SAMPLE ASSESSMENT TASKS

ANIMAL PRODUCTION SYSTEMS
ATAR YEAR 12

Sample assessment task

Animal Production Systems – ATAR Year 12

Task 2 – Unit 3 and Unit 4

Assessment type: Test

Conditions
Time for the task: 60 minutes

Calculator permitted

Task weighting
4% of the school mark for this pair of units

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Animal structure and function and Breeding and improvement test (73 marks)

Section	Number of questions	Suggested working time (minutes)	Marks available
Section One: Multiple-choice	15	20	15
Section Two: Short answer	4	20	38
Section Three: Extended answer	1	20	20
		Total	**73**

Section One: Multiple-choice (15 marks)

1. Genetic engineering differs from conventional breeding in that

    (a) reproduction is mitotic.

    (b) desired genes can be directly introduced into an ovuum.

    (c) genes recombine through meiosis.

    (d) growth hormones are synthesised.

2. In the oestrus cycle, regression of the corpus luteum is triggered by

    (a) progesterone.

    (b) prostaglandins.

    (c) oestrogen.

    (d) follicle-stimulating hormone.

3. The reproductive technology that would best enable a genetically superior female to produce many offspring is

    (a) artificial insemination.

    (b) oestrus synchronisation.

    (c) cloning.

    (d) embryo transfer.

4. The rate of ovulation in cows can be increased (superovulation) by injecting the cows with

    (a) luteinising hormone.

    (b) oestrogen.

    (c) progesterone.

    (d) follicle-stimulating hormone.

5. When an offspring strongly resembles its parents, the traits it has are said to

    (a) be highly heritable.

    (b) be highly desirable.

    (c) be dominant.

    (d) have a high genetic potential.

6. The maximum possible performance by an animal is referred to as its

   (a) heritability.

   (b) genetic potential.

   (c) selection differential.

   (d) genetic gain.

7. The specific aims of an artificial selection program are known as the

   (a) selection differential.

   (b) selection pressure.

   (c) breeding objectives.

   (d) estimated breeding values.

8. A transgenic animal is one that

   (a) has been cloned.

   (b) cannot reproduce.

   (c) contains DNA from another species.

   (d) has had genetic information removed.

9. Two hormones commonly used in artificial oestrus synchronisation are

   (a) progesterone and prostaglandin.

   (b) progesterone and luteinising hormone.

   (c) oestrogen and prostaglandin.

   (d) progesterone and oestrogen.

10. The Estimate Breeding Value (EBV) of an animal can only be used as a guide to the performance of its progeny because

   (a) inherited characteristics are subject to selection pressure.

   (b) many commercially important traits are controlled by multiple genes.

   (c) different traits show different degrees of heritability.

   (d) the inheritance of traits is affected by the animal's environment.

11. DNA testing of potential breeding stock is advantageous over performance testing because

   (a) it is cheaper than performance testing.

   (b) it can be done without sacrificing the animal.

   (c) DNA testing is subjective.

   (d) less desirable animals can be culled earlier.

12. A major advantage of sexual reproduction in a breeding program is that it
    (a) enables backcrossing to the dominant parent.
    (b) introduces genetic diversity.
    (c) stabilises the genotype.
    (d) segregates the phenotype from the genotype.

13. A device used to deliver hormone treatment directly into a female mammal's reproductive tract is known as a
    (a) controlled internal drug release (CIDR).
    (b) hormone growth promotant (HGP).
    (c) Foley catheter.
    (d) artificial insemination (AI) gun.

14. Which of the following statements is the best definition of an animal's pedigree?
    (a) an illustration of how a trait is inherited
    (b) a chart of an animal's ancestors
    (c) an animal's breeding record
    (d) paperwork which attests to the value of an animal

15. The hormone that stimulates testosterone production in males is
    (a) follicle-stimulating hormone (FSH).
    (b) gonadotropin-releasing hormone (GnRH).
    (c) luteinising hormone (LH).
    (d) adrenaline.

End of Section One

Section Two: Short answer **(38 marks)**

Question 16 **(9 marks)**

(a) Complete the table below by:
  - listing **two** female reproductive hormones
  - stating whether the hormone you have listed influences the establishment or the maintenance of pregnancy, and
  - briefly describing the role of each of the hormones you listed.

Hormone	Whether hormone establishes or maintains pregnancy	Description of hormone's role

(6 marks)

(b) Describe the action of **one** of the hormones involved in lactation and the timing of its action in relation to pregnancy. (3 marks)

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Question 17 **(6 marks)**

(a)   Identify **one** behavioural change and **one** physiological change that can be used to identify
oestrus. (2 marks)

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(b)   Describe how infertility can be identified and suggest **three** possible causes of infertility.
(4 marks)

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Question 18 **(15 marks)**

Animal enterprises often use Estimated Breeding Values (EBVs) to select sires.

(a)   Define the term Estimated Breeding Value and state a benefit of using EBVs in a commercial
breeding program. (2 marks)

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Selected growth EBVs of five different sires are shown in the table below.

