



January 2018

**Level 3 National in Animal management
Animal Breeding and Genetics (31644)**

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What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

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Animal Breeding and Genetics 31644H

Grade	Unclassified	Level 3		
		P	M	D
Boundary Mark	0	28	44	60

Introduction

This was the first time this assessment has been offered. It is a different paper to any others in the BTEC suite, being an amalgam of task based and exam-based questions. The task-based aspect of the paper was in the context of poultry breeding for a scenario that learners were provided with prior to assessment. The exam style questions covered other aspects of the specification such as the genetic technology section. The also allowed areas of the breeding information that were not included in the scenario to be covered.

Introduction to the Overall Performance of the Unit

The paper has performed well. The task-based questions allowed learners to apply their own research to the scenario and demonstrate their understanding of animal breeding in the context of poultry.

The exam-based questions allowed learners to demonstrate that they have an overall understanding and knowledge of the areas covered by the specification.

Many of the learners had obviously used the support material, and in particular the SAMS and additional SAMS to support their understanding of the requirements of the assessment, and centres are to be commended for supporting learners with these support materials.

Individual Questions

1(a)(i) This question was recall of unit content and was well answered. Some learners answered generically, from the specification, other answers referred particularly to poultry. Both approaches were credited.

1 (a) (i) Give **two** factors that breeders have to consider when selecting breeding poultry.

(2)

1 Their fertility, how easy it is to breed from them

2 Their regular laying ability - how many eggs they lay & how desirable this is

This learner has provided two correct factors breeders consider when selecting poultry and thus gaining both marks.

1(a)(ii)

Learners generally gained one or two marks on this question; they could identify one or two reasons but not extend them, to make four marks.

The following answer gained three marks as there are three identifications (increased egg yield/better carcass/ reduced inbreeding depression) but only one extension into explanation (increased health) learners should be encouraged to look at the command verb and the number of marks available for each question. A four mark explain question cannot be answered with a list of four things. Learners are expected to provide answers that identify a point and explanation of the point identified.

(4)

Because they want traits of each breed
The black rock has a strong immune
system and is a good egg layer.
These two qualities are desirable to
farmers as it benefits them financially.
Years of careful selection to produce a
chicken most beneficial.

The learner has been awarded two marks.

1(b)

This question was answered well by the learners who read the question carefully. Some learners described conditions for artificial incubation or rearing of chicks rather than natural incubation.

(4)

- 1 He should ensure that the humidity is correct (40-50% for the first 18 days and 65-75% for the final day). Incorrect humidity could result in chick deformities.
- 2 He should ensure that the temperature is not too high or too low. Incorrect temperatures may result in organ abnormalities in chicks.

This answer contained no rewardable material and therefore awarded 0 marks.

(b) Explain **two** conditions that John should consider so the hens incubate and raise their chicks successfully.

(4)

- 1 They have enough substrate to maintain a safe temperature - incubation temperature is about 33°C.
- 2 Easy, unlimited access to food and water. The mother cannot leave eggs for long - so having food and water accessible to her is essential.

This answer has been awarded two marks.

1(c)

This was the question based on the prerelease material. It was generally well answered; learners were able to demonstrate the research they had found. Where learners had not done as well, it was where they had not reached a recommendation, or only considered one breed and had not mentioned the others.

(12)

Buff Orpingtons are a dual purpose breed that reach 8-10lbs in weight. They are calm natured, enjoy attention and tolerate children. This makes them perfect for visitor interaction and school visits. As well as being reliable layers (200-280 eggs per year), they will also accept other eggs for incubation. Buff Orpingtons are ~~also~~ great mothers; which is essential in a growing flock.

Silkie chickens are a fluffy, show breed thought to originate in China. Although they are a small breed (3-4lbs), they are robust and can live for up to 9 years. Silkie chickens are poor layers; having 120 per year is lucky. As they are poor layers they are mainly used for show and public interaction.

