



# Australian and New Zealand College of Veterinary Scientists

## **Fellowship Examination**

June 2015

## **Veterinary Ophthalmology Paper 1**

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

**Section A:** Answer **ALL TWENTY (20)** Questions

**Section B:** Answer **ALL TEN (10)** Questions

**Section A:** Short Answer: Answer **TWENTY** questions each worth 4 marks. total 80 marks

**Section B:** Long Answer: Answer **TEN** questions each worth 10 marks..... total 100 marks

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# Paper 1: Veterinary Ophthalmology

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## SECTION A

Answer all twenty (20) questions

1. Answer **all** parts of this question:
  - a) State **two (2)** of the three DNA changes that result in hereditary disease. *(1 mark)*
  - b) State how many forms of progressive retinal atrophy (PRA) have been documented in Golden retrievers. Name the genes responsible for PRA in the Golden retriever. *(2 marks)*
  - c) In the Siberian husky, state what ocular disease is caused by an abnormality of the RPGR gene. *(1 mark)*
  
2. Answer **all** parts of this question:
  - a) State **two (2)** side effects of opioid sedation on ocular examination in animals. *(1 mark)*
  - b) State how many main locations at which the auriculopalpebral or palpebral nerves can be blocked in the horse. *(1 mark)*
  - c) Name **two (2)** local anaesthetics with a short onset of action which can be used for nerve blocks in horses. *(1 mark)*
  - d) Name **two (2)** local anaesthetics with a three to six hour duration used in horses. *(1 mark)*

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3. Answer **all** parts of this question:

- a) Name **two (2)** types of retinoscope. (1 mark)
- b) State the number of diopters retinoscopy allows the veterinary ophthalmologist to quantitatively determine the refractive error of the true refractive state. (1 mark)
- c) State the reason why cycloplegia is not necessary when performing retinoscopy in animals. (1 mark)
- d) According to a study of 14,400 adult dogs by Kubai et al in 2008, state to the nearest 5%, what percentage of dogs are anisometric. (1 mark)

4. Answer **all** parts of this question:

- a) State **four (4)** ways to measure *in vivo* corneal thickness. (2 marks)
- b) Ultrasound pachymetry has demonstrated a transient increase in central corneal thickness in canine phacofragmentation patients post operatively. State how long after surgery base line levels are achieved. (1 mark)
- c) Gerding et al in 2004, conducted an experiment using both specular microscopy and ultrasound pachymetry to assess the toxic effects of intracameral lidocaine on the corneal endothelium. State their findings. (1 mark)

5. Answer **all** parts of this question:

- a) The volume of suture material left in tissues increases logarithmically with increasing diameter. State the relative volume of material 7–0 and 8–0 sutures have in comparison to 9–0 suture material. (1 mark)
- b) Failure to achieve overlapping zones of compression may result in wound leakage. Name the mechanism by which the surgeon can increase the lateral extent of this compression effect. (1 mark)
- c) Name the deleterious effect on the cornea caused by overtightening a simple interrupted suture. (1 mark)
- d) Two benefits of a double continuous or counter suture pattern are better wound integrity should a suture break occur, and a more watertight seal. Name **two (2)** other advantages of such a suture pattern. (1 mark)

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6. Answer **all** parts of this question:

- a) The curve of microsurgical ophthalmic needles can be straight,  $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$  or  $\frac{1}{2}$  circles. State the expected difference between the bite patterns of a  $\frac{3}{8}$  needle and a  $\frac{1}{2}$  needle. (1 mark)
- b) State the minimum criteria that the length of a needle must satisfy in any given ophthalmic surgery. (1 mark)
- c) Name **four (4)** different types of suture needle tip geometry. (1 mark)
- d) State the range of depth to which the needle must pass in order to close a two step corneal incision. (1 mark)

7. The vitreous has essential physiologic and functional roles within the globe. Name **six (6)** of these functions. (4 marks)

8. Voriconazole 1% solution is the current treatment of choice for the treatment of fungal keratitis in horses. A recent study in veterinary ophthalmology investigated the stability of voriconazole 1% solution in a constant rate infusion pump for topical ocular delivery to horses.

