

Candidate Number:

The Institute of Animal Technology



MEMBERSHIP EXAMINATION 2003

Section A - ANIMAL TECHNOLOGY

Morning, Wednesday 11th June

(TOTAL TIME: 3 HOURS)

Part I

Short Answer Questions

(One half of the total marks)

Part II

Long Answer Questions

(One half of the total marks)

Write your candidate number at the top of this cover

Read the instructions for each part carefully

Part I

Attempt ALL Questions

You are advised to spend one and a half hours on this part

Write your answers in the spaces provided

Numbers in brackets indicate the marks available for each question

***Hand in this book, together with your answers for Part II,
at the end of the examination***

1. Give **two** invasive and **two** non-invasive methods of identifying a laboratory beagle and its pen mates.
State **one** different disadvantage for each method.

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(6)

2. Suggest **two** reasons for providing laboratory guinea pigs with a daily supplement of fresh green vegetables.

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(1)

3. Which vitamins are responsible for the following;

a) maintaining the integrity of connective tissue?

.....

(½)

b) assisting with the deposition of calcium in bones?

.....

(½)

c) supplying the source for the synthesis of rhodopsin in the retina?

.....

(½)

d) providing essential blood-clotting factors?

.....

(½)

4. Which inorganic elements (minerals) are needed in the diet of laboratory animals for the following;

a) hardening the enamel of teeth?

.....
($\frac{1}{2}$)

b) the synthesis of haemoglobin?

.....
($\frac{1}{2}$)

c) assisting with blood coagulation?

.....
($\frac{1}{2}$)

d) the synthesis of thyroid hormone?

.....
($\frac{1}{2}$)

5. The following features are found in a box designed for the transport of small rodents from a breeding establishment to a customer. There is at least one reason for each of the features listed. Explain the reasons.

a) The board from which the box is made incorporates a layer of wire mesh. (1 reason)

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.....

b) The internal and external surfaces of the board are coated with a plastic membrane. (2 reasons)

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.....

c) The walls of the box slope inwards from bottom to top. (1 reason)

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.....

d) The ventilation holes are covered with wire mesh. (2 reasons)

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.....

e) The wire mesh in the ventilation holes is covered with a layer of fibrous material. (1 reason)

.....
.....

f) The box contains sachets of a gel. (1 reason)

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.....

g) In use, the lid is taped securely in place with impervious plastic adhesive tape. (2 reasons)

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.....

(10)

6. List **five** items of information that should be included on a label attached to an animal transport container.

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(2½)

7. Define the term 'environmental enrichment'.

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(2)

8. List **five** possible disadvantages of using items in laboratory animal cages to enrich the environment.

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(2½)

9. Describe briefly **two** ways in which a laboratory animal might be able to exert control over its microenvironment.

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(2)

10. Give **four** reasons why animals may be housed in an isolator.

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(4)

11. Fill in the open cells of the following table.

Primary Host	Pathogen Category	Pathogen Example
Mouse	Virus	
		<i>Toxocara canis</i>
Mouse	Cestode	
Cat	Insect	
Rabbit	Protistan	
		<i>Fasciola hepatica</i>
Cattle	Spore forming bacteria	
		<i>Microsporium</i>
		<i>Streptococcus pneumoniae</i>
		<i>Psoroptes cuniculi</i>

(7½)

12. a) Name **three** hereditary diseases of laboratory animals.

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(1½)

b) Name **two** common diseases of ageing rats.

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(1)

c) List **five** other causes of non-infectious disease in laboratory animals.

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(2½)

13. Explain the difference between a direct and an indirect parasitic life cycle.

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.....

(2)

14. State what is meant by each of the following means of disease control.

a) Therapeutic treatment

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.....

(1)

b) Prophylactic treatment

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.....

(1)

c) Radical action

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.....

(1)

15. Define the term 'sterilisation'.

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(2)

16. State **four** methods of sterilising a glass drinking bottle.

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(2)

17. Give **three** factors which affect the dose of gamma irradiation received by an item during sterilisation.

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.....

(1½)

18. Briefly describe **four** differences between a ventilation system designed to exclude pathogens and one designed to contain pathogens.

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(4)

19. Give **four** reasons why a barrier maintained environment may break down.

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(2)

20. List the **four** criteria that are used to allocate pathogens to one of the four hazard groups by the Advisory Committee on Dangerous Pathogens.

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(4)

21. Give **one** advantage and **one** disadvantage of administering substances to animals by the following routes:

a) intravenous

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(1)

b) subcutaneous

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.....

(1)

c) intramuscular

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(1)

22. List **seven** factors that should be considered before choosing a method for the withdrawal of blood from a laboratory animal.

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(7)

23. State the aims of:

a) local anaesthesia

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(2)

b) general anaesthesia

.....
.....

(2)

24. Give **one** example of:

a) an inhalation anaesthetic

.....

(1)

b) an injectable local anaesthetic

.....

(1)

c) an injectable general anaesthetic

.....

