Government of **Western Australia**
School Curriculum and Standards Authority

ANIMAL PRODUCTION SYSTEMS

ATAR course examination 2020

Marking key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

2020/65184

Section One: Multiple-choice **20% (20 Marks)**

Question	Answer
1	A
2	B
3	D
4	A
5	D
6	C
7	D
8	B
9	C
10	D
11	C
12	B
13	A
14	A
15	A
16	D
17	C
18	B
19	B
20	C

Section Two: Short answer **50% (100 Marks)**

Note: Specific examples have been chosen to illustrate responses. In many cases where the question allows for responses in various contexts, the example given reflects one specific context.

Question 21 **(13 marks)**

(a) Identify **one** male and **one** female hormone that is released during natural breeding behaviour and outline their main roles. (6 marks)

Description	Marks
Male hormone	1
Female hormone	1
For each of the two hormones	
Main role stated	1
Observed behaviour stated	1
Subtotal	**4**
Total	**6**
Answers could include: • male – testosterone, sex drive, aggressive behaviour, development of secondary sex characteristics • female – oestrogen, progesterone, prostaglandin, FSH, LH • testosterone – regulates the males mating behaviour by stimulating their libido, willingness to find and mate females on heat • oestrogen – stimulates oestrous, so that the female will stand and accept the male at copulation.	
Accept other relevant answers.	

(b) Describe how **one** of the hormones identified in part (a) can be manipulated to improve breeding outcomes. (3 marks)

Description	Marks
Describes how the hormone can be manipulated, highlighting its role in improving the breeding outcome	3
Outlines how the hormone is used and its effect on the breeding outcome	2
States a relevant fact about how the hormone is used during breeding	1
Total	**3**
Answers could include: • testosterone – used to prepare teasers, the teaser stimulates the female to come on heat, they are run with the females prior to introducing the sires to improve the mating performance of the sire by having a number of females already on heat • progesterone – used as a temporary implant in females to synchronise heat cycles, all females in the group can be synchronised to come on heat at the same time, in an AI program this means the inseminator can AI a large number of females in one session, reducing the cost of the procedure • prostaglandin – used to stimulate heat by regressing the corpus luteum. Also used to make sure any females that are going into a breeding program are not pregnant (by chance).	
Accept other relevant answers.	

Question 21 (continued)

(c) Select a commercially-used livestock breeding technology and describe how it improves the rate of genetic gain. (4 marks)

Description	Marks
Breeding technology selected	1
Role of technology	
Describes the role of the technology in improving the rate of genetic gain	3
Outlines the technology and includes a link to the rate of genetic gain	2
Simple statement about the technology and genetic gain	1
Subtotal	**3**
Total	**4**
Answers could include: • breeding technology – artificial insemination, embryo transfer • artificial insemination – a select number of females are mated to a genetically superior sire that is not available for a natural breeding program. The sire is selected for superior characteristics that are highly heritable and the progeny are measured to quantify the rate of gain.	
Accept other relevant answers. Note: **not** cloning as this is not commercially-used in industry.	

Question 22 **(13 marks)**

(a) Outline how EBV is utilised in an animal breeding program. (2 marks)

Description	Marks
Includes, enables breeder to compare the individual of the same breed and age with individuals from other herds/flocks for those traits that are economically valuable	2
States it is the genetic value of an individual as a parent	1
Total	**2**
Accept other relevant answers.	

(b) (i) From the table above, clarify the breeding objectives of the buyer who selected ram tag A2 to produce prime lamb. (2 marks)

Description	Marks
Clarifies the breeding objective as to produce a heavier and more muscled lamb	2
States either the breeding objective as a heavier or more muscled lamb	1
Total	**2**
Answers should include: • ram buyer went for A2 because they are breeding heavier (WWT), and more muscled lamb. (WEMD which the market requires and pays a premium for.)	

(ii) For ram tag A2, calculate the progeny's expected genetic gain for each trait. (3 marks)

Description	Marks
WWT 9.4/2=+4.7 kgs	1
WFAT 2.1/2=+1.05 mm	1
WEMD 2.9/2=+1.45 mm	1
Total	**3**
Note: answer **must** include units of measurement for each gain.	

(iii) Explain the producer's choice in ram selection if the market was offering a better price for leaner lamb. (3 marks)

Description	Marks
Explains that ram A's weaning fat depth (of -0.75) passed on to its offspring will result in leaner lamb	3
Describes that ram A has a negative ASBV for weaning fat depth which should lower fat depth in the lamb	2
States that ram A rather than ram B	1
Total	**3**
Answers could include: • the amount of fat that a lamb has can be managed through nutrition if finishing in a feedlot. Heavy, faster growing lamb is still preferred • choosing a leaner ram would also depend on the extra value offered by the market. The price difference may not be significant enough • quicker turnoff – reduce costs.	

