

Candidate Number: .....

# The Institute of Animal Technology



## MEMBERSHIP EXAMINATION 2004

### Section A - ANIMAL TECHNOLOGY

Morning, Wednesday 16<sup>th</sup> 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. Complete the following table of stages of physical development in mice.

AGE	OBSERVABLE PHYSICAL CHARACTERISTICS
NEWBORN	Eyelids closed. Naked. Translucent bright pink skin. Pinnae small and tight to head.
2-3 DAYS	
	Coloured strains begin to show skin pigmentation.
10 DAYS	
12-14 DAYS	
17-18 DAYS	
19-21 DAYS	

(5½)

2. Give **five** properties of an ideal method of identification.

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(2½)

3. List **eight** factors you would consider when designing a cage for a laboratory animal.

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(4)

4. List **four** factors to be taken into account when selecting animals for breeding.

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(2)

5. Define the term 'economic breeding life' when applied to a laboratory animal.

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(2)

6. List **three** methods of confirming pregnancy in a laboratory beagle.

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(1½)

7. A homozygous male (+/+) is crossed with a heterozygous female (+/-). Use a diagram to predict the genetic makeup of the resulting offspring.

(2)

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

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(1)

9. Explain the difference between an essential and a non-essential amino acid.

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(2)

**10.** A diet contains the following:

carbohydrate	60%
protein	15%
fat	5%

Carbohydrate and protein, after digestion and assimilation, both provide 17kJ per gram, while fat provides 33kJ per gram.

- a) What is the total amount of energy provided by 100g of the diet?

***(Show all calculations)***

**(4)**

- b) What percentage of the energy is provided by the fat?

***(Show all calculations)***

**(2)**

**11.** Briefly describe how each of the following physiological conditions will alter the dietary requirements of an animal.

a) pregnancy

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

b) old age

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

c) low environmental temperature

.....  
..... (1)

d) early growth

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.....  
..... (3)

e) lactation

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



**12.** Give **three** ways in which environmental enrichment can be provided for **each** of the following laboratory species, using different examples for each species.

a) mouse

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.....  
.....

(1½)

b) rhesus monkey

.....  
.....  
.....

(1½)

**13.** You are asked to check the animals in a room you have not been in before. You find **ten** individually housed mice. Give **three** possible reasons why they may be housed like this.

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.....  
.....

(3)

**14.** A researcher informs you he wishes to bring some immuno-compromised mice into your conventional animal unit. Give him **four** options for housing these animals to preserve their health status.

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(2)

**15.** Name one piece of equipment used to measure each of the following environmental conditions in an animal room.

a) ventilation rate

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b) atmospheric pressure differential

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c) illumination

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d) noise

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**(2)**

**16.** The breeding performance in your rat breeding colony has suddenly declined. Give **four** environmental factors that may be responsible and state how they effect the animals.

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**(6)**

**17.** Name a pathogen that could be eliminated by Caesarian rederivation.

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**(1)**

18. Complete the following table.

Species	Nutritional requirement	Disease caused if nutritional requirement omitted from diet
Cat		Anaemia
	Vitamin C	
	Vitamin D3	

(2½)

19. a) Name **two** infectious agents against which all dogs should be vaccinated.

.....  
 .....

b) List **two** clinical signs of **one** of these infectious agents.

Infectious agent.....

First clinical sign.....

Second clinical sign.....

(2)

20. a) Name a parasite with an indirect life cycle.

.....

b) Give **three** implications for an animal unit if a laboratory animal is diagnosed with an infestation of this parasite.

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 .....  
 .....

(2)

21. a) Define 'zoonosis'

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.....

b) Name **three** zoonotic agents that may be found in laboratory animals.

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(2½)

22. List **six** factors that will affect the efficiency of a chemical disinfectant.

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(3)

23. You are to perform a study on pregnant rats and have to administer the test compound between day 6 and day 15 of gestation. At a dose of 1cm<sup>3</sup>/100g of bodyweight, you have a choice of subcutaneous, intraperitoneal, intravenous, and intradermal dose routes. State your preferred route giving **two** reasons why you have chosen this route, and give **two** reasons why you have not chosen **one** of the other routes.

a) Preferred route

.....

Reason i).....

.....

Reason ii).....

.....

(2½)

b) Non-preferred route

.....

Reason i).....

.....

Reason ii).....

.....

(2½)

**24.** List and explain **three** factors that can limit the volume of blood that may safely be withdrawn from an animal.

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(4½)

**25.** Give **five** reasons why you might be required to administer a substance to a laboratory animal.

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(2½)

**26.** a) Why should dogs be fasted prior to anaesthesia?

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.....

b) Name **one** other species that should be fasted prior to surgery.

.....

c) Name **two** species that do not need to be fasted prior to surgery.

.....  
.....

(2½)

**27.** Give an example of a pre-anaesthetic medication for a dog and the appropriate route(s) of administration.

.....  
.....