Group EBVs for growth (kg)				
Sire	**Birth weight**	**200-day growth**	**400-day growth**	**600-day growth**
A	-1	+10	+30	+45
B	+2	+14	+25	+28
C	+5	+16	+40	+50
D	+2	+10	+25	+30
E	+1	+10	+28	+40
Average	+2	+12	+28	+35

(b) (i) Which sire would a buyer select to increase yearling weight and avoid birthing problems? Explain your choice. (3 marks)

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(ii) A breeder chose to mate sire C to a female which had a 600-day growth EBV of -10 kg. Calculate the probable genetic gain of the offspring for 600-day growth. Explain how you calculated this figure. (3 marks)

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(c) List **three** EBVs, other than weight EBVs, of economic importance. (3 marks)

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(d) Describe **two** factors that would affect the accuracy of these EBVs. (4 marks)

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Question 19 (8 marks)

Complete the table below by:
- defining the term
- stating the importance of the factor in an animal breeding program.

Term	Definition	Importance in an animal breeding program
Heritability		
Phenotype		
Genetic potential		
Environmental effects		

Section Three: Extended answer (20 marks)

Answer this question on lined paper.

Remember to complete a plan for your answer.

Question 20 (20 marks)

Advances in reproductive and genetic technologies have the potential to improve the profitability and productivity of animal enterprises.

(a) Outline the process of cloning and identify **two** possible benefits and **two** possible ethical issues associated with this technology in animal production systems. (8 marks)

(b) Discuss **one** advantage and **one** disadvantage of each of the following breeding technologies:

- oestrus synchronisation
- artificial insemination
- pregnancy testing/scanning. (12 marks)

Marking key for sample assessment task 2 – Unit 3 and Unit 4

Section One: Multiple-choice

Question number	Answer
1	B
2	B
3	D
4	D
5	A
6	B
7	C
8	C
9	A
10	C
11	D
12	B
13	A
14	B
15	C

Description	Marks
1 mark for each question	1–15
Total	/15

Section Two: Short answer

16. (a) Complete the table below by:
    - listing **two** female reproductive hormones
    - stating whether the hormone you have listed influences the establishment or the maintenance of pregnancy, and
    - briefly describing the role of each of the hormones you listed.

Description	Marks
Lists two female reproductive hormones	1–2
For each of the listed hormones, states whether it influences the establishment or the maintenance of pregnancy	1–2
Briefly describes each hormone's role	1–2
Total	**/6**
Answer could include, but is not limited to:	

Hormone	Whether hormone establishes or maintains pregnancy	Description of hormone's role
follicle-stimulating hormone	establishment	growth and development of follicles in ovary
luteinising hormone	establishment	causes mature follicle to rupture and form CL
oestrogen	establishment/maintenance	stimulates heat, growth of uterus, mucous in cervix
progesterone	maintenance	prevents oestrus and ovulation; development of wall of uterus
relaxin	maintenance	relaxes pelvic ligaments

(b) Describe the action of **one** of the hormones involved in lactation and the timing of its action in relation to pregnancy.

Description	Marks
Hormone correctly named	1
Describes the action of this hormone	1
Gives the timing of the secretion/action of this hormone	1
Total	**/3**
Answer could include, but is not limited to:	

Hormone	Description of hormone's action	Timing
prolactin	stimulates alveolar cells to secrete milk	mid to end of pregnancy
oxytocin	milk letdown	during suckling, physical stimulation of the teat

17. (a) Identify **one** behavioural change and **one** physiological change that can be used to identify oestrus.

Description	Marks
Identifies one behavioural change associated with oestrus	1
Identifies one physiological change associated with oestrus	1
Total	**/2**
Answer could include, but is not limited to:	

- change in behaviour of the female described, e.g. restless, mounted by other females, acceptance by the male, copulation
- additional details on anatomy and physiology, e.g. elevated body temperature, vaginal colour and discharge

(b) Describe how infertility can be identified and suggest **three** possible causes of infertility.

Description	Marks
Describes how infertility can be identified	1
Suggests three possible causes of infertility	1–3
Total	**/4**
Answer could include, but is not limited to:	

- identification may include repeat breeding cycle without pregnancy, failure to produce live offspring
- causes may include age, poor nutrition, poor sperm quality, failure to ovulate, miscarriage, disease, climate

18. (a) Define the term Estimated Breeding Value and state a benefit of using EBVs in a commercial breeding program.

Description	Marks
Definition of Estimated Breeding Value – EBV is an estimate of the genetic value of an animal as a parent	1
States a benefit of using EBVs	1
Total	**/2**
Answer could include, but is not limited to:	

Possible benefits may include:
- allows for estimation of genetic gain of animal's offspring
- selection of breeding animals based on their genetic merit for particular traits

(b) (i) Which sire would a buyer select to increase yearling weight and avoid birthing problems? Explain your choice.

Description	Marks
Sire A	1
Low birth weight reduces possible birth problems for cow	1
The second highest EBV for yearling growth rate (400-day growth)	1
Total	**/3**

(ii) A breeder chose to mate sire C to a female which had a 600-day growth EBV of -10 kg. Calculate the probable genetic gain of the offspring for 600-day growth. Explain how you calculated this figure.

Description	Marks
Genetic gain = (50 - 10) /2	1
= +20 kg	1
Recognition that parent EBVs are added together and the sum divided by 2 because offspring inherits 50% of genetic gain from each parent	1
Total	**/3**

(c) List **three** EBVs, other than weight EBVs, of economic importance.