Question 22 **(continued)**

(c) Consider **one** adaptation to reproduction management and explain how it would improve the efficiency of an élite sire's superior genetics in a breeding program.

(3 marks)

Description	Marks
Considers a relevant adaptation that highlights the efficiencies	3
Outlines a relevant adaptation that refers to efficient use of the sire	2
States a relevant adaptation	1
Total	**3**

Answers could include:

- artificial insemination – collect fresh semen from the sire, extend it and inseminate it into a greater number of ewes than the sire could normally be expected to mate. Usually 50 females over a six week period. Using AI any number of females can be synchronised and mated over a much shorter period of time
- select only superior females to mate with sire, using DNA testing those females who would make the most genetic gain are identified
- feed lupins to the sire for up to six weeks prior to mating to increase sperm production, thus increasing his chances to get all females in the mob pregnant
- feed lupins to ewes 14 days prior to putting ram in and a further 14 days while the ram is in, to increase the number of twin conceptions to maximise the sires genetic spread.

Accept other relevant answers.

Question 23 **(9 marks)**

(a) (i) Outline the main difference between a feed additive and a growth promotant in a nutrition program. (2 marks)

Description	Marks
Outlines the difference	2
States what a feed additive or a growth promotant is	1
Total	**2**
Answers could include: • a growth promotant is only concerned with increasing the rate of growth whereas a feed additive is used to improve the quality of the feed/rectify nutrient deficiencies or similar or • increase palatability to increase feed intake.	
Accept other relevant answers.	

(ii) Why are animal by-products banned as feed additives in Australia? (2 marks)

Description	Marks
Clarifies meat meal cannot be fed to ruminants because it is a restricted animal material (RAM) and is banned due to its link to the occurrence to mad cow disease	2
States meat meal cannot be fed to ruminants	1
Total	**2**

(b) (i) Comment on the reliability of the trial on the basis of the above results. (2 marks)

Description	Marks
Comments on the amount of variation, making particular mention of sites 2 and 5. While at each site there has been an improvement except for site 5. The results at site 2 are questionable, particularly when the other three sites had a similar response	2
Makes a relevant statement about variation in the results	1
Total	**2**
Accept other relevant answers.	

Question 23 (continued)

(ii) Explain a reason for the differences in average growth rates at each site.

(3 marks)

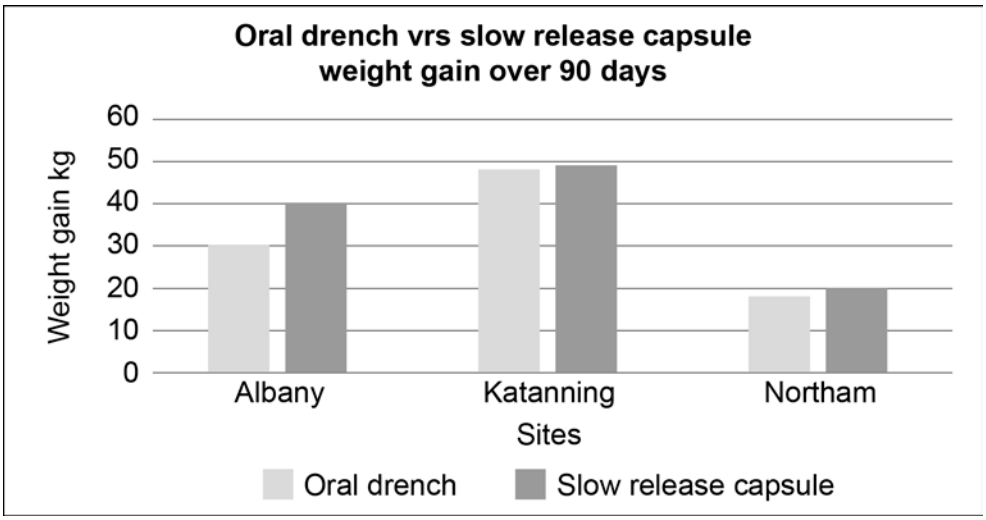
Description	Marks
Explains a relevant reason, providing a clear connection to the differences	3
Describes a relevant reason and attempts to describe the effect	2
States one relevant reason for the difference	1
Total	**3**
Answers could include: • breed of pig – different pure bred pigs have different growth rates and pigs that are crossbred would have hybrid vigour • age of pigs – younger pigs have a greater rate of growth • sex of pigs – male pigs have a higher rate of growth due to testosterone • facility – temperature, humidity, space • ration – could be different quantity.	
Accept other relevant answers – environmental conditions, number of feeds per day, health status of pigs, management practices.	

