National Exams May 2013

04-Agric-A1, Animal or Human Physiology

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is A CLOSED BOOK EXAM.
   Candidates may use one of two calculators, the Casio or Sharp approved models.

3. FIVE (5) questions constitute a complete exam paper.
   The first five questions as they appear in the answer book will be marked.

4. Each question is of equal value.

5. Full marks cannot be gained just by getting the "correct" answer. You must also communicate clearly how the problem is solved.

20   1. Use a sketch to illustrate the variation of metabolic heat production by farm animals (homeotherm) with the effective ambient temperature, and indicate the following zones on the sketch, and briefly explain each zone.

           A: thermalneutral zone
           B: cool zone
           C: cold zone
           D: intolerably cold zone
           E: warm zone
           F: hot zone
           G: intolerably hot zone

20   2. The lower critical temperature (LCT) defines the lower boundary of the thermalneutral zone. Discuss how each of the following factors may affect LCT: flooring (including bedding); feeding; group size; and air movement.

20   3. Use a sketch to describe the partitioning of feed energy within animals. Give two examples of external stressors and discuss how they affect energy intake and its partition.

20   4. A homoeothermic animal must dissipate heat produced inside its body to the environment in order to maintain a constant bore temperature. (a) Use a sketch to show the paths of heat flow from the body core to the environment. (b) Describe the means by which animals adjust the rate of heat flow through its body when the environmental temperature changes.

20   5. Estimating heat production by animals is important in the design of heating and ventilation systems for animal buildings. According the ASABE Standards (American Society of Agricultural and Biological Engineers), sensible heat production by a 60-kg pig is 2.0 W/kg (W per kg of body mass) at 10°C ambient temperature, and 1.3 W/kg at 20°C. If a barn houses 1000 pigs of 70-kg at a temperature of 18°C, determine the total sensible heat production by the pigs in the barn. Assume the metabolic body size is $M^{0.6}$ for pigs.

20   6. In animal production systems, can short periods of illumination be offset by increasing light intensity? Explain why. Use a specific animal species as example in your discussion.