Description	Marks
Lists three EBVs of economic importance (1 mark each)	1–3
Total	**/3**
Answer could include, but is not limited to:	

scrotal circumference	calving ease	calving interval
eye muscle area	rump/rib fat depth	carcase weight
marbling	milk yield	fibre diameter (wool)

(d) Describe **two** factors that would affect the accuracy of these EBVs.

Description	Marks
Description of effect of factor on accuracy of EBVs provided (1–2 marks for each factor)	1–4
Total	**/4**
Answer could include, but is not limited to:	

- amount of data collected to calculate EBV – from progeny, relatives etc.
- low amount of data = low accuracy
- heritability of trait
- if trait has low heritability, i.e. relatively high environmental influence, then accuracy of EBV will be relatively low

19. Complete the table below by:
    - defining the term
    - stating the importance of the factor in an animal breeding program.

Description	Marks
Gives correct definition for each term (1 mark each)	1–4
Provides statement of importance of each factor in an animal breeding program (1 mark each)	1–4
Total	/8

Answer could include, but is not limited to:

Term	Definition	Importance in an animal breeding program
Heritability	The degree to which a trait is controlled by genetics versus the environment	Only highly heritable traits should be used in selecting a sire based on EBVs
Phenotype	Refers to the observable trait of an individual (the way the genotype is expressed)	It is the expression of the genotype due to its interaction with the environment and needs to be taken into account when selecting breeding animals
Genetic potential	Refers to best possible performance of an animal based on its genotype	Only realised under optimal environmental conditions
Environmental effects	Non-genetic factors caused by environmental conditions	Affects expression of genotype

Section Three: Extended answer

20. (a) Outline the process of cloning and identify **two** possible benefits and **two** possible ethical issues associated with this technology in animal production systems.

Description	Marks
Outline of process	1–4
Identifies two possible benefits	1–2
Identifies two possible ethical issues	1–2
Total	**/8**
Answer could include, but is not limited to:	

Process:
- diploid/body/somatic cells collected from animal to be cloned
- donor egg collected and nucleus removed
- nucleus from cloned animal inserted into egg
- apply electric shock to egg
- grow in lab until bundle of cells formed
- insert embryo into surrogate female for normal pregnancy and birth

Possible benefits:
- to produce genetically identical individuals
- to produce individuals with desired genetics, e.g. quantity and quality of milk, meat, wool
- to breed from superior individuals that are unable to reproduce/produce gametes
- to produce multiple copies of desirable animals

Possible ethical issues
- belief that it is interfering with nature
- unknown effects on human health
- invasive
- low success rate (Dolly was produced after 277 eggs, 29 embryos [three surviving to birth] and one surviving to adulthood)
- intellectual property – who owns the technology?
- contradicts the accepted ethic of minimal use of animals in science, i.e. 3Rs of animal use (reduction, replacement, refinement)
- genetic variation may ultimately be reduced
- concern that the practice may be extended to humans

(b) Discuss **one** advantage and **one** disadvantage of each of the following breeding technologies:
- oestrus synchronisation
- artificial insemination
- pregnancy testing/scanning.

Description	Marks
For each breeding technology:	
Describes comprehensively one advantage and one disadvantage	4
Describes briefly one advantage and one disadvantage	3
Identifies one advantage and one disadvantage	2
Identifies one advantage or one disadvantage	1
Total	**/12**
Answer could include, but is not limited to:	

Method	Advantages	Disadvantages
Oestrus synchronisation	- more concentrated birthing period, leading to greater uniformity at weaning - less time spent observing/assisting difficult births - use of improved genetics for producing a value-added product - less time for oestrus (heat) detection - no teaser required - more efficient feed utilisation	- cost – animal treatments and labour - use of drugs - veterinary supervision/prescription - extra planning and management - good handling facilities are required - you can only synchronise the number of females you can inseminate at one time
Artificial insemination	- there is no need of maintenance of the sire for a herd, therefore no sire maintenance cost - screening of disease agents - is not physically stressful for the male as per a natural mating - it prevents the spread of certain diseases and sterility due to sexually transmitted diseases, e.g. vibriosis - accurate breeding records maintained so can manage animals strategically for key stages of pregnancy, birth and lactation, and grow as a 'batch', therefore increasing efficiency - the progeny testing can be done at an early age - semen can be used from high performing sires even after their death - semen is easily transported - less likely for cow injury as in natural mating - females with silent heat are inseminated - increases producer safety as not handling bulls	- requires trained operators and special equipment - semen needs to be stored correctly - requires more time than natural mating - improper cleaning of instruments and insanitary conditions may lead to lower fertility - market for bulls will be reduced, while that for superior sires is increased - laborious to detect females in heat, in natural mating, males do this instinctively - can lead to decreased rate of fertility
Pregnancy testing/scanning	- increases reproductive rate by removing dry animals - a reduction in feed costs by feeding dry ewes less - can change flock structure towards a younger flock - more strategic management at key stages of pregnancy - in sheep, scanning ewes for single and twin status also allows: - twin-bearing ewes better feed access/quality - the identification of lambs born as twins for the estimation of breeding value - an estimation of lamb survival rates	- additional animal handling, requires good facilities - a stress for animals - can be hard to detect if a farmer is unsure of joining dates in natural system – needs good records and distinct joining period - invasive for cows (manual palpation) - time, labour, cost, availability of operators

Sample assessment task

Animal Production Systems – ATAR Year 12

Task 3 – Unit 3 and Unit 4

Assessment type: Production

Conditions
Period allowed for completion of the task: two weeks

Parts 1 and 3 are to be carried out individually by the students within class time.
Part 2 can be completed as group work.