Question 24 **(13 marks)**

(a) Outline **one** reason for using slow-release capsules in preference to an oral drench to control worms. (2 marks)

Description	Marks
Outlines an effectiveness advantage with detail	2
States a relevant difference related to effectiveness	1
Total	**2**
Answers could include: • slow release capsule is inside the animal, releasing a controlled amount of drench over a period of time, effectively controlling worms as they are ingested from the pasture. • capsule lasts longer, less labour required • kills off hatching larvae for longer, enabling sheep to clean paddocks.	
Accept other relevant answers.	

(b) Construct a bar graph using the above data. (5 marks)



Description	Marks
Graph title relevant	1
X-axis, title and three sites named	1
Y-axis, title and units, 0 to 60 in kg	1
Weight gain for each site is plotted accurately on a bar graph	1
Plotted data is correctly identified with a key	1
Total	**5**
Note: allocated a maximum of 3 marks if a bar graph is NOT used.	

(c) Propose a conclusion that could be drawn from the trial results. (2 marks)

Description	Marks
Proposes the slight gain by slow release capsules over oral drench at all sites and a larger increase at the Albany site, concluding that the slow release capsule is more effective at controlling worms in Albany	2
States that weight gain using the slow release capsule is greater than using an oral drench	1
Total	**2**
Accept other relevant answers.	

Question 24 (continued)

(d) (i) State a possible bias in the data in part (b). (1 mark)

Description	Marks
States relevant bias	1
Total	**1**
Answers could include: • weight range of wethers at each site • weighing techniques at each site • variation in bloodlines of the sheep • higher worm burdens at some sites • seasonal conditions at sites.	
Accept other relevant answers.	

(ii) Describe a relevant change in the experimental design that could minimise the bias stated in part (d)(i). (3 marks)

Description	Marks
Describes a relevant change to minimise bias	3
Outlines a relevant change to minimise bias	2
States a relevant change to minimise bias	1
Total	**3**
Answers could include: • all the wethers should be weighed before they are selected for the trial, any that vary too greatly from the average should not be used • weighing method should be the same at each site, including the time of weighing as this will be influenced by gut fill • all wethers should be selected from the same bloodline, so that genetic variation for growth rate can be minimised.	
Accept other relevant answers.	

Question 25 **(19 marks)**

(a) Outline **two** effects that climate change has on the productivity of the selected livestock production system. (4 marks)

Description	Marks
For each of the potential effects	
Outlines the effect of climate change that causes loss of productivity in the selected livestock system	2
States one climate change effect on the selected livestock system	1
Total	**4**
Answers could include: • dairy cattle – average temperatures are rising causing overheating and lower milk production; lower average rainfall resulting in lower pasture production causing higher costs in supplementary feeding • beef cattle – rising temperatures affect fertility rates and affecting calving rates, lower average rainfall resulting in lower pasture production causing higher costs in supplementary feeding or lower stocking rates • pigs – lower productivity from reduced feed intake in high temperatures, higher running costs of intensive housing due to variability of climate.	
Accept other relevant answers.	

(b) (i) Does the graph support the theory of climate change? Outline a reason for your response. (3 marks)

Description	Marks
Yes	1
Subtotal	**1**
Reason	
The trend is that the average number of very hot days is increasing even though year in year out the number of very hot days fluctuates	2
States the number of hot days is increasing	1
Subtotal	**2**
Total	**3**
Accept other relevant answers.	

Question 25 (continued)

(ii) Describe the long-term effect of an increase in very hot days on the sustainability of the livestock production system. (3 marks)

Description	Marks
Describes the reasons behind the long-term effect on sustainability	3
Outlines the links of the long-term effect with the sustainability of the selected livestock system	2
States a relevant long-term effect	1
Total	**3**
Answers could include: • dairy cattle – increasing very hot days cause overheating, lowering average milk production, reducing sustainability; lower production can be compensated by milking more cows which increases costs of production and puts pressure on the farm environment, not sustainable as margins are squeezed • pigs – become stressed, unable to sweat and with small lungs unable to dissipate body heat. Pigs growth rate slows in grower pigs and breeding can be disrupted in sows, resulting in lower pregnancy rates and less pigs/sow/year.	
Accept other relevant answers for other livestock types.	

(c) (i) Describe **one** short-term strategy for optimising production during the increasing number of very hot days. (3 marks)

Description	Marks
Describes relevant short-term strategy	3
Outlines relevant short-term strategy	2
States strategy	1
Total	**3**
Answers could include: • dairy cattle – change milking times on very hot days to minimize heat exposure, milking earlier in the morning and later in the afternoon to avoid the heat of the day • beef cattle – avoid mustering/yarding cattle on very hot days, adjusting the husbandry plan according to the short-term weather forecast, starting early, staging the muster. Most forecasts give a fairly accurate seven day forecast • pigs – maintain cool drinking water temperature. Avoid feeding during the hottest part of the day.	
Accept other relevant answers.	

