth trial with the same dietary treatments we used in this year's class experiment (diet A, high energy, high protein; diet B, low energy, high protein), but with additional metabolic measurements. Using knowledge you gained in the lecture course, predict treatment differences (diet A vs. diet B) in the following measurements:

1. rate of hepatic gluconeogenesis
2. rate of muscle protein synthesis
3. rate of fatty acid synthesis in adipose tissue

Briefly explain your answers.

(9 points)

- (b) Discuss the concept “glucose sparing effect of pregnancy” in relation to the ability of previously well-conditioned beef cows that are underfed during late pregnancy to give birth to calves of normal birth weight. (10 points)

- (c) Discuss two examples of how the unusual metabolic characteristics of cats affect their nutrient requirements in relation to those of dogs and most other mammals. (10 points)

- (d) Explain why the inclusion of large amounts of cereal concentrates in the diets of high-yielding dairy cows has such an important positive influence on milk yield, with reference to mediating effects in the rumen, liver, and mammary gland. (15 points)

**THIS COMPLETES THE COMPULSORY SECTION OF THE EXAM.
ATTEMPT THREE (3) MORE QUESTIONS.**

QUESTION 3 (30 points)

(a) Discuss the significance of early feeding of colostrum to newborn dairy calves. (10 points)

(b) Why do laying hens have a high dietary requirement for linoleic acid? Explain how this requirement is met easily in American poultry feeding systems. (10 points)

- (c) This summer, poor forage growing conditions forced a local dairy farmer to use imported alfalfa hay in the close-up ration fed to late-pregnant dairy cows. He has been seeing a marked increase in the incidence of milk fever (parturient paresis) in his newly calved cows. Explain the problem and suggest how it may be avoided in future. (10 points)

QUESTION 4 (30 points)

- (a) Explain why a swine producer might consider moderately restricting the energy intake of pigs approaching market weight in order to be paid a premium for lean meat production. (10 points)

- (b) Discuss the significance of coprophagy in the nutrition of the rabbit and indicate how this practice affects the efficiency of utilization of plant protein compared to that of other nonruminant herbivores such as the horse. (10 points)

- (c) Your obese, geriatric dog has developed insulin-dependent diabetes mellitus. Explain how failure to treat his condition may lead to ketoacidosis. (10 points)

QUESTION 5 (30 points)

- (a) Plasma leptin concentrations are low in highly athletic women and in dairy cows during early lactation. Offer a common explanation for this observation and briefly explain how it might relate to the low fertility seen in both cases. (15 points)
- (b) Use your experience in the lamb growth trial to explain why cattle grazing mature, low-protein summer pasture responded poorly to urea supplementation. Suggest a nutritional solution to this lack of response. (15 points)

QUESTION 6 (30 points)

- (a) Describe the expected pattern of energy balance in a well-managed dairy cow during a normal annual production cycle. Discuss how this affects the synthesis of milk fat in early versus late lactation, with reference to the sources and mammary utilization of specific metabolic precursors.

(OR)

- (b) The cheetah and the African hunting dog are successful big-game predators with very different hunting styles. The cheetah can reach speeds greater than 60 mph within seconds, but can sustain this explosive activity for less than 2 minutes. In contrast, hunting dogs, working in cooperation, wear down their prey by steadily chasing it at much lower speeds for hours, if necessary. Contrast the major sources of ATP for muscle contraction in these two species, referring to extramuscular sources of energy where relevant.

