

PLACE LABEL HERE

**Tasmanian Qualifications Authority**

# **SCIENCE OF NATURAL RESOURCES**

**Senior Secondary 5C**

*Subject Code: SNR5C*

**Sample External Assessment**

**2004**

**Time: 2 hours**

On the basis of your performance in this examination, the examiners will provide a result on the following criterion taken from the syllabus statement:

- Criterion 4**      Develop and evaluate experiments.
- Criterion 7**      Demonstrate knowledge and understanding of scientific ideas relevant to the resource and its development.
- Criterion 8**      Analyse, interpret and draw conclusions.

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Pages:        19  
Questions:    8

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## **CANDIDATE INSTRUCTIONS**

Candidates **MUST** ensure that they have addressed **ALL** of the externally assessed criteria on this examination paper.

Answer **ALL** questions. Answers must be written in the spaces provided on the examination paper.

No other printed material is allowed into this examination.

You should make sure you answer all parts within each question so that the criteria can be assessed.

### Section A – Criterion 4

You should spend approximately 30 minutes on this section.

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**Question 1**

An egg producer experimented with different feed rations with the aim of increasing production whilst reducing the cost of feed per egg. The data from two experiments are shown below.

Experiment 1							
Protein concentration in feed (%)	10	11	12	13	14	15	16
Total vitamin level (mg/kg)	100	100	100	100	100	100	100
Cost of feed per 100 hens per day (\$)	6.00	7.00	7.50	8.00	8.50	8.75	9.00
Number of eggs per 100 hens per day	60	70	75	80	85	80	80

Experiment 2							
Protein concentration in feed (%)	14	14	14	14	14	14	14
Total vitamin level (mg/kg)	50	75	100	125	150	175	200
Cost of feed per 100 hens per day (\$)	8.00	8.25	8.50	8.75	9.00	9.25	9.50
Number of eggs per 100 hens per day	70	80	85	90	95	95	95

(a) What is the independent variable in (2 marks)

Experiment 1 .....

Experiment 2 .....

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(b) State **two** variables that were controlled in Experiment 1. (1 mark)

(i) .....

(ii) .....

(c) State **two other** variables that would also need to be controlled in both experiments. (1 mark)

(i) .....

(ii) .....

**Question 1 continues opposite.**

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**Question 1 (continued)**

(d) What was being investigated in Experiment 2? (2 marks)

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(e) Give details of how you could present the experimental results to most clearly represent them, keeping in mind the egg producer's aims. (3 marks)

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(f) What follow up action would you recommend for this investigation, if any? (2 marks)

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**Question 2**

*In answering this question refer to the following information and the table below.*

Sustainable farming of native fish in the River Murray region has been developed from wild stocks of Murray cod, silver perch, and golden perch. Initial trials of the production of Murray cod have indicated that the surface area of a dam and stocking levels are more important in maximising production than food supply.

A trial of different stocking levels for Murray cod in five ponds at Loxton over two years gave the following results.

	<b>Trial Pond Production (kg/ha)</b>					
<i>Stocking level (fish/ha)</i>	<i>Pond 1</i>	<i>Pond 2</i>	<i>Pond 3</i>	<i>Pond 4</i>	<i>Pond 5</i>	<i>Mean</i>
100	180	150	165	195	155	169
200	210	180	170	220	190	194
400	130	140	115	125	105	123

- (a) (i) Name two important biological factors that should be considered in the design of this trial to ensure minimal variation. Give reasons. (2 marks)

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- (ii) Name two important environmental factors that should be considered in the design of this trial to ensure minimal variation. Give reasons. (2 marks)

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**Question 2 (continued)**

(b) A water chemist has been asked to analyse the levels of pollutant in one of the ponds. The chemist has four choices on how the water samples are collected and analysed.

- A. one sample taken in the middle of the lake and analysed
- B. ten samples taken randomly in the lake and then mixed and one analysis carried out
- C. ten samples taken randomly in the lake and then individually analysed
- D. six samples taken around the edge of the lake and one in the middle and then individually analysed

(i) Explain the reliability of each method listed. (8 marks)

A: .....

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B: .....

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C: .....

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D: .....