(ii) Describe **two** long-term improvements to the livestock production system to maintain sustainability as the number of very hot days increases. (6 marks)

Description	Marks
For each of the two long-term improvements	
Describes how the improvement contributes to sustainable production in the long-term	3
Outlines how the improvement contributes to sustainable production in the long-term	2
States a long-term improvement	1
Subtotal	**3**
Total	**6**

Answers could include:

- dairy – select cows for heat tolerance/breed heat tolerant cows by using characteristics from heat tolerant breeds such as Bos Indicus.
  Plant shade trees in areas where cows can rest/build shaded feed shed to enable cows to get out of the direct sunlight during the hottest part of the day
- pigs – in an intensive system the provision of insulation and cooling should be factored into the design of the piggery. Reduce stocking density that will reduce output but have a positive effect on growth rates factored into budgets. Aim for higher farrowing/weaning rates to compensate for larger floor space.

Accept other relevant answers.

Question 26 **(17 marks)**

(a) Identify a type of livestock digestive system, state a relevant livestock example and explain how carbohydrates are digested. (5 marks)

Description	Marks
Type of digestive system	1
Subtotal	**1**
Relevant livestock type stated	1
Subtotal	**1**
Explains carbohydrate digestion and links enzymes	3
Outlines at least two basic steps of carbohydrate digestion	2
Statement about digestion of carbohydrates in the selected digestive system	1
Subtotal	**3**
Total	**5**

Answers could include:

- monogastric – pig; begins in the mouth where amylase in the saliva is added during chewing. Food enters the gastric stomach where the amalyse is neutralised by stomach acid and the food is converted into chime, which passes into the small intestine where enzymes are secreted (amalyse, maltase, sucrose and lactase), breaking down the carbohydrates into monosaccharides which are then absorbed into the bloodstream
- microbial – sheep, cow, goat; no amalyse secreted in the mouth, most carbohydrate is digested in the rumen by microbes releasing enyzymes and producing simple sugars. The microbes take up the simple sugars and metabolise them into volatile fatty acids (acetic, propionic, butyric) which are then absorbed through the rumen wall and carried to the liver where they become the main source of energy.
- pseudo ruminant – horse.
- camelid – alpaca, llama.

Accept other relevant answers.

(b) Outline how energy is used and lost by livestock during metabolic processes. (2 marks)

Description	Marks
Outlines how energy is used for maintenance first, normal body functions. Some energy is lost during metabolism through faeces, urine, gases and heat	2
States a relevant fact about energy and metabolism	1
Total	**2**

Accept other relevant answers.

(c) Identify a type of livestock digestive system that differs from part (a), state a relevant livestock example and explain how protein is digested in this digestive system. (5 marks)

Description	Marks
Type of digestive system	1
Subtotal	**1**
Relevant livestock type stated	1
Subtotal	**1**
Explains protein digestion and links enzymes	3
Outlines at least two basic steps of protein digestion	2
Statement about digestion of protein in the selected digestive system	1
Subtotal	**3**
Total	**5**

Answers could include:

- monogastric – pig; protein is broken down by pepsin in the gastric stomach into peptides. As peptides pass into the small intestine in the chime, peptidases break the peptides down into amino acids which are absorbed into the bloodstream through the intestinal wall.
- microbial – sheep, cow, goat; proteins are broken down in the rumen by microbes into peptides and amino acids, and further into ammonia, which is absorbed through the rumen wall, carried to the liver where it is converted into urea. Most of the urea is secreted in urine. The microbes use the amino acids to build microbial protein which is available to the ruminant when the microbes die and are digested in the abomasum and small intestine and absorbed as amino acids.

(d) Outline the effect of a sudden change in feed type on the metabolism of a ruminant. (2 marks)

Description	Marks
Outlines the change in acid production in the rumen to more lactic acid disrupts/kills the rumen microorganisms and the animal stops digesting feed	2
States that a sudden change in feed type causes the metabolism to shut down, eventually causing death	1
Total	**2**

Question 26 (continued)

(e) Explain the importance of feed rations to achieve market specifications of livestock in a pasture-based grazing system. (3 marks)

Description	Marks
Explains the importance of identifying the required supplements in an animals diet so that the market specifications of, for example, fat cover and live weight, are met while still grazing on pasture	3
Outlines how supplements are used to overcome nutritional deficiencies so that livestock can continue to grow	2
Makes a relevant statement that links supplements to a deficiency in the pasture-based system	1
Total	**3**
Answers could include: • feed rations are used to overcome nutritional deficiencies brought about by a need to match feed requirements caused by the production cycle demands (pregnancy, calving), seasonal conditions (late break) and drought • protein and energy are critical considerations in a feed ration. Balancing a ration that is fed in the pasture needs to take account of the residual protein/energy of the pasture so that valuable feed is not wasted.	
Accept other relevant answers.	

