**Candidate Number: .....**

# The Institute of Animal Technology

# MEMBERSHIP EXAMINATION 2006

## Section A - ANIMAL TECHNOLOGY

**Morning, Wednesday 14th 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.** Explain the terms macro-environment and micro-environment.

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***(4)***

**3.** List **five** essential features of a transport box suitable for pathogen free rodents.

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***(2½)***

**4.** Give **four** methods of providing water to rodents that are in transit for 24 hours.

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***(2)***

**5.** A homozygous male (+/+) is crossed with a heterozygous female (+/-).
**Use a diagram** to predict the genotype of the resulting offspring.

***(2)***

**6.** Complete the following table.

| Animal | Length of Oestrous cycle | Gestation period | Weight at birth | Weaning age |
|---|---|---|---|---|
| Hereford Cow | | | | |
| Large White Sow | | | | |
| Suffolk Ewe | | | | |
| Toggenberg Goat | | | | |
| Wistar rat | | | | |
| New Zealand White rabbit | | | | |
| Balb/c mouse | | | | |

***(14)***

**7.** State **one** advantage and **one** disadvantage of each of the following methods of identifying individual animals. In each case, suggest a different species for which the method would be suitable.

a) plastic numbered ear-tag

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***(1½)***

b) implanted electronic transponder

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***(1½)***

c) collar with attached numbered disc

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***(1½)***

d) ear punch code

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***(1½)***

e) applying coloured dyes to the fur

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***(1½)***

f) recording the external features of the animals

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***(1½)***

**8.** Define the term ‘economic breeding life’ when applied to a laboratory animal.

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***(2)***

**9.** Give **two** reasons for the use of cryopreservation.

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***(2)***

**10.** Define the terms ‘knock in’ and ‘knock out’ in relation to genetically modified mice.

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***(4)***

**11.** What is an essential amino acid?

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***(2)***

**12.** What are the specific vitamin requirements of the following?

a) New world primates

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***(1)***

b) Cats

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***(½)***

c) Animals with restricted gut flora

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***(½ )***

d) Old World primates

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***(½)***

**13.** Give **one** advantage and **one** disadvantage of adding antibiotics to the diets of farm animals.

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***(2)***

**14.** Define the term ‘environmental enrichment’.

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***(2)***

**15.** Define the term ‘infectious disease’

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***(2)***

**16.** What **four** characteristics of the pinworm *Syphacia* make it difficult to eradicate from an animal colony?

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***(2)***

**17.** Explain why, for the purpose of sterilising articles:

a) dry steam is more efficient than hot air

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***(2)***

b) steam under pressure is more efficient than unpressurised steam

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***(2)***

**18.** a) Distinguish between fumigation and fogging.

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***(2)***

b) Name **one** agent suitable for fumigation……

***(½)***

c) Name **one** agent suitable for fogging……

***(½)***

**19.** Name **three** methods of sterilisation suitable for surgical instruments.

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***(1½)***

**20.** What is the definition of a zoonosis?

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***(1)***

**21.** Give **three** reasons why it may be desirable to house animals in a barriered environment.

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***(3)***

**22.** Give **two** methods by which 'clean' animals can be re-derived into a Specified Pathogen Free unit.

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***(2)***

**23.** Give **two** examples of each of the following routes for administering substances to laboratory animals.

a) Topical

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b) Enteral

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c) Parenteral

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*(3)*

**24.** List **four** criteria to be considered when choosing a route for administering substances to animals.

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*(4)*

**25.** **Six** male mice are to be vasectomised. The dose volume for the injectable anaesthetic agent via the intraperitoneal route is 0.11ml/10g bodyweight. **Three** of the mice weigh 25g each, the other **three** mice weigh 30g each, the volume required to fill the needle is 3.0µl.

Using a new needle for each mouse, calculate the minimum amount of anaesthetic agent required to the nearest 0.01ml.

***(Show all calculations)***

*(4)*

**26.** From the following list put a cross (X) against one size of syringe and one size of needle you would select for administering an intravenous injection to a 3.5kg New Zealand White rabbit at a dosage volume of 0.18cm³/100g bodyweight.

| | |
|---|---|
| 2cm³ syringe …….. | 18G x 1 ½ ″ needle …….. |
| 5cm³ syringe …….. | 21G x 1 ½ ″ needle …….. |
| 10cm³ syringe …… | 23G x 1 ″ needle …….. |
| 20cm³ syringe …… | 28G x ⅝ ″ needle …….. |

***(1)***

**27.** a) What are the functions of premedication prior to anaesthesia?

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***(1½)***

b) Give an example of an agent for each of these functions.