Answer **all** parts of this question:

- a) In what material should voriconazole 1% be stored? (1 mark)
- b) Between what temperature range is voriconazole 1% stable? (1 mark)
- c) When correctly stored, how long does voriconazole 1% remain stable? (1 mark)
- d) What is the main problem encountered when using voriconazole 1% in a constant rate infusion? (1 mark)

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9. With respect to canine ocular neoplasia:
- a) Approximately what percentage of anterior melanocytic neoplasms are malignant? *(1 mark)*
  - b) What percentage of malignant melanomas affecting the eyes of dogs are choroidal in origin? *(1 mark)*
  - c) What are the **two (2)** most common neoplasms reported to metastasise to the eye of dogs? *(1 mark)*
  - d) What **two (2)** risk factors have been proposed to increase the risk of development of corneal squamous cell carcinoma in dogs? *(1 mark)*
10. A recent study by Wiggans et al (Veterinary Ophthalmology, 2014) evaluated the diagnostic utility of aqueous humour analysis in dogs and cats with uveitis.

Answer **all** parts of this question:

- a) Based on their conclusions, should aqueocentesis be performed based on the clinical grading of the degree of uveitis? Briefly explain why they arrived at this conclusion. *(1 mark)*
- b) Considering only dogs, aqueous humour cytology permitted the diagnosis of what type of general disease process? *(1 mark)*
- c) Considering only cats, how useful was aqueocentesis in determining an aetiological cause for uveitis? *(1 mark)*
- d) What was/were the predominant cell type(s) present in the entire chamber of cats with necropsy confirmed FIP and uveitis? *(1 mark)*

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11. A recent publication by Bell et al (Veterinary Ophthalmology, 2013) investigated septic implantation syndrome in dogs and cats.

Answer **all** parts of this question:

- a) List **four (4)** pathological characteristics of this disease. (1 mark)
- b) What was the primary cellular infiltrate present? (1 mark)
- c) Approximately what percentage of dogs and cats had infectious organisms identified histologically? (1 mark)
- d) What type of organism was seen most commonly? (1 mark)

12. Answer **all** parts of this question:

- a) In what **three (3)** ways is an ophthalmic drug distributed after topical application to the eye? (1 mark)
- b) What is the typical volume of a single drop from most ophthalmic dropper bottles? (1 mark)
- c) List **four (4)** factors known to influence corneal drug absorption. (1 mark)
- d) List **two (2)** general factors which increase corneal penetration of topically applied drugs. (1 mark)

13. Briefly state the mechanism of action of the following drugs:

- a) tropicamide (1 mark)
- b) pilocarpine (1 mark)
- c) chloramphenicol (1 mark)
- d) tissue plasminogen activator (tPA). (1 mark)

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14. With respect to pathogenic organisms which can cause ocular diseases in mammals:
- a) Name **four (4)** pathogenic Protozoa and their definitive host(s). *(1 mark)*
  - b) With respect to conjunctival scrapings, within what day range are Chlamydomphila inclusion bodies found in conjunctival cells of cats with this disease? *(1 mark)*
  - c) Which bacterium has two strains, one that is primarily extracellular, and one that is able to invade and live within host corneal epithelial cells? *(1 mark)*
  - d) Following exposure, what percentage of FHV-1 infected cats are reported to shed virus spontaneously or when naturally stressed? *(1 mark)*
15. In cetaceans (including dolphins), blood destined for the retina and the choroid first passes through the ophthalmic rete.