Task weighting
10% of the school mark for this pair of units

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Management of barber's pole worm in sheep **(71 marks)**

Background information

An important aspect of sustainable agriculture is to manage pests and diseases to avoid or limit their resistance to pesticides. This is usually achieved by the planned and strategic use of a variety of pest control methods, while reducing reliance on chemical control. Improper use of chemical pest control has led to the development of resistance in some pests to some commonly used pesticides. This is becoming a very serious problem for the sheep industry in Australia.

In this task, you will explore the management of barber's pole worm, a pest of sheep that has developed resistance to some pesticides.

Part 1: Devising a Pest Management Plan

1. For the following types of pest control, briefly describe **two** examples for each type of control relevant to barber's pole worm (BPW).

    (a) chemical control   (4 marks)

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(b)   biological control   (4 marks)

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(c)   cultural control   (4 marks)

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2.   Explain how the different types of control might be combined in a plan and give the relative
     timings for suggested actions.   (6 marks)

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3.   Explain why the monitoring of pest levels and their effects is important to the success of any
     control program. Describe how this could be carried out as part of your plan.   (6 marks)

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Part 2: Monitoring Integrated Pest Management Strategies

You will be given a mob of sheep from the school farm to monitor for barber's pole worm.

4. Describe **two** factors that can increase the susceptibility of sheep to BPW infestation.

(4 marks)

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5. Assess your sheep using the FAMACHA scoring system. Record your findings, plus any other relevant observations in an appropriate table. Attach your table to your report (see question 7 before designing your table). (5 marks)

6. Describe what the FAMACHA system is measuring and the how the scoring is interpreted.

(4 marks)

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7. Based on the FAMACHA scoring and other relevant observations for the flock, give your management recommendations with regard to chemical control of BPW. Recommendations for each sheep can be included in the table provided for question 5. (2 marks)

8. Faecal Egg Count (FEC) for worms can be used as part of the monitoring process. To do this, manure samples are needed. Outline a plan to collect manure samples from at least **four** sheep. Your plan needs to include the steps taken to ensure representative samples are taken from each animal, and animal welfare and occupational, health and safety requirements are addressed. (6 marks)

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9. Describe the procedure by which FEC measurements can be made using the manure samples collected. Any occupational, health and safety requirements need to be included in your response. (5 marks)

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10. Carry out FEC measurements for the samples collected and comment on the findings for your sheep. State how these findings may influence the future management of the flock.   (6 marks)

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Part 3: Interpreting Parasite Resistance Data

The table below shows the results of a survey of the incidence of drench resistance in a variety of parasitic worms on farming properties across Australia.

'% properties' refers to the proportion of properties surveyed where resistance to the named drench was found to occur.

Active ingredient	Brown stomach worm % properties	Black scour worm % properties	Barber's pole worm % properties	Any worm* % properties
BZ	88	87	75	96
LEV	82	86	30	96
NAP	72	79	15	86
IVM	76	31	74	87
ABA	49	25	83	77
MOX	38	14	52	54
BZ/LEV	79	48	19	81
BZ/LEV/NAP	59	55	11	74
BZ/LEV/ABA	22	6	14	28
MPL	0	0	0	0

*Any worm = one or more of the following: *Brown stomach*, *Black scour* or *Barber's pole worms*

BZ = Benzimidazole   LEV = Levamisole   NAP = Naphthalophos   IVM = Ivermectin
ABA = Abamectin   MOX = Moxidectin   MPL = Monepantel

11. For the seven single drenches, discuss the level of resistance developed by barber's pole worm (BPW). Rank the single drenches from least to most resistant. (3 marks)

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12. For BPW, indicate the incidence of resistance when combination drenches were used. Rank the combination drenches from least to most resistant. (2 marks)

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13. Based on these findings, what management recommendations would you make for long-term chemical control of BPW as part of an Integrated Pest Management program? (4 marks)

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14. Explain what is meant by the following statement:

'There are two ways you can get drench-resistant worms: breed your own and/or buy someone else's.'

Suggest actions that could be taken to reduce the risk of introducing drench-resistant worms onto and around a property. (6 marks)

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Marking key for sample assessment task 3 – Unit 3 and Unit 4

1. For the following types of pest control, briefly describe **two** examples for each type of control relevant to barber's pole worm (BPW).

   (a) chemical control

Description	Marks
Two examples provided (1 mark each)	1–2
Brief description provided for each example (1 mark each)	1–2
Total	/4
Answer could include, but is not limited to:	

   - oral or injectable drenches
   - broad spectrum drenches – benzimidazoles, levamisole, the 'MLs' (macrocyclic lactones), monepantel, and products with various combinations of benzimidazoles, levamisole and MLs
   - narrow spectrum drenches – effective only against barber's pole worm and includes the active ingredient closantel, and the organo-phosphate naphthalophos. These drenches are preferred where only barber's pole worm is a problem. Combinations of organo-phosphates and other drenches also have a role against barber's pole worm
   - persistent action against larvae – closantel and moxidectin persist in the sheep for some weeks, killing barber's pole worm larvae taken in during grazing, slow release capsules can provide persistent control