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(ii) Which method will provide the most accurate assessment? Give reasons. (3 marks)

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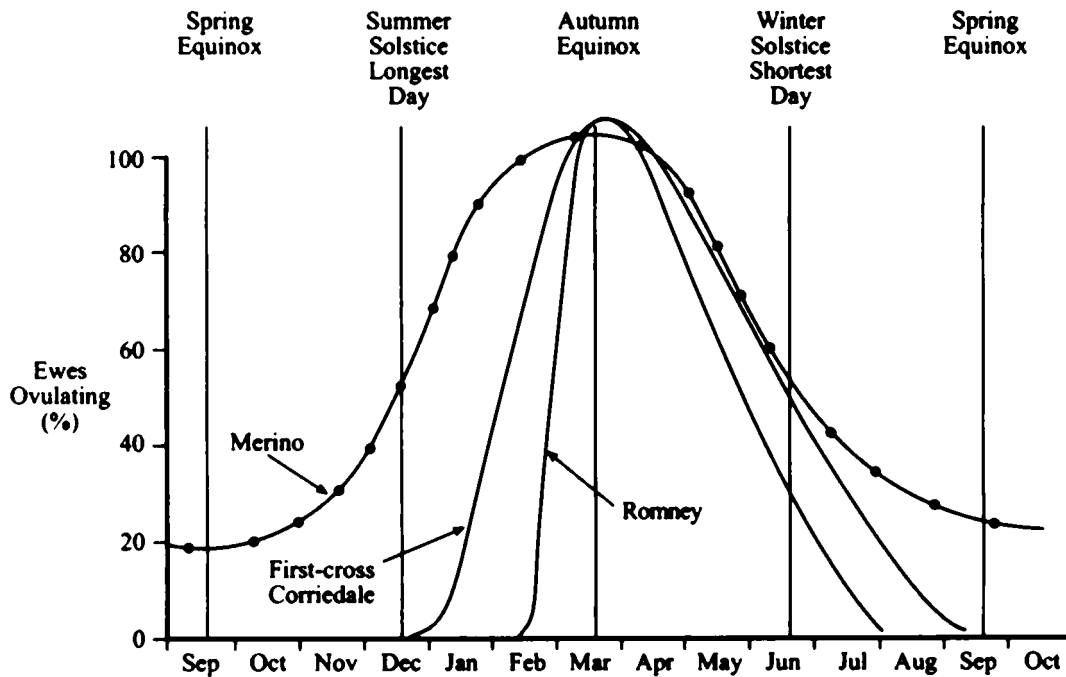
**Section B – Criterion 8**

You should spend approximately 60 minutes on this section.

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**Question 3**

In answering this question refer to the following graph, which shows how the breeding seasons (when ewes are ovulating) varies between different breeds/cross-breeds of sheep.



(a) Which sheep breed is least affected by day length? Explain your answer. (3 marks)

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(b) A six week period is used by farmers for mating, using the graph, what dates would be the most effective for mating sheep. (2 marks)

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**Question 4**

Most people recognise that Tasmanian farms need more trees, as windbreaks, for erosion and salinity control, or as part of a more balanced ecosystem. However the usual method of planting ‘tubestock’ ie, seedlings raised in pots in a nursery, and protecting them with a plastic sleeve and three stakes, is very expensive (about \$2 per tree for materials). An alternative was investigated, involving trees grown in an in-ground nursery, and lifted ‘bare-root’ and planted directly. These sturdy seedlings cost 20-50c each and are claimed to not need protection. An experiment was set up with four species, either planted in tubes or in an in-ground nursery, and with or without protection. The survival and vigour of the trees after two months was scored on a scale as follows:

- 0 = dead
- 5 = vigorous healthy seedling

Each record in the table below is an average of 12 trees.

	Tubestock		Bare-root	
	Protected	Unprotected	Protected	Unprotected
<i>Acacia meransii</i> (black wattle)	5.0	3.3	1.7	0.9
<i>Casuarina littoralis</i> (bull oak)	4.7	3.2	4.1	3.2
<i>Eucalyptus ovata</i> (black gum)	4.8	3.2	4.3	3.3
<i>Eucalyptus viminalis</i> (white gum)	4.7	4.7	3.3	3.5
Average (calculate)	4.8	3.6	3.4	2.7

(a) When averaged over all species, which combination of treatments gave: (2 marks)

(i) the best result? .....

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(ii) the worst result? .....