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***(1½)***

**28.** What general anaesthetic regime could be used for a **ten** minute X-ray scan of a laboratory rodent?

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***(2)***

**29.** a) What signs of pain might you detect post surgery in:

i) a rat

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***(2)***

ii) a dog

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***(2)***

b) What steps could you take to prevent such pain occurring?

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***(3)***

**30.** List **ten** factors which might influence your choice of method for performing euthanasia of laboratory animals.

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***(5)***

***Questions 31-33 relate to the Animals (Scientific Procedures) Act 1986 (ASPA)***

**31.** Complete the following table as indicated by (∗) of euthanasia methods listed in Schedule1:

| Method | Animal for which appropriate | Weight of animal |
|---|---|---|
| Overdose of anaesthetic | ∗ | No limit |
| Exposure to carbon dioxide gas | Rodents, rabbits and birds | ∗ |
| Dislocation of the neck | Rodents | ∗ |
| | ∗ | Up to 1 kg |
| | Birds | ∗ |
| Concussion of the brain | ∗ | Up to 1 kg |
| | Rabbits | ∗ |
| | ∗ | Up to 250g |
| | Amphibians and reptiles(with destruction of the brain) | ∗ |
| Decapitation of foetal, larval and embryonic forms | ∗ | Up to 50g |

***(5)***

**32.** Under the ASPA 1986 what are the meanings of the following terms?

a) cost/benefit analysis

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***(3)***

b) re-use of animals

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***(3)***

c) humane endpoints

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***(2)***

d) severity limits

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***(2)***

**33.** Under the ASPA 1986 define the following terms:

a) Regulated Procedure

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***(2)***

b) Protected Animal

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***(2)***

c) Project Licence

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***(2)***

d) Personal Licence

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***(2)***

e) Certificate of Designation

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***(2)***

**34.** What part do the following play in regulating Good Laboratory Practice?

a) education and training of staff

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***(2)***

b) documentation

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***(2)***

c) retention of data

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***(2)***

**35.** Define the following terms within Good Laboratory Practice regulations:

a) standard operating procedure

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***(2)***

b) quality control

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***(2)***

c) archive

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***(2)***

d) raw data

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***(2)***

**36.** Name the chambers of a ruminant stomach and state their functions.

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***(10)***

**37.** Give an example of a farm animal that is

a) an omnivore

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***(½)***

b) a ruminant herbivore

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***(½)***

c) a non ruminant herbivore

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***(½)***

**38.** List **five** essential features of an automated incubator for hatching domestic poultry.

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***(2½)***

**39.** List **three** functions of the broody hen during natural incubation.

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***(1½)***

**40.** What is the incubation period for quail eggs?

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***(½)***

**41.** List **four** problems that you might encounter when floor housing groups of quail.

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***(2)***

## *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.** a) Write an account of the composition and manufacture of a typical pelleted diet for feeding laboratory rodents, giving details of components and reasons for their inclusion.

***(60%)***

b) What changes in the composition of the diet would be required if it were to be used for feeding pregnant and growing animals?
What difference might this make in your choice of ingredients?
Explain the reasons for changing the composition.

***(40%)***

**2.** A Study Director has given you a protocol for a 52 week dietary toxicology study. A control group and three test groups, each comprising twenty male and twenty female rats, are to be fed ad-lib with their respective diets for the duration of the study.
In the week prior to commencement of treatment and in week 51 of treatment all animals are to undergo an overnight urine collection and blood sampling is to be performed.
The test compound being administered is expected to induce tumour formation.

Under the following headings discuss:

(a) detailed licensing requirements

***(30%)***

(b) equipment and sampling schedules

***(40%)***

(c) monitoring and welfare aspects

***(30%)***

**3.** Describe how the environment of common laboratory species may be enriched, with particular reference to the aims and methods of enrichment available and the possible effects on behaviour.

***(100%)***

**4.** Under the following headings discuss the importation and establishment of a genetically altered line of mice from a research establishment in the USA.

a) Legislation

***(30%)***

b) Importation

***(20%)***

c) Receipt of animals

***(20%)***

d) Establishment of line

***(30%)***

**5.** a) How might you determine that disease is present in a breeding colony of mice?

***(30%)***

b) How and why might disease have a significant impact on the colony?

***(70%)***

## *End of Part II*