   (b) biological control

Description	Marks
Two examples provided (1 mark each)	1–2
Brief description provided for each example (1 mark each)	1–2
Total	/4
Answer could include, but is not limited to:	

   - select for sheep with higher resistance to BPM
   - fungal spores added to feed traps larvae in developing hyphae when they emerge from manure
   - vaccination – to improve sheep's immunity/resistance to worm (still in development)

   (c) cultural control

Description	Marks
Two examples provided (1 mark each)	1–2
Brief description provided for each example (1 mark each)	1–2
Total	/4
Answer could include, but is not limited to:	

   - rotate and rest paddocks – break worm lifecycle by removing suitable host
   - mow paddocks – reduces chances of transmission of larvae to new hosts
   - manure spreading – manure dries out and worm eggs/larvae die

2. Explain how the different types of control might be combined in a plan and give the relative timings for suggested actions.

Description	Marks
Concurrent and/or sequential use of methods, e.g. chemical, with biological and cultural management	1
Recognition of importance of rotations of chemical groups (pesticides) to avoid development of resistance in worms	1
Recognition of importance of avoiding pest build-up through cultural practices, including: • farm hygiene • paddock rotations and resting • manure spreading • mowing paddocks	1–2
Recognition of importance of tactical treatment of outbreaks by chemical means to limit pest build-up	1
Drenching only when worm populations are highest (usually wet and warm weather) and avoiding drenching in hot dry weather (summer)	1
Total	**/6**

3. Explain why the monitoring of pest levels and their effects is important to the success of any control program. Describe how this could be carried out as part of your plan.

Description	Marks
Recognition of importance of monitoring in determining need for action to control pests in terms of the economic injury threshold	1–2
Recognition of importance of monitoring in determining the timing of responses	1
Recognition of importance of monitoring in determining whether control measures in a plan are successful or whether changes are required to plan	1
Description about inclusion of monitoring as part of a plan includes: • how monitoring will be done, e.g. through egg worm counts, observations of sheep condition • timing of monitoring activities	1 1
Total	**/6**

4. Describe **two** factors that can increase the susceptibility of sheep to BPW infestation.

Description	Marks
Identifies two factors increasing susceptibility (1 mark each)	1–2
Description provided for each factor (1 mark each)	1–2
Total	**/4**
Answer could include, but is not limited to:	
• age – old and very young sheep (lambs) have decreased immunity and so increased susceptibility • pregnant, lactating sheep – potential for decreased immunity due to stress of pregnancy and lactation • some sheep naturally have low resistance, probably due to genetics • weather – warm and wet conditions, ideal for BPW infection of paddocks • farms with populations of pesticide-resistance BPW, so traditional chemical control methods are less effective	

5. Assess your sheep using the FAMACHA scoring system. Record your findings, plus any other relevant observations in an appropriate table. Attach your table to your report (see question 7 before designing your table).

Description	Marks
Table has appropriate columns	1–2
FAMACHA scores (from 1–5) are entered in table	1–2
Condition scores and other observations entered in table	1
Total	**/5**

6. Describe what the FAMACHA system is measuring and the how the scoring is interpreted.

Description	Marks
FAMACHA assesses colouration of mucous membranes around eye for level of anaemia as BPW affects protein content/red blood cell level of host's blood with anaemia, indicating high worm burden	1
Sheep with scores of 1–2 identified as optimal/acceptable so no treatment needed	1
Sheep with scores of three identified as borderline (other observations/monitoring may be needed to determine if dose required)	1
Sheep with scores of 4–5 require dose urgently	1
Total	**/4**

7. Based on the FAMACHA scoring and other relevant observations for the flock, give your management recommendations with regard to chemical control of BPW. Recommendations for each sheep can be included in the table provided for question 5.

Description	Marks
Appropriate recommendation made based on FAMACHA score and other observations	1–2
Total	**/2**

8. Faecal Egg Count (FEC) for worms can be used as part of the monitoring process. To do this, manure samples are needed. Outline a plan to collect manure samples from at least **four** sheep. Your plan needs to include the steps taken to ensure representative samples are taken from each animal, and animal welfare and occupational, health and safety requirements are addressed.

Description	Marks
Collection method described to include obtaining representative samples	1–2
Animal welfare steps included	1–2
Occupational, health and safety requirements included	1–2
Total	**/6**
Answer could include, but is not limited to:	
Correct technique outlined at http://www.wormboss.com.au/tests-tools/tests/checking-a-mob-of-sheep-for-worms.php	

9. Describe the procedure by which FEC measurements can be made using the manure samples collected. Any occupational, health and safety requirements need to be included in your response.

Description	Marks
Description of procedure provided and includes:	
• sample preparation	1–2
• egg count using microscope	1–2
Occupational, health and safety requirements included	1
Total	**/5**
Answer could include, but is not limited to:	
Suitable method and other details of procedure are available via http://www.rvc.ac.uk/Review/Parasitology/EggCount/Principle.htm	

10. Carry out FEC measurements for the samples collected and comment on the findings for your sheep. State how these findings may influence the future management of the flock.

Description	Marks
Measurements taken using correct procedure	1–2
Egg count recorded and average FEC provided	1
Statement relating BPW status of sheep to FEC value provided	1
Statement relating BPW status to success of management strategies and possible need for changes provided	1–2
Total	**/6**

11. For the seven single drenches, discuss the level of resistance developed by barber's pole worm (BPW). Rank the single drenches from least to most resistant.