Question 27 **(16 marks)**

(a) (i) The grain/hay mix needs to provide 10% protein. Using the Pearson Square method, design a suitable ration and show the ingredients as a percentage. (6 marks)

Description	Marks
Grain selected – barley or oats	1
Hay selected	1
Grain ratio calculated	1
Hay ratio calculated	1
Grain percentage calculated	1
Hay percentage calculated	1
Total	**6**

Answers could include:

- Barley 14 — 10 — Hay 8

$\frac{2}{6}$ = 33% (or 34%) Barley

$\frac{4}{6}$ = 67% (or 66%) Hay

- Oats 12 — 10 — Hay 8

$\frac{2}{4}$ = 50% Oats

$\frac{2}{4}$ = 50% Hay

No marks if hay is not selected.

(ii) Outline a reason for the grain/hay mix selected in part (a)(i). (2 marks)

Description	Marks
Outlines the reason for selected mix	2
States a relevant fact about the ration	1
Total	**2**

Answers could include:

- barley/hay mix contains less grain, is the least cost ration
- oat/hay mix is easy to measure out and oats is a safe grain to feed
- cost of pellets too high.

Accept other relevant answers.

Question 27 (continued)

(b) (i) Compare the cost of the selected grain/hay ration from part (a)(i) with that of the pellets by completing the value of A **or** B, **and** C, D and E in the following partial budget. (4 marks)

Item	**Cost $/tonne**	**Grain/hay ration cost $/tonne**	**Pellet ration cost $/tonne**
Barley	300	**A** = **100**	
Oats	300	**B** = **150**	
Hay	120	**C** = **80** **60**	
Pellets	350		350
Mixing machinery	40	40	0
Labour mixing	40	40	0
Labour feeding out	40	40	40
Storage	20	20	0
Delivery	10	0	10
Total $/tonne		**D** = **$320** **$350**	**E** = $**400**

Description	**Marks**
Cost of barley or oats calculated (A or B)	1
Cost of hay calculated (C)	1
Total of grain/hay ration calculated (D)	1
Total of pellet ration calculated (E)	1
Total	**4**
Answers could include: • barley/hay calculation = $180 • oat/hay calculation = $210 • total of grain/hay ration = $320 (barley/hay) or $ 350 (oat/hay) • total of pellet ration = $400	

(ii) State the **least-cost** ration. (1 mark)

Description	**Marks**
Grain/hay ration	1
Total	**1**

(iii) Explain **one** aspect of this partial budget that will require recalculation on a regular basis. (3 marks)

Description	**Marks**
Explains the changing costs of the ingredients due to seasonal conditions, supply/demand and how much the producer can retain from their cropping program or store on-farm	3
Describes the changing costs of grain and hay, relating it to availability	2
States feed ingredient costs	1
Total	**3**
Accept other relevant answers.	

Section Three: Extended answer **30% (40 Marks)**

Question 28 **(20 marks)**

(a) Outline a relevant example of pesticide resistance in livestock and explain how this resistance could have developed. (6 marks)

Description	Marks
Example	
Relevant example outlined, e.g. Barbers pole worm resistant to clear drenches	2
Relevant example stated, e.g. Barbers pole worm	1
Subtotal	**2**
Explanation	
Explains how the resistance can be developed, for example, process of natural resistance and human error when using pesticides as the main contributing factors	4
Describes how the resistance can be developed, for example, the process of resistance that occurs naturally and links poor practices to its occurrence	3
Outlines how the resistance can be developed, for example, the presence of genetic variation within a population	2
States a relevant fact about how disease resistance develops	1
Subtotal	**4**
Total	**6**
Answers could include: • relevant examples are worm drenches, lice treatments, fly-strike protection, baits where pest have developed increased resistance to the product and producers have few options, e.g. clear drenches have full resistance • any group of animals includes individuals that exhibit genetic variation. When subjected to a pesticide some individuals survive. The vulnerable pests are killed and the resistant ones breed to become dominant in the population. Generational change is short in parasites which allows for quick repopulation. • human error in application rates, timing and continuously using pesticides with the same mode of action hastens the resistance.	
Accept other relevant answers.	