Answer **both** parts of this question:

- a) In the dolphin, the rete derives its blood supply from which structures? *(1 mark)*
  - b) State **three (3)** suggested functions for the ophthalmic rete in dolphins. *(3 marks)*
16. Answer **all** parts of this question:
- a) What are the palisades of Vogt? *(1 mark)*
  - b) Why are the palisades of Vogt useful in human autograft transplantation? *(2 marks)*
  - c) In horses there are no palisades of Vogt. Where specifically is the equivalent area located in this species? *(1 mark)*

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17. List **four (4)** abnormalities that are a feature of Peter's anomaly. (4 marks)
18. Answer **all** parts of this question:
- a) Define Bowman's layer. (1 mark)
  - b) What species have been reported to have a Bowman's layer? (2 marks)
  - c) Recently there has been some debate focused around the discovery of a new layer in the cornea named Dua's layer. Where specifically in the cornea is this new layer purported to be? (1 mark)

19. The precorneal tear film contains both nonspecific and specific antimicrobial substances.

Answer **all** parts of this question:

- a) Other than lysozyme, and lactoferrin, name **two (2)** nonspecific antimicrobial substances in the pre-ocular tear film. (1 mark)
  - b) What is the mechanism of action of lysozyme? (1 mark)
  - c) Where is lysozyme produced? (1 mark)
  - d) What is the mechanism of action of lactoferrin? (1 mark)
20. With respect to the photopigment regeneration process:
- a) What is the only step that takes place in the outer segment of the photoreceptor? (1 mark)
  - b) Where is opsin synthesised? (1 mark)
  - c) What **two (2)** vital roles does RPE65 play in the visual cycle? (2 marks)

**Section B over page**



## **SECTION B**

**Answer all ten (10) questions**

1. Answer **both** parts of this question:
  - a) Define toll-like receptors (TLRs) and pathogen-associated molecular patterns (PAMPS). *(5 marks)*
  - b) Briefly outline the role they play within the ocular innate immune response. *(5 marks)*
2. Outline the mechanism of action of topical calcineurin inhibitors (cyclosporine and tacrolimus). Based on the literature, justify their indications for use **and** comment on their side effects. *(10 marks)*
3. Briefly discuss drug penetration across the cornea after topical application. Your answer should include factors that influence corneal drug absorption. *(10 marks)*
4. Briefly describe the histopathological characteristics of **each** of the following conditions and briefly comment on the aetiology of **each** condition:
  - a) Spontaneous chronic corneal epithelial defects (SCCED) of dogs. *(2.5 marks)*
  - b) Feline lipogranulomatous conjunctivitis. *(2.5 marks)*
  - c) Feline corneal sequestration. *(2.5 marks)*
  - d) Multifocal retinopathies in dogs. *(2.5 marks)*

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5. Answer **all** parts of this question:

- a) The oculocardiac reflex is defined as a heart rate decrease from the basic value. By what percentage does the heart rate need to fall for this term to be applied? *(1 mark)*
- b) Describe the afferent and efferent pathways of the oculocardiac reflex. *(4 marks)*
- c) List **four (4)** clinically relevant ways this reflex can be initiated. *(4 marks)*
- d) A recent paper outlines how the oculocardiac reflex might be prevented in horses. What method do they recommend? *(1 mark)*

6. Three phases of iridocorneal angle maturation have been described.

Answer **both** parts of this question:

- a) Describe **each** of these phases. *(9 marks)*
- b) By what age is maturation of the pectinate ligaments complete in dogs? *(1 mark)*

7. Answer **all** parts of this question:

- a) Morphologically pectens can be categorised into **three (3)** forms. What are the **three (3)** forms of pecten called **and** give an example of a bird that is representative of **each**. *(3 marks)*
- b) How do the pectens of diurnal species differ from those of nocturnal species? *(1 mark)*
- c) The exact function of the pecten has not been determined. Give **four (4)** suggested functions of the pecten. *(4 marks)*
- d) What visual advantage does the pecten provide over the situation found in the human eye? *(1 mark)*
- e) What is the embryological origin of the pecten? *(1 mark)*

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8. In a recent paper by Gould et al (Veterinary Ophthalmology, 2011), 30 different breeds of dogs were screened for genetic abnormalities for primary lens luxation (PLL).