Description	Marks
Identifies drenches where resistance has developed (Benzimidazole, Ivermectin, Abamectin)	1
Identifies drenches where low or no resistance has developed (Naphthalophos, Monepantel)	1
Ranks the single drenches from least to most resistant	1
Total	**/3**

12. For BPW, indicate the incidence of resistance when combination drenches were used. Rank the combination drenches from least to most resistant.

Description	Marks
Recognises that combination drenches have relatively high effectiveness (i.e. BPW has developed relatively low resistance to the combinations)	1
Ranks the combination drenches from least to most resistant	1
Total	**/2**

13. Based on these findings, what management recommendations would you make for long-term chemical control of BPW as part of an Integrated Pest Management program?

Description	Marks
Recognises need to rotate drenches, based on mode of action, annually	1
Comments on the relative effectiveness of combination drenches versus single drenches	1
Recognises need to include Monepantal and combination drenches in rotations	1
Recognises that combination drenches must only include chemicals with different modes of action	1
Total	**/4**

14. Explain what is meant by the following statement:

'There are two ways you can get drench-resistant worms: breed your own and/or buy someone else's.'

Suggest actions that could be taken to reduce the risk of introducing drench-resistant worms onto and around a property.

Description	Marks
Explanation of statement includes recognition that: • 'breed your own' relates to the inappropriate use of chemical control of worms • 'buy someone else's' relates to not taking appropriate quarantine processes when buying in sheep	1 1
Provides appropriate actions to reduce risk of introducing drench-resistant worms onto and around a property	1–4
Total	**/6**
Answer could include, but is not limited to:	
Actions to reduce risk of introducing drench-resistant worms onto and around a property may include: • get sheep's worm resistance status before purchase • assume purchased sheep are carrying worms with some degree of drench resistance to one or more drench groups • quarantine drench all sheep new to the property • use a combination of unrelated drenches with one of these being monepantel • quarantine the sheep in yards after treatment for at least three days to allow worm eggs present at the time of drenching to pass out of the gut • after quarantine, release the sheep onto a paddock that is likely to be contaminated with worm larvae due to grazing by other sheep. This will dilute (lower the proportion of) resistant worms surviving treatment with worm larvae already on your property. • test the imported sheep 10–14 days after drenching (FEC) for added confidence that treatment was successful.	

Sample assessment task

Animal Production Systems – ATAR Year 12

Task 8 – Unit 3 and Unit 4

Assessment type: Investigation

Conditions
Period allowed for completion of the task: Five weeks
In-class validation assessment: 30 minutes

Task weighting
10% of the school mark for this pair of units

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Effect of feed additives/supplements on the growth rates of prime lambs   **(98 marks)**

Feed additives/supplements are administered to livestock to improve performance and, thus, profitability. They can be used to alleviate or prevent nutritional deficiencies, increase the quantity and/or quality of animal products, prevent disease and improve feed conversion efficiency.

You are required to complete a scientific investigation into the effect of specific feed additives on the growth rate of pasture-fed prime lambs on the school farm.

What you need to do

1. **Planning the investigation**
   • Develop a hypothesis to test
   • Plan the investigation, using elements of experimental design, including variables and controls
   • Select appropriate equipment/livestock/materials to use in the investigation
   • Provide a description of the method to be used in the investigation
   • Choose an appropriate way to display your raw data

2. **Conducting the trial**
   • Carry out the investigation in an organised and safe manner
   • Accurately collect and record data
   • Minimise sources of error (large sample size, replicates, repeat trials, random sampling)

3. **Processing data**
   • Calculate means
   • Analyse data (interpret tables, graphs and statistics, identify trends, make comparisons, consider validity of results)
   • Select appropriate methods to display results

4. **Conclusions and evaluation**
   - Relate the hypothesis to the results
   - Discuss the results – what was measured and observed?
   - Draw conclusions which are consistent with the data using scientific knowledge
   - Make general suggestions for improving the techniques or the design of the investigation
   - Make a feed additive/supplement recommendation based on the results
   - Provide a reference list

5. **Complete an in-class validation assessment** (under test conditions) based on your work in this investigation

What you need to submit for assessment

1. You will need to submit your findings in the form of a **scientific report** using the *Scientific Investigation: Effect of Feed Additives/Supplements on Growth Rates in Prime Lambs* sheet as a guide.
2. The **in-class validation assessment** (under test conditions) based on your work on this investigation.