The Indian Game is a stocky Cornish chicken that weighs around 6-8lbs. As they have large amounts of breast meat and lay around 170 eggs per year they are dual-purpose. However, Indian Game are difficult to breed and have an aggressive temperament. This makes them unsuitable for John's smallholding.

Overall, John should stock Buff Orpingtons as they are dual-purpose, good mothers and will tolerate children. This means that they suit the requirements that John asked for.

This is an example of an answer that was awarded full marks.

Few learners did not seem to understand the requirements of the question and failed to assess or recommend, and just included some comments about how to keep poultry. This suggests that they have not seen or discussed the available support material like the Sample Assessment Material (SAMS) and additional Sample Assessment Material (SAMS) when they have been revising for this assessment.

John needs to look at what are the minimum accommodation requirements are by law, the Animal Welfare Act, Farmed Animals Act, and use these to determine what measurements he needs, what materials to use, what lighting to use. Also he should look at the temperments of each breed and consider keep the 3 different breeds seperated, for example the Indian Game chickens are known to have an aggressive temperment. He should also consider providing the accommodations with the correct equipment needed for egg laying if needed - also he should consider a seperate area for the hens if he doesn't

want chicks so this seperate area should be available. Also there should be a seperate area available to put any poultry in that appear ill as this will help stop the spread of infection. He should also when choosing his poultry he should look at the records and look at their health history.

2(a)

This question was either answered very well or very poorly and this seemed to reflect the input the learners had received as much as the innate ability of the learners. Good responses took the information from the stimulus and applied it accurately.

2 (a) Calculate the phenotypic probabilities using the dihybrid template.

(8)

		Female gametes				
		RP	Rp	rP	rp	
Male gametes	RP	RRPP*	RRPp*	RrPP*	RrPp*	○ = Single ①
	Rp	RRPp*	RRpp□	RrPp*	Rrpp□	△ = Pea ③
	rP	RrPP*	RrPp*	rrPP ^Δ	rrPp ^Δ	□ = Rose ③
	rp	RrPp*	Rrpp□	rrPp ^Δ	rrpp [○]	* walnut ④

Phenotypic probability	Single = $\frac{1}{16}$
1 : 3 : 3 : 9	Pea = $\frac{3}{16}$
	Rose = $\frac{3}{16}$
	walnut = $\frac{9}{16}$

This answer has been awarded eight marks.

Other responses showed that learners had some idea how a Punnett square worked but did not understand the genetics involved. They could not identify the correct alleles so gained no marks.

		Female gametes				
		<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	
		<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	<u>R</u> <u>P</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>
Male gametes	<u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	
	<u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	
	<u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	
	<u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	<u>R</u> <u>P</u> <u>P</u> <u>r</u>	

Phenotypic probability Co-dominance
 $\frac{16}{16}$ ~~Homozygous~~ ~~Homozygous~~ for walnut comb
 16 Het 100%.

This learner has not correctly calculated the phenotypic probabilities.

2(b)

Many learners gained two marks on this question. They could identify two reasons but could not expand them into explanations. There was little understanding of the buildup of deleterious/recessive alleles demonstrated.

This answer gained two marks for the two identifications of reduced production and inheritance leading to an increase on poor quality birds.

(b) Explain **two** reasons why inbreeding depression may cause problems in a poultry flock.

(4)

1. Inbreeding depression can cause unproductive birds resulting in less or no eggs being laid

2. Inbreeding depression can pass down to offspring resulting in an increase of poor quality birds. This can cause health risks and new diseases

2(c)

Learners gained good marks on this question, they could identify three ways, though they often did not expand these to the full six marks available.

An example of a good response demonstrating expansion of the points is included below.

(c) Explain **three** ways of making sure that eggs in an incubator are hatched successfully.

(6)

- 1 Temperature: eggs have to be kept at 99.5 degrees any higher or lower will result in embryo termination
- 2 Humidity: 60 to 50% humidity should be maintained for first 18 days, ^{increased} ~~reduced~~ to 65 to 75% before hatching
- 3 Ventilation: oxygen should be allowed to circulate within the incubator to allow the embryo to breathe as eggs are porous.