Question 28 (continued)

(b) Using practical examples, recommend how pesticide resistance can be managed in the animal production enterprise. (6 marks)

Description	Marks
Comprehensively recommends how to manage pesticide resistance using a range of strategies with relevant examples to highlight how it works in practice	6
Recommends how to manage pesticide resistance using a range of strategies with relevant example to highlight how it works in practice	5
Explains how to manage pesticide resistance with relevant examples	4
Describes how to manage pesticide resistance with a practical example	3
Outlines how to manage pesticide resistance with a practical example	2
Makes a relevant statement about managing pesticide resistance without referring to a practical example	1
Total	**6**

Answers could include:

- managing pesticide resistance – don't use the same mode of action when selecting a pesticide – example: keep an accurate register of pesticides used, dose rates, WHP, batch number; rotate drenches so that worms are being challenged continually; cull livestock that have low immunity; ensure the equipment used to deliver the pesticide is correctly calibrated so that the correct dose rate is given; ensure livestock are weighed to determine the correct dose rate
- minimise pesticide use by implementing IPM – example: monitoring cattle for worms by using a fecal worm egg count test; use rotational grazing with sheep to reduce the worm population on the pasture; select replacements with higher natural immunity to worms; maintain tight biosecurity by quarantining new arrivals until they have been cleared; switch to organic farming where the criteria for pest control requires no pesticide use.

Accept other relevant answers.

(c) Define quality assurance (QA), state a livestock QA program and evaluate its role in maintaining Australia's 'clean, green' image with regard to the use of pesticides.

(8 marks)

Description	Marks
A process that verifies that a product meets the required market specifications	2
Mentions market specifications	1
Subtotal	**2**
States a relevant quality assurance program	1
Subtotal	**1**
Evaluation	
Evaluates the records required and links it back to the QA program, highlighting the self-audit/industry audit process to ensure accurate records are kept, particularly when using pesticides	5
Explains the records required and links it back to the QA program, with attention to the self-audit/industry audit process for accurate records when using pesticides	4
Describes the records required with links to QA program to ensure accurate records when using pesticides	3
Outlines a more detailed approach to record keeping, including date used, mob, rate, withholding period (Export Slaughter Intervals (ESI) where relevant), batch number and stock control	2
Makes a relevant statement about how the QA process stated can help maintain a 'clean, green' image e.g. keep records of any treatments carried out on the farm	1
Subtotal	**5**
Total	**8**
Answers could include: • QA examples – Livestock Production Assurance, Milkline, Australian Pork Industry Quality (APIQ), SQF2000, AUSMEAT, Meat Standards Australia (MSA) • practices that promote the careful use of pesticides, their impact on the environment, contamination of soil and waterways • implementation of IPM principles to reduce the reliance on pesticides • accurate and up-to-date records that document pesticide use, either on the livestock, the pasture or any supplementary feeds • purchase feed from a trusted (accredited) supplier. Certification covered by a commodity vendor declaration.	
Accept other relevant answers.	

Question 29 **(20 marks)**

(a) Explain, using examples, how animal production systems are changing as a result of consumer pressures. Evaluate the effectiveness of adopting new technologies to assist with making the stated changes. (11 marks)

Description	Marks
Uses appropriate examples	2
Refers to one relevant example	1
Subtotal	**2**
Animal production practices	
Explains how animal production practices change as a result of consumer pressures	4
Describes how animal production practices change as a result of consumer pressures	3
Outlines how animal production practices change as a result of consumer pressures	2
States how animal production practices change as a result of consumer pressures	1
Subtotal	**4**
New technology	
Evaluates the effectiveness of adopting a new technology, clearly identifying how these technologies are effective for producers for the stated change bought about by consumer pressure	5
Explains the effectiveness of adopting a new technology, outlining how these technologies are effective for producers for the stated change bought about by consumer pressure	4
Describes the effectiveness of adopting a new technology, indicating how these technologies are effective for producers for the stated change bought about by consumer pressure	3
Outlines the effectiveness of adopting a new technology	2
States the effectiveness of adopting a new technology	1
Subtotal	**5**
Total	**11**

External/consumer pressure	How production systems are changing
Altering/stopping animal production practices that are deemed to either cause excessive stress or significantly alter their normal behaviours. Examples: • mulesing of lambs • intensive production systems • live export trade • marketing and selling livestock • slaughtering of animals • dehorning calves	• sedation (anaesthesia) prior to mulesing • breeding of sheep more resistant to fly strike (bare breech area) • movement away from battery caged eggs to barnyard/free range • improvements in controlling an animal's environmental conditions – e.g. insulation, ventilation, air conditioning, shade in feedlots • legally enforceable industry standards on animal welfare. – e.g. euthanasia protocols, treatment of diseased/sick animals, animal handling procedures, fit to load criteria
End product pressures • eating quality guarantees • fat characteristic (e.g. colour, distribution) • meat characteristics	• breeding programs that target desirable traits – breed selection, breeding systems (crossbreeding) • compulsory participation in quality assurance programs to access markets • adaption of new technologies – fat scanning, automatic weighing drafting systems, using EBV for growth and fat