Scientific Investigation: Effect of Feed Additives/Supplements on Growth Rates of Prime Lambs

Part 1: Planning

1. Explain why feed additives/supplements are used in some animal production systems. Identify **two** feed additives/supplements that could be used in prime lamb productions and give the specific reason for their use. (8 marks)

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2. Choose an additive/supplement to test in your investigation. Explain its role in the animal's body and relate this to how it contributes to the animal's health and performance. (4 marks)

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3. Write a hypothesis for your investigation. *(Hint: it needs to be a statement that can be tested.)* (2 marks)

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4. Identify the following variables for the investigation:

    (a) Independent variable (1 mark)

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    _____

    (b) Dependent variable (1 mark)

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    (c) Control variables (4 marks)

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5. List the equipment and materials you will need to carry out your investigation. (4 marks)

Equipment/materials list

6. Describe the steps in your method and include diagrams, if required.

    Your description needs to show how your method will:
    *   satisfy the requirements of good experimental design (fair test, randomisation and replication), and
    *   ensure that the data obtained is accurate. (12 marks)

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7. Choose an appropriate way to display your raw data. Any tables can be done in a spread sheet and printed as needed. (3 marks)

Part 2: Conducting the trial

8. Carry out the investigation according to your plan. Ensure that it has been approved by your teacher.
   Mark allocation for conducting the trial will be as follows:
   - additives/supplements measured and administered to animals correctly   (2 marks)
   - work practices meet occupational, health and safety requirements   (2 marks)
   - safe and responsible handling of animals   (2 marks)
   - data correctly recorded.   (2 marks)

Part 3: Processing data

9. Process your results by:
   - calculating the growth rate, mean and percentage change in mass
   - carry out relevant statistical analysis – standard deviation and standard error.
   Present this information in a suitable table format to summarise your results and draw a graph to display your processed results.   (9 marks)

Part 4: Conclusions and evaluation

10. Describe and explain any patterns or trends in your data.   (4 marks)

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11. Do the data support the hypothesis? Support your answer using the results of the investigation.
    (3 marks)

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12. State a conclusion that relates to the hypothesis. Comment on your level of confidence in the conclusion. Support your statement with reference to your results. (5 marks)

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13. Identify the main sources of experimental error. Explain how they contribute to inaccuracy in the results. (3 marks)

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14. Comment on the standard deviation of your data and what this means in terms of the reliability of your results. (3 marks)

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15. Suggest how the experimental design may have been improved to reduce any errors or, if you think no changes are needed, explain why. (3 marks)

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16. Give recommendations for the management of the lambs based on the findings of this investigation. Explain how you think these recommendations will improve the management of the lambs. (4 marks)

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17. Provide a reference list acknowledging any sources of information used in the investigation and report, so another reader could access these resources. Use at least **three** sources.

For books, the name of the author(s), title of the book, date of publication, and publisher need to provided.

For scientific reports, the name of the author(s), report title, date of publication and where the report is published need to be provided.

Where web-based sources are used, give its html address, the date accessed and, ideally, the author(s).

(3 marks)

Effect of Feed Additives/Supplements on Growth Rates of Prime Lambs

In-class validation questions **(14 marks)**

1. Explain why the following criteria are important in experimental design and how your experimental plan met these criteria.

    (a) Replication (2 marks)

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    (b) Randomisation (2 marks)

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2. Explain the steps taken to ensure that the data recorded were accurate. (2 marks)

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3. What was the conclusion of your investigation? (Was your hypothesis supported?) (2 marks)

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4. Comment on the level of reliability of your results. Explain why you believe the results have the level of reliability you have indicated. (3 marks)

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5. Describe how the experimental plan could be improved to reduce sources of error. (3 marks)

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Marking key for sample assessment task 8 – Unit 3 and Unit 4

1. Explain why feed additives/supplements are used in some animal production systems. Identify **two** feed additives/supplements that could be used in prime lamb productions and give the specific reason for their use.

Description	Marks
Explains the reason for using feed additives/supplements for at least two feed additives/supplements (2 marks each)	1–4
Identifies two examples of feed additives/supplements (1 mark each)	1–2
Explains the benefits for the given examples (1 mark each)	1–2
Total	**/8**
Answer could include, but is not limited to:	
General reasons for using feed additives/supplements may include: • correct nutritional deficiencies, e.g. vitamin D (in housed animals), animals on pasture grown in mineral deficient soils • support high production levels, e.g. calcium for lactating females, layer hens • improve feed conversion efficiency, e.g. antibiotics • prevent disease (especially in intensive systems), e.g. antibiotics Possible feed additives/supplements for prime lambs include: • cobalt – for vitamin B_{12} synthesis in rumen bacteria; important for energy and protein metabolism • selenium – helps protect cell membrane due to its antioxidant properties; helps support the immune system	

2. Choose an additive/supplement to test in your investigation. Explain its role in the animal's body and relate this to how it contributes to the animal's health and performance.

Description	Marks
Provides explanation of the role of the feed additives/supplements	1–2
Relates role of feed additives/supplements to animal health and performance	1–2
Total	**/4**

3. Write a hypothesis for your investigation. *(Hint: it needs to be a statement that can be tested.)*

Description	Marks
Appropriate statement relating growth rate and feed additive/supplement provided	1–2
Total	**/2**

4. Identify the following variables for the investigation:

   (a) Independent variable

Description	Marks
Feed additive/supplement	1
Total	**/1**

   (b) Dependent variable

Description	Marks
Growth rate of lambs	1
Total	**/1**

(c)   Control variables

Description	Marks
Identifies at least four control variables	1–4
Total	**/4**
Answer could include, but is not limited to:	

- age of lambs
- gender
- source of additive/supplement
- environmental conditions to which lambs are exposed
- pastures common to all lambs

5.   List the equipment and materials you will need to carry out your investigation.

Description	Marks
Provides a comprehensive list of the equipment and materials required	1–4
Total	**/4**

6.   Describe the steps in your method and include diagrams, if required.

Your description needs to show how your method will:
- satisfy the requirements of good experimental design (fair test, randomisation and replication), and
- ensure that the data obtained is accurate.