(1)

25. Give **four** ways in which the depth of anaesthesia can be monitored.

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(2)

26. List **four** signs which may indicate crisis in an animal during recovery from an operation.

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(2)

27. List **eight** factors which influence the choice of method for euthanasia.

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(4)

Questions 28-33 relate to the Animals (Scientific Procedures) Act 1986

28. Identify the individual responsible for each of the following:

Ensuring that any protected animal which is not the immediate responsibility of a personal licensee and which is found to be in severe pain or severe distress that cannot be alleviated is killed promptly.	
Maintaining records of the source, use and final disposal of animals held for scientific procedures.	
Arranging for the killing of an animal suffering adverse effects at the end of a series of procedures.	
Granting a project licence.	
Ensuring the appropriate use of anaesthesia during a regulated surgical procedure.	

(2½)

29. For each of the following animals name an appropriate Schedule 1 method of killing, other than an overdose of an anaesthetic:

a) domestic fowl weighing 2kg

..... *(½)*

b) rat weighing 800g

..... *(½)*

c) calf aged 2 months

..... *(½)*

d) rat foetus on day 19 of gestation

..... *(½)*

30. After undertaking one of the appropriate methods of humane killing, Schedule 1 requires that the process of euthanasia is completed in one of **six** ways. Name them.

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.....

(3)

31. A project licence is granted only after the costs and benefits of the programme of work have been weighed. Explain what is meant by **cost** and **benefit** in this context.

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(2)

32. List **eight** responsibilities of the Named Animal Care and Welfare Officer.

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(4)

33. For each of the following state whether the procedure is regulated or non-regulated. In each case where the procedure is identified as non-regulated give the reason why that conclusion has been reached.

a) Removal of the adrenal glands from a young adult rat that has been killed by decapitation.

.....
.....

b) Ear punch biopsy in mice for genotyping.

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.....

c) Inoculation of embryonated hens eggs on day 8 of incubation with virus recovery two days later.

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.....

d) Blood sampling of sentinel animals in a rodent breeding colony.

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(3½)

34. The humane use of animals in scientific procedures is guided by three moral and ethical principles (the 3Rs). Name the 3Rs and explain the three principles.

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(4½)

35. List **six** areas of work that Good Laboratory Practice (GLP) covers in the animal facility.

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(3)

36. List **six** steps by which a Standard Operating Procedure (SOP) is prepared and implemented.

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(3)

37. Complete the following table.

Animal	Breeding Season	Length of Oestrous Cycle	Duration of Oestrus	Gestation Period	Litter Interval
Cow					
Sheep					
Goat					
Pig					
Horse					

(12½)

38. Complete the following.

A foal is a

A gilt is a

A gelding is a

A tup is a

(4)

39. State **four** methods that may be used to ascertain that pregnancy has occurred in farm animals.

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.....

(4)

40. Name **three** breeds of pigs used in research.

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(3)

41. Describe **three** commonly used breeding systems that may be used for the continuing production of a herd of Friesian cows.

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(3)

42. Give an example of a farm animal that is

a) an omnivore

..... (1/2)

b) a ruminant herbivore

..... (1/2)

c) a non ruminant herbivore

..... (1/2)

43. Name the chambers of a ruminant stomach.

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.....
.....
..... (2)

44. State the function of the first chamber of a ruminant stomach.

.....
..... (2)

45. What colour male chicks would result from pairing a Rhode Island Red cockerel to a White Sussex Hen?

..... (1/2)

46. What is the purpose of adding oyster shell and grit to a poultry diet?

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.....

(2)

47. State **three** forms of food that may be offered to poultry.

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(1½)

48. Name **three** methods for housing poultry.

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(1½)

49. State the difference between Broiler and Layer strains of chicken.

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(2)

50. Name the species of bird included in Schedule 2 of the Animals (Scientific Procedures) Act 1986.

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(1)

51. Give **three** important factors when storing eggs for hatching.

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.....
.....

(1½)

52. What is the incubation temperature of the chicken egg?

.....

(1)

53. How long is the incubation period for the chicken egg?

.....

(1)

54. State **two** methods of incubating chicken eggs.

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.....

(2)

55. State **four** reasons for the cryopreservation of a genetically modified rodent strain.

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(4)

56. Define the term 'knock out' in relation to genetically modified mice.

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(1)

57. State **four** methods of obtaining samples suitable for checking the genetic authenticity of a genetically modified mouse strain.
Give **one** advantage or **one** disadvantage for each (different in each case).