Answer **all** parts of this question:

- a) Name and describe the genetic mutation found to cause PLL in this study. *(3 marks)*
  - b) Name **one (1)** of the two breeds with the highest frequency of the genetic mutation described in this paper. *(1 mark)*
  - c) Name **one (1)** breed that has been shown to have an increased risk of PLL that did not show the genetic mutation being tested. *(1 mark)*
  - d) One breed in particular was shown to have an incidence of PLL of 5% in heterozygotes. Name the breed. To the nearest 5%, state what the overall lifetime incidence of clinically recognisable PLL is across the whole breed. *(2 marks)*
  - e) Human patients with mutations of a similar gene have also been identified. Name **one (1)** clinical abnormality associated with this mutation in humans. *(1 mark)*
  - f) Gould et al speculate that a specific physical criterion that has been selected for in dogs has inadvertently increased the incidence of the genetic mutation causing PLL. Name the physical characteristic suggested. *(1 mark)*
  - g) Name the breed in this study that had PLL, and was homozygous for the mutation, but had not been previously described. *(1 mark)*
9. With reference to the **three (3)** main types of instrumental tonometry used in veterinary ophthalmology, explain the mechanism and any associated physical principles by which they measure intraocular pressure. *(10 marks)*

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10. The lens has a very basic anatomic design.

Answer **all** parts of this question:

- a) List **four (4)** components integral to this design. (2 marks)
- b) From what embryologic tissue is the lens derived? (1 mark)
- c) List **six (6)** congenital lens anomalies. (3 marks)
- d) Describe the embryonic vascular supply of the lens, making note as to when **each** part regresses. (4 marks)

**End of paper**



# Australian and New Zealand College of Veterinary Scientists

## Fellowship Examination

June 2015

## Veterinary Ophthalmology Paper 2

Perusal time: **Twenty (20)** minutes

Time allowed: **Three (3)** hours after perusal

**Section A:** Answer **ALL TWENTY (20)** Questions

**Section B:** Answer **ALL TEN (10)** Questions

**Section A:** Short Answer: Answer **TWENTY** questions each worth 4 marks. total 80 marks

**Section B:** Long Answer: Answer **TEN** questions each worth 10 marks.....total 100 marks

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# Paper 2: Veterinary Ophthalmology

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## SECTION A

Answer all twenty (20) questions

1. In relation to the use of spring-loaded mouth gags in cats:
  - a) What ocular and general health problems may be associated with their use? *(3 marks)*
  - b) Occlusion of which artery is thought to be responsible for these conditions in answer 1 a)? *(1 mark)*
  
2. Equine corneal diseases are a common clinical problem. Management of a deep corneal stromal abscess in particular can be a significant challenge for veterinary ophthalmologists. A recent two-part study of 51 horses by Henriksen (Veterinary Ophthalmology, 2014) investigated the clinical and pathological aspects of this disease.

Answer **all** parts of this question:

- a) Name the **four (4)** categories identified based on clinical appearance. *(1 mark)*
- b) Which clinical categories were most likely to be histologically associated with fungal organisms? *(1 mark)*
- c) Only 5.9% of horses sampled cultured positive for fungal organisms. What percentage of horses had a histologically confirmed fungal diagnosis? *(1 mark)*
- d) What was the association between histologically confirmed fungal stromal abscess and degree of corneal vascularisation? *(1 mark)*