	• improvements in nutritional management – ration formulation, grazing management, finisher diets
Global increase in meat consumption as a result of changing diets, rising income levels and population growth in countries that are not traditionally beef/lamb consumers	• adoption of new technologies that improve efficiency • changing of production systems to meet premium export market specifications.
New technologies	Evaluation
Precision agriculture – RFID, biometric sensors, GPS, controlled traffic farming, drones	These are effective technologies with the potential to dramatically improve productivity and efficiency. Issues of this technology revolve around accessibility, practicality and acceptability.
Artificial intelligence and robotics	Artificial intelligence is an effective tool for monitoring factors such as product quality and productivity and an animal's health conditions. Robotics – improves efficiency, improves productivity and reduces environmental waste.
Breeding technologies – gene markers, estimated breeding values sexed semen in dairy industry	Effective technology for producing a desirable product that meets consumer demands. Issues – potential detrimental impact of focusing on selecting one trait whilst negatively impacting on another. e.g. fly strike – selecting for less wrinkles with potential reduction in wool yield.
Accept other relevant answers.	

Question 29 (continued)

(b) Describe the relevance that market information has on the sustainability of an animal production system. Consider **two** strategies that could be incorporated into the production planning process to mitigate the risk of a downturn in market returns.

(9 marks)

Description	Marks
Relevance	
Describes the relevance market information has on enterprise sustainability	3
Outlines the relevance market information has on enterprise sustainability	2
Identifies the relevance market information has on enterprise sustainability	1
Subtotal	**3**
For each of the two strategies	
Considers a risk mitigation strategy that clearly shows it has been incorporated into the production plan in case of a downturn in market returns	3
Outlines a risk mitigation strategy that takes into account a downturn in market returns	2
States a risk mitigation strategy	1
Subtotal	**6**
Total	**9**

Answers could include:

Relevance of market information for sustainability with reference to increasing income and profitability

- up-to-date and reliable market information is essential for primary producers to reduce the risks associated with marketing their product. Market knowledge helps determine the optimum time to sell their commodity, who to target in the supply chain to maximise returns or decisions whether to supply to the market 'out of season'
- market information guides planning, giving producers best case scenarios for price, volume, changes in specifications, changes in delivery/welfare standards
- source of market information could significantly determine its relevance. Market information may be biased if deriving from a source with a vested interest or ulterior motive. You would be relatively confident that industry funded and independent organisations (e.g. MLA, Department of Agriculture) would provide reliable and up-to-date market information in which to formulate sustainable enterprise planning.

Risk mitigation strategies

- diversification into other enterprises is a very common management tool to reduce risk, e.g. planning for a combination of livestock and cropping enterprises that spread the risk of potential fluctuations in financial returns
- flexibility within an enterprise – plan for the ability to change markets subjected to either positive or negative commodity prices, e.g. out of season feedlotting of lambs
- forward contracts – an agreement between the producer and buyer to purchase the commodity at a predetermined future date and price. This protects the producer against detrimental commodity price movements
- value adding to the product to increase margins. Taking the product further down the marketing chain. Works well with producers who have a niche product and have the marketing skills to take advantage of the opportunities.

Accept other relevant answers.

Question 30 **(20 marks)**

(a) Outline **two** market standards that need to be met by the product stated above before it leaves the farm and explain how these standards are maintained during the production phase. (12 marks)

Description	Marks
For each of the two market standards	
Standard outlined	2
Standard stated	1
Subtotal	**4**
For each of the two market standards	
Explains how the producer utilises the standards during the production phase and what records are required for internal and external auditing of the standards	4
Describes the standards and how they guide the producer to maintain the standards	3
Outlines how standards are linked to maintaining the standards	2
Relevant statement in regards to standards documentation	1
Subtotal	**8**
Total	**12**

Answers could include:

- Merino – wool, dairy – milk, beef cattle – beef, sheep – live export
- wool – Standard 1: free of medulated fibres-shear exotic breeds after merinos, making sure wool from exotic breeds does not come into contact with merino wool and is baled and identified correctly in the classers specification
  Standard 2: free of contamination – sheep yards and shearing shed are cleaned of potential contaminants such as wire, baling twine, plastic wrapping, feed bags prior to commencing shearing and rubbish bins are in place in the shearing shed for the correct disposal of rubbish
- beef – Standard 1: National Livestock Identification System compliant ear tag of bolus – each animal has an individual NLIS tag which supports life long tracking.
  Standard 2: horned cattle – horn tipping to reduce damage and bruising during transport
- milk – Standard 1: no antibiotics in the milk-cows that have been treated with antibiotics are identified and the milk is diverted from the tank to a bucket. This practice stays in place until the withholding period has lapsed
  Standard 2: maintain a low somatic cell count (SCC) which increases the quality and shelf life of the milk. The standard varies between processors but 250 000 cells/ml is a recognised industry standard
- sheep live export – Standard 1: free of scabby mouth – all export sheep are vaccinated for scabby mouth to reduce the chance of an infection while in transit.
  Standard 2: NLIS compliant tag – all export sheep must have the correct age colour ear tag with the required NLIS information
- wool – the producer either employs a registered wool classer or holds an owner-classer qualification. The Australian Wool Exchange (AWEX) standards stipulate how medulated fibres are to be treated, from shearing order to disposal of wool that is contaminated. The classer signs a statutory declaration (wool specification) that provides the broker with information about how the modulated fibres were treated
  AWEX provides guidelines and a checklist so that producers can prepare the shearing area prior to shearing. The checklist includes such items as removing rubbish, providing bins, removing baling twine, using approved wool packs

Question 30 (continued)

• beef – any producer who supplies beef for Meat Standards Australia (MSA) must be registered. This requires an on-line training program and certification to use the MSA NVD's when delivering. Any cattle being sent for MSA must have been on the dispatching property for at least 30 days. The cattle would need to appear as transferred on the NLIS data base to confirm this requirement. • milk – when milk is picked up a sample is taken and tested at the processing facility before it is mixed with other milk loads. The antibiotic count must be zero. Cows that are undergoing mastitis treatment with antibiotics must be milked last or into a bucket to reduce the chance of contamination. This milk is kept separate until the withholding period is passed. Milk with a high SCC is still processed however it may attract a lower price/litre and if the SCC continues to be above the required level the milk contract could be cancelled.
Accept other relevant answers.

(b) How are tariffs and quotas used to protect Australia's domestic market share? Examine another management strategy at the farm, state and national level that is critical to securing Australia's global competitiveness. (8 marks)

Description	Marks
Tariffs and quotas	
Explores both strategies, giving a detailed accounts of how each strategy can protect Australia's international market share	4
Describes both strategies, linking the strategies to protection of industries that are more vulnerable to competition	3
Outlines how tariffs and quotas work as a protection strategy	2
Makes a relevant statement about either tariffs or quotas as a protection strategy	1
Subtotal	**4**
Management strategy	
Examines the role of quarantine at a farm, state and national level, the strategies in place at each level and what would happen if there was a breach of quarantine	4
Describes quarantine as part of the wider biosecurity strategy to protect Australian exports	3
Outlines the role of quarantine to reduce the impact of foreign contamination at Australia's borders	2
Makes a relevant statement about Australia's biosecurity and how it secures Australia's 'clean, green' status	1
Subtotal	**4**
Total	**8**

Answers could include:

- tariffs – a tariff is a tax imposed by the government on some goods and services that are imported from other countries. The tariff increases the price the consumer pays and therefore less desirable to the consumer. The locally made product is then able to compete with the cheaper import. By passing the cost of the tariff onto the consumer the local product appears cheaper. The Australian producer benefits from a tariff but does not encourage producers to be better farmers while they are receiving assistance to outprice an overseas competitor
- quotas – enable a quantity of goods and services to be exempted or have a reduced import duty. This limits the influx of goods and services into Australia and potentially under-cutting the local industry by dumping cheaper goods on the market. The quota enables a foreign country to sell its goods in Australia without decimating the local industry. It is often used where an industry is in its setting up

phase, before it gets into full production. The foreign goods help supplement the market • quarantine – keeping unwanted pests and diseases (exotic) out of Australia while allowing the flow of goods and people where possible is the role of quarantine. At a national level goods and people are inspected by Australian Quarantine and Inspection Service (AQIS) at all ports, airports and mail exchanges. Early detection helps to stop pests entering and disrupting production systems. At the State level there are quarantine stations, for example, set up on the main entry points to Western Australia to prevent the entry of unwanted pests that have established in other parts of Australia. Any outbreaks within Australia are dealt with under the Standing Committee on Agriculture and Resource Management (SCARM) which coordinates a joint partnership response. Part of this response is a 72 hour stand-still, utilised when there is an outbreak, to allow authorities to track movements and areas of contamination. The NLIS was developed so that tracking of cattle movements could be transparent. On-farm biosecurity has become the many cogs that drive the industry. Each farm implements a biosecurity plan that minimises the risk of pest/diseases entering the farm, relying on the good sense and goodwill of visitors, contractors and suppliers to follow the protocol set down by the farm in relation to the identified risks. Piggeries have a much stricter protocol than a sheep farm because of the nature of their production.
Accept other relevant answers.

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