Description	Marks
Method indicates:	
• what is to be measured	1
• how measurements are to be taken	1–2
• how fair test is achieved, i.e. control of required variables	1–2
• how randomisation will be achieved	1–2
• how replication will be achieved	1–2
• how accuracy of data will be achieved	1–2
• sufficient detail that another person could conduct the experiment	1
Total	**/12**

7.   Choose an appropriate way to display your raw data. Any tables can be done in a spread sheet and printed as needed.

Description	Marks
Table includes:	
• appropriately headed columns	1
• title	1
• correct units	1
Total	**/3**

8. Carry out the investigation according to your plan. Ensure that it has been approved by your teacher.

Description	Marks
Additives/supplements measured and administered to animals correctly	1–2
Work practices meet occupational, health and safety requirements	1–2
Safe and responsible handling of animals	1–2
Data correctly recorded	1–2
Total	**/8**

9. Process your results by:
   - calculating the growth rate, mean and percentage change in mass
   - carry out relevant statistical analysis – standard deviation and standard error.

   Present this information in a suitable table format to summarise your results and draw a graph to display your processed results.

Description	Marks
Calculation of growth rate, mean and percentage change in mass	1–2
Statistical analysis of results – standard deviations and standard errors	1–2
Processed data presented in suitable format with appropriate headings and units	1–2
Data displayed in a suitable graph with • title • accurate plotting • axes labelled, including units	1 1 1
Total	**/9**

10. Describe and explain any patterns or trends in your data.

Description	Marks
Describes trend between growth rate and feed additive/supplement	1–2
Provides explanation for trend based on appropriate principles for animal growth	1–2
Total	**/4**

11. Do the data support the hypothesis? Support your answer using the results of the investigation.

Description	Marks
Statement about support or not of hypothesis provided	1
Explanation for support or not of hypothesis uses evidence from the experimental work	1–2
Total	**/3**

12. State a conclusion that relates to the hypothesis. Comment on your level of confidence in the conclusion. Support your statement with reference to your results.

Description	Marks
Provides a conclusion that relates to the hypothesis	1–2
Provides a statement indicating level of confidence in results	1
Uses processed data to support statement about level of confidence	1–2
Total	**/5**

13. Identify the main sources of experimental error. Explain how they contribute to inaccuracy in the results.

Description	Marks
Identifies (without discussing) the main sources of error	1
Explains how the errors contribute to inaccuracy in the results	1–2
Total	**/3**

14. Comment on the standard deviation of your data and what this means in terms of the reliability of your results.

Description	Marks
Indicates whether the standard deviation is high or low	1
Comments on the relationship between standard deviation and reliability of the results	1–2
Total	**/3**

15. Suggest how the experimental design may have been improved to reduce any errors or, if you think no changes are needed, explain why.

Description	Marks
Identifies improvements to experimental design (or indicates lack of need for changes)	1
Explains how suggested changes will improve experimental design or why no changes are needed	1–2
Total	**/3**

16. Give recommendations for the management of the lambs based on the findings of this investigation. Explain how you think these recommendations will improve the management of the lambs.

Description	Marks
Provides management recommendations	1
Relates recommendations to results of experiment	1
Explains how recommendations will improve the management of the lambs	1–2
Total	**/4**

17. Provide a reference list acknowledging any sources of information used in the investigation and report, so another reader could access these resources. Use at least **three** sources.
For books, the name of the author(s), title of the book, date of publication, and publisher need to provided.
For scientific reports, the name of the author(s), report title, date of publication and where the report is published need to be provided.
Where web based sources are used, give its html address, the date accessed and, ideally, the author(s).

Description	Marks
Three references provided	1
References provided with sufficient detail to enable someone else to locate it – authors, publication dates, etc. provided as appropriate	1–2
Total	**/3**

Effect of Feed Additives/Supplements on Growth Rates of Prime Lambs

In-class validation questions

1. Explain why the following criteria are important in experimental design and how your experimental plan met these criteria.

    (a) Replication

Description	Marks
Recognition of importance of replication to improve reliability	1
States numbers of animals in each group to be tested	1
Total	**/2**

    (b) Randomisation

Description	Marks
Recognition that randomisation is to reduce bias	1
Describes how selection of animals for treatments was done to achieve randomisation	1
Total	**/2**

2. Explain the steps taken to ensure that the data recorded were accurate.

Description	Marks
Steps taken to achieve accuracy explained	1–2
Total	**/2**
Answer could include, but is not limited to:	
• taring weighing scales between animals • calibrating weighing equipment • ensuring animals receive correct dose of treatment	

3. What was the conclusion of your investigation? (Was your hypothesis supported?)

Description	Marks
Provides relevant conclusion for investigation	1
Relates conclusion to support of hypothesis	1
Total	**/2**

4. Comment on the level of reliability of your results. Explain why you believe the results have the level of reliability you have indicated.

Description	Marks
Comments on level of reliability, e.g. high, medium, low	1
Explanation relates reliability to degree of replication in the experiment	1
Recognition that lower standard deviation means higher reliability	1
Total	**/3**

5. Describe how the experimental plan could be improved to reduce sources of error.

Description	Marks
Identifies sources of error	1
Describes appropriate changes that could be made to reduces sources of error	1–2
Total	**/3**