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3. With respect to non-healing corneal ulcers in horses:
- a) What is the typical clinical age of horses with this condition? *(1 mark)*
  - b) What are the typical clinical signs? *(1 mark)*
  - c) Name **two (2)** surgical procedures that have been shown to be most effective in the treatment of this type of corneal ulceration in horses. *(1 mark)*
  - d) Name **two (2)** treatment factors, surgical or other, that have been shown to be less effective in the treatment of this type of corneal ulceration in horses. *(1 mark)*
4. Briefly outline the aetiopathogenesis and clinical appearance of the following conditions:
- a) chromodacryorrhea in rats *(1 mark)*
  - b) conjunctival overgrowth in rabbits *(1 mark)*
  - c) hypertrophic uveal bone formation in guinea pigs *(1 mark)*
  - d) retained spectacles in snakes. *(1 mark)*
5. List the neuro-ophthalmic clinical signs that may be seen with the following conditions:
- a) congenital stationary night blindness in Appaloosa horses *(1 mark)*
  - b) hydrocephalus in a Cavalier King Charles spaniel *(1 mark)*
  - c) partial albinism and retinal hypopigmentation in Siamese cats *(1 mark)*
  - d) otitis media in dogs. *(1 mark)*

**Continued over page**

6. With respect to systemic hypertension in dogs:
- a) List the known causes of secondary hypertension in dogs. *(1 mark)*
  - b) List the ocular lesions associated with disease. *(1 mark)*
  - c) What is the suggested normal range of repeatable systolic blood pressure measurement in a calm, untreated dog? *(1 mark)*
  - d) Name **two (2)** classes of drugs used to manage systemic hypertension in dogs. *(1 mark)*
7. Answer **all** parts of this question:
- a) Keratoconjunctivitis sicca has been reported to occur in what percentage of cases of nictitans glands that remain prolapsed. *(1 mark)*
  - b) From which artery does the third eyelid receive its blood supply? *(1 mark)*
  - c) What type of gland is the nictitating membrane gland? *(1 mark)*
  - d) In cases of prolapse of the nictitans gland, what recurrence rate has been reported for orbital anchoring techniques? *(1 mark)*
8. Answer **all** parts of this question:
- a) Which **three (3)** dog breeds have been reported in the literature to suffer from uveal cyst-associated glaucoma? *(1.5 marks)*
  - b) From what embryological origin do uveal cysts derive? *(0.5 marks)*
  - c) Give **four (4)** proposed mechanisms by which uveal cyst-associated glaucoma may arise. *(2 marks)*

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9. In cases of neurogenic keratoconjunctivitis sicca where there is ipsilateral xeromycteria:
- a) Where is the lesion most likely to be found **and** why? (2 marks)
  - b) What is the recommended starting dose for 1% pilocarpine? (1 mark)
  - c) A recent paper (Matheis, Veterinary Ophthalmology, 2012) found the disease to be self-limiting in what percentage of cases. (1 mark)
10. Three main methods of providing globe akinesia have been described – retrobulbar anaesthesia, sub-Tenon's anaesthesia and systemic atracurium.

Answer **all** parts of this question:

- a) List **three (3)** advantages of sub-Tenon's anaesthesia compared with systemic atracurium. (1.5 marks)
  - b) Describe how you would perform a sub-Tenon's anaesthesia procedure. (1.5 marks)
  - c) Retrobulbar haemorrhage or inadvertent injection of a local anaesthetic into a blood vessel are two possible disadvantages of retrobulbar anaesthesia. List **two (2)** other potential disadvantages of this technique. (1 mark)
11. List **four (4)** factors that contribute to tear staining syndrome. (4 marks)
12. Describe how you would perform a medial canthoplasty in a brachycephalic dog. (4 marks)
13. Outline the causes of calcium degeneration in the cornea. (4 marks)