This learner has correctly identified and explained three ways of making sure that eggs in an incubator are hatched successfully.

3(a) This was well answered and learners that had been well prepared could expand their answers into full explanations.

1 prevents in breeding between animals lessening the likelihood of genetic defects resulting in 'purer' bred animals.

2 keeping notes of the highest producers helps to maintain that production standard throughout that genetic line.

This learner has been awarded full marks.

3 (a) Explain **two** reasons why keeping records may help him produce high quality birds.

1 You can identify which breeds have been crossed and ^{thus} which breeds should be cross-bred in future. (4)

2

This learner has been awarded zero marks as they have not been able to correct answer the question.

3(b)

Learners generally gained one or two marks here. A lot of answers referred to the animal welfare act, not incorrect in itself but there is legislation specific to breeding animals that would have been easier to use as an example.

Although the scenario is about poultry, there is no requirement in the question to refer to poultry and any example could have been used, or the answer could have been generically about all animals. As a description was required, full marks could not be gained by listing the five freedoms and this approach limited many learners as seen in this exemplar which gained two marks for identifying the act and the freedoms.

Breeding animals' needs are supported by the Animal Welfare Act, 2006 - in which it states the 'five freedoms' that every animal should be subject to by law in order to have good standards of welfare. These are • Freedom from hunger and thirst • this provides them with the basic right of food + water. • Freedom from discomfort • this allows them enough space in their habitat to live comfortably (one reason why caged hens are now given much more space + acceptable cages). • Freedom from pain, injury or disease • they are not made to suffer + are cared and looked after well - eg. in the case of Bird Flu / Avian Influenza. • Freedom to express normal behaviour • they can't be confined to the point where they can't stretch/nest, and bear huddling is now heavily regulated (respects foraging). • Freedom from fear + distress • no predator housed nearby.

This learner has only been awarded two marks

(b) Describe **one** way that breeding animals' needs are supported by legislation.

(4)

The welfare of farmed animals act (2007) means that all animals including poultry must be maintained and bred within the care of the animal welfare act (2006), meaning they must all be kept in suitable accommodation, be fed the correct diet, prevented from diseases, and be housed separate if needed. These acts insure the correct care when breeding.

This learner has been awarded three marks.

3(c)

Learners who read the question and understood the term conception, did well on this question. Some learners answered it as pregnancy in general and missed the point of the question, making it difficult to pick up marks.

Its important to know to increase number of offspring and value of offspring.
Artificial insemination allows a high quality breed to carry on their genes by inserting semen into the female. to produce quality offspring

This answer gained no marks as the learner has talked about artificial insemination, the other comment has no rewardable material.

It is important to identify conception in animals because when an animal is pregnant they will need alterations to their diet to ensure they are getting enough nutrients.
It is also important because it allows owners to predict when parturition will begin. Meaning that the appropriate care & treatment can be ready if there are any complications.

This learner has understood that changing the care and diet and predicting parturition dates is important when rearing livestock.

4(a) and 4 (b)

Learners had either learnt the lists in the specification or they had not, this seem to be a centre specific issue. For 4(b) some learners had listed three types of mutation but had not expanded the description so had gained three marks rather than the full six.

This learner had identified two points for 4(a) so gaining two marks as there was no expansion, but had gone on to describe three points and gain full marks for 4(b)

4 (a) Explain **two** stages in the process of genetic modification by insertion.

1 The desired gene is ^{base pair} ~~separated~~ ^{added to} ~~from~~ a ^{lower transcribed (4)} ~~DNA~~ ^{base strand} ~~sequence~~ taken from a subject organism then placed into the ^{amino acid} ~~base~~ ^{sequence} of another subject that carries another desired trait.

2 The modified DNA sequence is then ~~best~~ placed into the embryo of the chosen offspring before being born naturally showing the modified desired traits.