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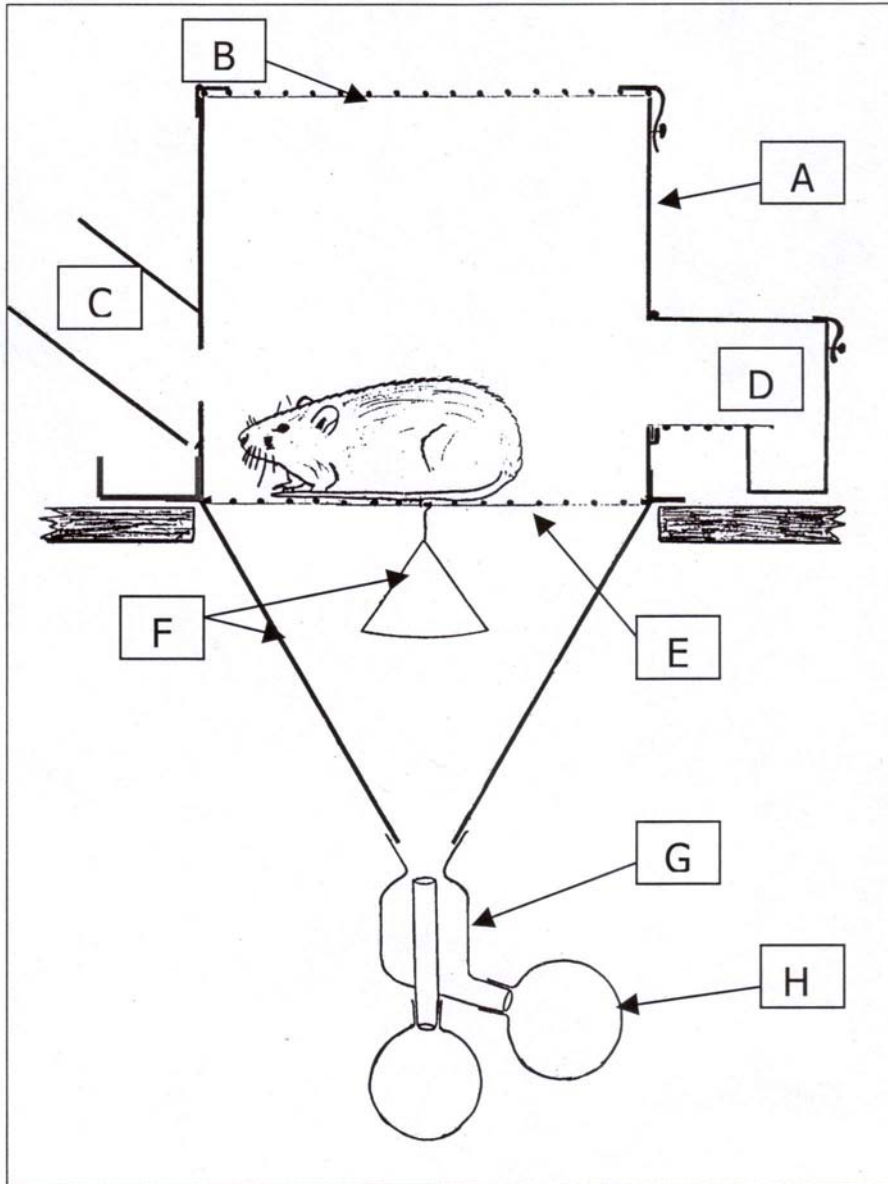
(4)

58. List the stages involved in the process of establishing a transgenic colony.

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(8)

59. Identify the design characteristics and function of each of the parts labeled A-G in the diagram. What is collected in vessel H?



A.....

B.....

C.....

D.....
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E.....
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F.....
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G.....
.....

H.....

(7½)

End of Part I

Part II

Attempt THREE Questions from five

***This part should take approximately one and a half hours to
complete***

Equal marks are available for each question

***The approximate percentage of marks available
for each section of the question is indicated***

***Start each new answer on a fresh sheet of paper
Write on one side of the paper only***

***Write your candidate number in the top right hand corner and the
question number in the top left hand corner of every answer sheet***

Credit will be given for diagrams which make your answer clearer

***You must hand in all answer sheets together with this book
at the end of the examination***

Attempt THREE questions

- 1.** Under the following headings describe the factors to consider when working in an Animal Containment Level 3 Unit.
 - (a) Protection of personnel **35%**
 - (b) Air conditioning/ventilation system **25%**
 - (c) Removal of biological samples **15%**
 - (d) Removal of waste **25%**

- 2.**
 - (a) Describe the factors which should be considered when choosing routes of administration of substances to laboratory animals. **35%**
 - (b) After administering a test substance describe the factors to be considered for the subsequent monitoring of the animals. **65%**

- 3.** Discuss the factors that would influence whether a strain of rodents should be bred in an animal unit or obtained from a commercial breeder. **100%**

4. You have recently been granted a personal licence and are intending to perform your first experiment, which involves vascular cannulation in a small group of rats under general anaesthesia with recovery.

Under the following headings describe the actions you would take before and during the experiment to ensure compliance with the Animals (Scientific Procedures) Act 1986 and with the conditions of your licence:

- | | | |
|-----|------------------------------------|------------|
| (a) | Training and competence | 15% |
| (b) | Authorities granted in licences | 35% |
| (c) | Adverse effects and animal welfare | 30% |
| (d) | Cage labelling and record keeping | 20% |

5. Laboratory guinea pigs are routinely offered pelleted diet to satisfy most of their nutritional requirements.

- | | | |
|-----|--|------------|
| (a) | List and describe the ingredients of a pelleted diet suitable for guinea pigs and briefly describe the process of manufacture. | 45% |
| (b) | How is the quality and composition of a pelleted diet maintained from one batch to the next? | 30% |
| (c) | Explain how the various components of the diet contribute to the total protein content of the product. | 25% |

End of Part II