**Continued over page**

14. Phacoclastic uveitis is a potentially devastating disease that is best-managed using phacoemulsification to remove the lens material. What are the proposed mechanisms for persistence of the uveitis after surgical intervention? (4 marks)
15. With respect to corneal ulcers and their management:
- a) List **four (4)** protease inhibitors that have been recommended for the treatment of melting ulcers. (2 marks)
  - b) List **four (4)** benefits of protease inhibitors in the treatment of corneal ulcers. (2 marks)
16. Answer **both** parts of this question:
- a) Outline why alkali burns are more damaging to the eye than acid burns. (2 marks)
  - b) List **two (2)** advantages of amniotic membrane in corneal surgery. (2 marks)
17. Systemic disease can cause cataracts. Describe the appearance of the cataracts associated with the following conditions and briefly state their pathogenesis:
- a) diabetes mellitus (2 marks)
  - b) hypocalcaemia. (2 marks)
18. Answer **both** parts of this question:
- a) List **four (4)** differential diagnoses for a swollen optic nerve head. (2 marks)
  - b) MRI can aid in the investigations of 'swollen discs'. Briefly describe this test making reference to the technique. (2 marks)
19. Briefly describe the **three (3)** broad categories of glaucoma in cats. (4 marks)
20. Prior to cataract surgery there are tests that should be used to determine if the patient is a good surgical candidate. Name these tests and briefly describe why they are performed. (4 marks)

**Section B over page**

## SECTION B

Answer all ten (10) questions

1. Briefly discuss persistent hyperplastic primary vitreous / persistent hyperplastic tunica vasculosa lentis syndrome (PHPV / PHTVL). Your answer should include a definition of the syndrome, reference to breeds affected and studied extensively, embryologic day at which the maldevelopment occurs, and candidate genes for the syndrome. (10 marks)
2. Define a retinal detachment. Discuss types and subtypes of retinal detachment, including pathogenesis of these types. (10 marks)
3. Conjunctival neoplasia occurs infrequently in the dog.

Answer **both** parts of this question:

- a) Compare and contrast melanomas, mast cell tumours and haemangiomas / haemangiosarcomas of the conjunctiva. In your answer address the predisposing factors, most common locations, biological behaviour, treatment and prognosis of **each** of these tumours. (9 marks)
  - b) Other than the tumours listed above, what other tumour types have been reported in the canine conjunctiva. (1 mark)
4. Eyelid lacerations are common in horses. Describe your surgical approach to this problem. Your answer **need not** address sedation or regional nerve blocks. (10 marks)
  5. A 10-year-old female Dachshund presents with sudden disturbance of vision over the last 48 hours. Develop an algorithm that outlines your clinical examination of this patient to help you differentiate the location of the lesion. The use of a flow diagram is encouraged but is not essential. (10 marks)

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6. Briefly outline the ocular manifestations of the following diseases:
- a) *Streptococcus equi* (Strangles) in horses. (2.5 marks)
  - b) *Encephalitozoon cuniculi* in rabbits. (2.5 marks)
  - c) Protothecosis in dogs. (2.5 marks)
  - d) Bracken fern toxicity in cows. (2.5 marks)
7. With respect to ocular squamous cell carcinoma (SCC) in cattle:
- a) Describe the clinical signs. (1 mark)
  - b) With respect to the ocular structure affected, what is the relative frequency of distribution of lesions? (2 marks)
  - c) Briefly outline the disease stages and their different appearances. (6 marks)
  - d) List the treatment options for eyelid SCC in cattle. (1 mark)
8. With reference to the clinical use of cryotherapy:
- a) List **four (4)** ophthalmic diseases that may be treated with cryosurgery. (2 marks)
  - b) The mechanism of action of cryotherapy has an immediate, a delayed, and a late phase. Describe **each** of these phases. (5 marks)
  - c) Describe the protocol that maximises cellular destruction. (1 mark)
  - d) With reference to the recent literature, why might cryosurgery be useful for the treatment of pigmentary keratitis **and** what are its limitations in the treatment of this condition? (2 marks)

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9. Describe the clinical syndrome of eosinophilic myositis of the muscles of mastication (MMM). Include a discussion of the aetiology, clinical signs, differential diagnoses, diagnosis, treatment and prognosis of this condition. *(10 marks)*
10. With respect to the insertion of gonioimplants for the treatment of glaucoma, higher success rates may result when the gonioimplant is employed early in the disease process:
- a) Give **six (6)** reasons that have been suggested for this apparently higher success rate. *(3 marks)*
  - b) Outline the ideal post-surgical management of these cases. *(7 marks)*

**End of paper**