(1)

**28.** List **three** potential advantages and **three** potential disadvantages of using an inhaled anaesthetic agent compared with an injectable anaesthetic agent.

Advantages.....

.....  
.....

Disadvantages.....

.....  
.....

(6)

**29.** Name **three** physiological parameters that should be monitored during anaesthesia.

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.....  
.....

(1½)

30. List **four** signs of an anaesthetic overdose.

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.....  
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(2)

31. How can a theatre technician reduce exposure to waste anaesthetic gases?

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(½)

32. Four male rabbits have just been castrated and are placed in individual pens. You are responsible for their post-operative care. List the routine steps you would take to ensure the rabbits are undergoing a smooth recovery over the following seven days.

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.....  
.....

(2)

33. List **four** clinical signs of infection following abdominal surgery in a rabbit.

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(2)

34. Name **three** people you should contact if you were concerned about the health of an experimental animal.

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(1½)

35. List **three** measures that could be taken to prevent a bitch from removing her skin sutures.

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(1½)

36. Give **four** reasons for killing laboratory animals.

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(2)

**Questions 37-43 relate to the Animals (Scientific Procedures) Act 1986**

37. Complete the table to name either an animal or a method of euthanasia (different for each) as described in Schedule 1 of the Act.

<b>Animal</b>	<b>Method</b>
<b>1.0kg rabbit</b>	
	<b>Dislocation of neck</b>
	<b>Rising concentration of carbon dioxide gas</b>
<b>Cow</b>	
<b>Horse</b>	

(2½)

38. Give **two** criteria that must be fulfilled to use a non Schedule 1 method of euthanasia.

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.....  
(1)

**39.** With reference to Schedule 2 of the Act:

a) Name the **two** species that must normally be obtained only from a designated breeding establishment.

.....  
(1)

b) Name the **one** avian species included.

.....  
(½)

c) Under what circumstances are pigs and sheep included?

.....  
(½)

d) Name the **five** rodent species included.

.....  
.....  
(1)

**40.** Within the scope of the Act define the following terms:

a) Cost/benefit analysis

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

b) Humane endpoints

.....  
.....  
(1)

c) Severity limits

.....  
.....  
(1)

**41.** 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)

**42.** Within the scope of Act define the following:

a) Regulated procedure

.....  
 .....

(2)

b) Protected animal

.....  
 .....  
 .....  
 .....

(4)

c) Certificate of Designation

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(2)

**43.** State the purpose and function of the Ethical Review Process.

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(6)

**44.** Name **three** forms in which food may be supplied to common farm animals.

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(1½)

**45.** Complete the following table.

Species	Length of Oestrous Cycle	Gestation Period	Average Litter Size Born
Cow			
Sheep			
Pig			
Goat			
Horse			

(7½)

46. Give **three** factors which are important in the artificial incubation of eggs.

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.....  
.....

(1½)

47. State **one** possible cause of each of the following in incubated chicken eggs:

a) blood rings

.....

b) clear eggs

.....

c) dead chick inside complete egg

.....

d) pipped egg not hatching

.....

(2)

**48.** What is the incubation period for:

a) quail eggs?

.....

b) domestic chicken eggs?

.....

**(1)**

***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***

***Please turn over***

## ***Attempt THREE questions***

- 1.** Describe a method for delivering each of the following into a SPF unit, in a sterile condition. Explain the purpose of each stage in the methods you describe.
  - (a) plastic-wrapped packages of diet previously sterilized by gamma-irradiation by the manufacturer **25%**
  - (b) bags of sawdust for animal bedding, via the autoclave **45%**
  - (c) air **30%**
  
- 2.** Outline the processes involved to establish a transgenic mouse colony under the following headings;
  - (a) Superovulation **25%**
  - (b) Isolation of embryo and blastocyst **25%**
  - (c) Provision of sterile males **50%**
  
- 3.** You have recently been given a protocol to perform a four week study with daily intravenous dosing throughout. There are four experimental groups each comprising twenty rats. All groups are treated. Each animal is to receive a fixed dose volume of  $1.5\text{cm}^3$  / day at a dose rate of  $1\text{ cm}^3$  / minute.

Under the following headings discuss the factors to be taken into consideration before initiating the study.

  - (a) Licensing requirements **20%**
  - (b) Competence, skill and staffing implications **30%**
  - (c) Equipment **20%**
  - (d) Pre and post dose monitoring and welfare aspects **30%**

4. Under the following headings describe the features and work practices in an isolation unit which houses animals infected with a Hazard Group 3 agent (Advisory Committee on Dangerous Pathogens).

- (a) Waste material **40%**
- (b) Staff safety **60%**

5. (a) Explain the importance of Standard Operating Procedures. **30%**

(b) Describe the stages involved in the preparation and implementation of a Standard Operating Procedure. **20%**

(c) Explain how each of the following helps ensure Good Laboratory Practice:

- i) Written protocols **25%**
- ii) Retention of data, specimens and reports **25%**

***End of Part II***