

2006 (modified 2012)



AUSTRALIAN AND NEW ZEALAND COLLEGE OF VETERINARY SCIENTISTS

MEMBERSHIP GUIDELINES

Animal Breeding and Genetics

INTRODUCTION

These Membership Guidelines should be read in conjunction with the *Membership Candidate Handbook*.

ELIGIBILITY REQUIREMENTS OF CANDIDATE

The candidate must meet the eligibility pre-requisites for Membership described in the *Membership Candidate Handbook*. This subject area is one in which experts may be non-veterinarians and therefore it is possible that the candidate may have worked with, sought guidance from, or been mentored by a person who is not a veterinary graduate. This is quite acceptable and is the preferred option if the best person available is not a veterinarian.

OBJECTIVES

Membership of the College by examination in Animal Breeding and Genetics is intended to demonstrate that the person has a sound understanding of the principals and application of the subject and is able to give proper advice in this discipline area to lay persons who own and breed animals, including those with substantial practical experience, and to other veterinarians.

LEARNING OUTCOMES

The candidate will be expected to have a sound knowledge of:

- The basic mechanisms of inheritance including the structure, role and behaviour of chromosomes and genes
- Mendelian inheritance and the factors that effect the segregation of genes

- The common phenotypes that are determined or influenced by one or a few genes, including coat colour and disorders with a genetic basis
- Molecular genetics, how DNA forms genes, how proteins are formed from DNA, and how modern molecular genetic techniques can be applied in animal breeding
- The behaviour of genes in populations of animals and the common mathematical models used to predict genetic events in animal populations
- Quantitative genetics and its application in animal breeding programs, from single herd or flock level up to national and international programs
- The factors which affect the success of breeding programs
- The application of advanced breeding technologies like AI, MOET, sexed semen and others to breeding programs and the implications of these for genetic improvement of animals
- The basis and application of cross-breeding programs
- The genetic evaluation programs commonly used in Australasia for dairy cattle, beef cattle, wool sheep, meat sheep, pigs and poultry (egg and meat)
- The industry structures which affect the way that genetic evaluation programs work in each species, and how genetic theories are best applied
- The issues currently facing breeders of the common domesticated species of animals in Australasia

The candidate will be expected to be able to:

- Apply his or her understanding of inheritance to explain the occurrence of common problems or opportunities for genetic improvement in animals and animal production, including genes which contribute to increased susceptibility to disease, increased resistance to disease, resilience to disease, or cause disease directly
- Apply his or her understanding of genetic principles to the selection for anthelmintic, insecticide or antibiotic resistance in invertebrates and micro-organisms that cause diseases in animals
- Devise a practical breeding program for breeders of farm animals, performance animals, working dogs and companion animals
- Distinguish between the important genetic decisions to be made by seedstock producers and commercial producers of livestock

- Use mathematical expressions which are common in quantitative genetics to predict the outcomes of particular approaches to genetic improvement
- Devise and use simple mathematical models, using computer software like spreadsheets or other programs, to develop, analyse and experiment with genetic decisions
- Apply his or her understanding of genetic principles to the breeding of unfamiliar animal species or populations
- Provide informed advice to lay persons and scientists about the merits of particular genetic decisions or genetic selection programs

EXAMINATIONS

The Membership examination has two sections.

Section 1 consists of two written papers (Paper 1 and Paper 2), each of two hours duration.

Section 2 consists of an oral examination of at least 45 minutes.

Each section contributes 50% to the overall mark for the subject.

Paper 1 and Paper 2 each contribute 50% of the marks in Section 1.

Section 1

Paper 1

This paper is designed to test the understanding of the basic genetic principles described in the Learning Outcomes. Questions may cite specific examples where genetic principles apply but the required answers should be expected to address the theoretical basis underlying each example. Calculations may be required and approved scientific calculators should be taken to the examination room.

Paper 2

This paper is designed to (a) test the candidate's ability to apply genetic principles to particular problems or particular tasks and (b) test the candidate's familiarity with the current practices and current issues which arise from animal breeding and genetics activities in Australasia. Calculations may be required and approved scientific calculators should be taken to the examination room.

Section 2

The oral examination will explore the candidate's knowledge and understanding of Animal Breeding and Genetics.. Candidates will not be expected to recall complicated

formulae or to do calculations in the oral examination. The oral examination will seek primarily to explore the candidate's understanding of genetic matters and the candidate's ability to advise interested persons on genetic matters.

RECOMMENDED READING LIST

The candidate is expected to read widely within the discipline, paying particular attention to areas not part of their normal work experiences. This list of books and journals is intended to guide the candidate to some core references and other source material. Candidates also should be guided by their mentors. *The list is not comprehensive and is not intended as an indicator of the content of the examination.*

Nicholas, FW 2003. **Introduction to Veterinary Genetics**. Blackwell, Oxford, England.

REFERENCE TEXTS

Barker, JSF, Hammond, K and McClintock, AE (eds) 1982. **Future Developments in the Genetic Improvement of Animals**. Academic Press, Sydney, Australia.

Bowling, AT and Ruvinsky, A (eds) 2000. **The Genetics of the Horse**. CAB International, Oxon, England

Dolling, CHS 1970. **Breeding Merinos**. Rigby Limited, Adelaide, Australia.

Falconer, DS and Mackay, TFC 1996. **Introduction to Quantitative Genetics**. Longman Group Ltd. Essex, England

Fries, R and Ruvinsky, A. 1999. **The Genetics of Cattle**. CAB International, Oxon, England

Gray, GD, Woolaston, RR and Eaton BT (eds) 1995. **Breeding for Resistance to Infectious Diseases in Small Ruminants**. ACIAR, Canberra, Australia

McGuirk, BJ (ed) 1987. **Merino Improvement Programs in Australia**. Australian Wool Corporation, Melbourne, Australia

Nicholas, FW 1987. **Veterinary Genetics**. Clarendon Press Oxford, England

Piper, L and Ruvinsky, A (eds) 1997. **The Genetics of Sheep**. CAB International, Oxon, England

Ruvinsky, A and Sampson, J (eds) 2001. **The Genetics of the Dog**. CAB International, Oxon, England

PERIODICALS

Animal Production
Animal Genetics
Australian Journal of Agricultural Research
Journal of Animal Breeding and Genetics
Journal of Animal Science
Livestock Production Science
Wool Technology and Sheep Breeding

PROCEEDINGS OF MEETINGS

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Association for the Advancement of Animal Breeding and Genetics (AAABG), Proceedings of Conferences, Australia and New Zealand.

World Congress on Genetics Applied to Livestock Production. Proceedings of Conferences, International, every four years.

INDUSTRY PUBLICATIONS

There is a large volume of information published for breeders and advisors by the organisations representing the major animal industries, including wool sheep, meat sheep, beef cattle and dairy cattle. Some of this can be sourced by contacting the industry bodies directly, some is available via the internet.

FURTHER INFORMATION

For further information contact the College Office

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