(b) Describe **three** different types of mutation.

(6)

1 Translocation is the movement of a chromosome segment to a nonhomologous chromosome or to a region within the same chromosome. It is also the movement of a ribosome along mRNA in the course of translation.

2 Point mutations are a single base pair change that can result in changes to the amino acid transcribed but ~~also~~ sometimes the same amino acid can be coded for

3 Frameshift is when the length of the mRNA or DNA strand is altered by the insertion or deletion of a base. It affects how the strand is read and which amino acids may be produced

This learner has been awarded two marks for 4a and six marks for 4b.

4 (c) This question required learners to evaluate, this means that learners need to look at both positives and negatives of the process.

Many learners described without evaluating but there were some good responses seen for instance this response gained full marks.

(c) Evaluate the use of DNA screening to ensure that animals in breeding programmes produce healthy offspring.

(6)

DNA screening is used to identify any undesired traits such as mutations or abnormalities. This is a costly process but can prevent animals being born with an undesired trait that could hinder its overall welfare. A disadvantage to this process is that it can prevent genetic variation, preventing evolution within certain species. This process also calls for many ethical issues to be raised as some think of it as ~~too~~ unnatural or 'playing God'. The purpose of this process can also raise issues as although it can be used to promote welfare and stop illnesses some may abuse the right to produce animal offspring for their own wants and needs, which could detract the animals' welfare.

This learner has been awarded six marks for correctly evaluating the use of DNA screening to ensure that animals in breeding programmes produce healthy offspring.

This learner has included some description with very simplistic evaluation, gaining three marks.

programmes produce healthy offspring.

Screening ensures that offspring do not have genetic diseases or disorders, which allows the fetuses with these to be aborted or have genetic modification done to rectify. can be helpful to industry, however many people see it as cruel.

This learner has been awarded three marks.

4(d)

There were a lot of answers that gave good descriptive answers, although the discussions rarely led to any conclusions or analysis. Some learners seemed unfamiliar with the term 'pharming' which is identified in the specification as a potential ethical issue.

This answer gained nine marks, there is good description and some discussion but not enough depth for the full twelve marks.

(d) Discuss the ethical issues that 'pharming' may raise and how these issues are regulated.

(12)

'Pharming' manipulates structures with the milk to make it more medically beneficial.

As it is a type of genetic modification it may cause issues for the animals themselves. This means that it can be unethical as it may cause health issues in the animals or complications (such as deformities) in their offspring.

The animals used in the 'pharming' production will still be covered by the Animal Welfare Act 2006. This means that those caring for them must still adhere to the legislation. The animals used should still have their basic needs met and not be left to suffer.

By having this legislation in place it means that the animals' welfare will be kept at a high level and any mistreatment results in prosecution.

Furthermore, establishments will undergo regular checks from officials. These checks help to ensure that animals are cared for correctly and have appropriate housing to meet their needs. Without these, farmers may provide care not

This learner has made some generic comments but has shown no great understanding of 'pharming' as an issue. A level 1 answer

issues with farming mainly revolve around long term effects. many people argue saying that it is impossible to see how this could impact us in 10-20 years. another common argument is that we're playing god and we have no right to alter such things as it is against nature.

on the other side it can be extremely useful as it could possibly save lives. there is debate on whether this will impact the animals welfare as they have to be kept in an extremely controlled environment.

This learner has been awarded two marks.

Summary

The learners generally performed well on this paper. To ensure learners perform to the best of their ability they should do the following.

- Use the SAMS and additional SAMS to ensure that they understand the nature of the task they are going to have to complete.
- Ensure that the research notes they take into the assessment contain enough information to enable them to make the recommendations required.
- Practice exam style questions, paying particular note to the command verbs and the marks offered to ensure their responses can target the available marks.
- Take care to read the questions in the exam paper, learners missed a lot of marks by answering a different question to that asked.
- Ensure they read back through the answers they have written to make sure they make sense and answer the question that has been asked.

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Welsh Assembly Government