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(b) When averaged over all species, was protection worthwhile? (2 marks)

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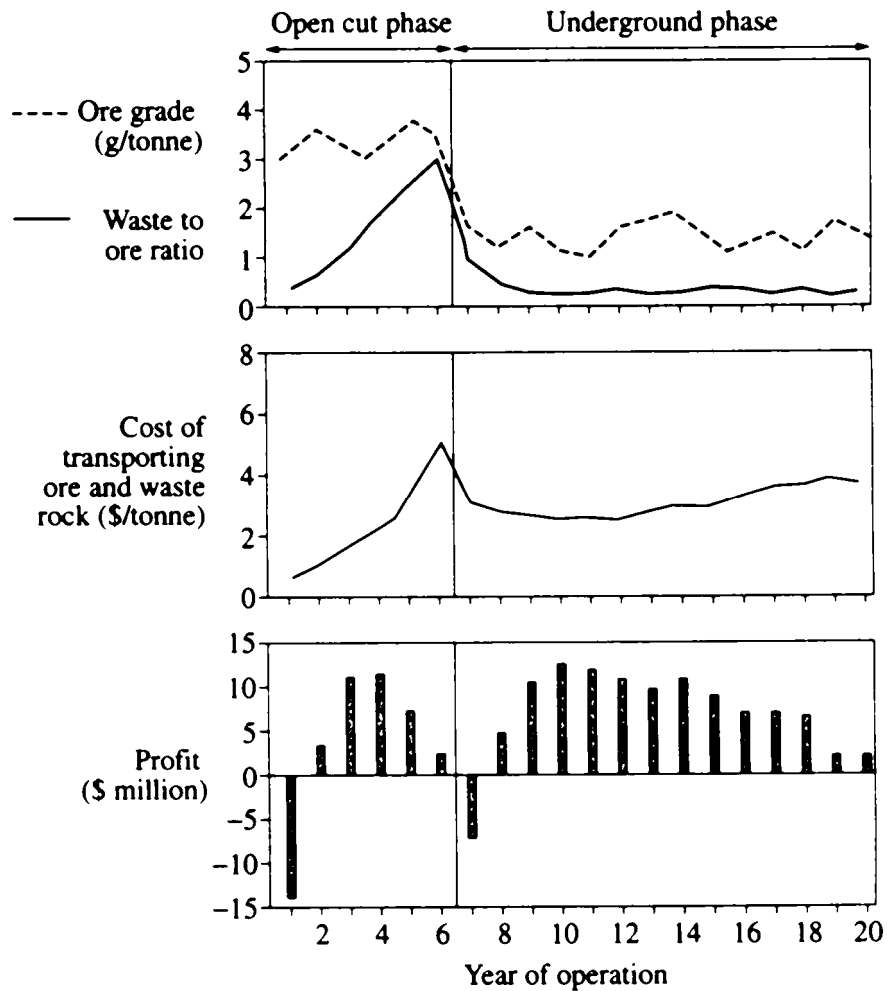
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**Question 5**

Mining of the Lasseter gold deposit involved an open-cut operation (above ground) for the first six years followed by a further 14 years of underground mining. The graphs summarise various aspects of the operation.



- (a) Describe the relationship between waste rock to ore ratio and the cost of transport during both phases of the mining operation. (2 marks)

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**Question 5 (continued)**

(b) Explain the variation in mine profitability over the years of mine operation. (4 marks)

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**Question 6**

Tasmanian has large reserves of black coal, estimated at over 500 million tonnes, mainly near the east coast and in the north-east. Of these, around 150 million tonnes are currently marketable, although roughly 60% of this marketable quantity is beneath the Douglas Apsley National Park (Department of Resources and Energy 1991). The costs of extracting coal in Tasmania are higher than elsewhere due to the geology of the State's reserves. Tasmanian black coal also has a relatively high ash and moisture content. At current extraction rates (Table 1), Tasmania's developed coal reserves in the Fingal Valley and on Mt Nicholas are expected to have a life of 50 years (Bacon, 1996). Around 75% of Tasmanian coal is used to generate steam and heat for use in industrial processes. The main users are secondary industries such as manufacturers of paper, paper pulp, newsprint, beer, frozen vegetables and cement. Australian Paper, A.N.M. Ltd, North Forest Products and Goliath Portland Cement Company Ltd, combined, use about 56% of Tasmania's coal production (Table 2).

**Table 1: Tasmanian Black Coal production ('000 tonnes)**

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Saleable#	310	394	380	407	356	350	342	301	378
Total Raw*	502	617	600	645	596	585	542	476	571

**Table 2: Tasmanian Coal Consumption ('000 tonnes)**

	1984/85	1985/86	1986/87	1987/88	1988/89	1989(1)	1990(1)	1991(1)	1992(1)
Goliath Cement	78	87	67	71	81	84	92	78	67
Paper Mills	200	203	219	218	235	228	218	196	183
Other	67	101	99	119	132	126	137	128	127
TOTAL	345	391	385	408	448	438	447	402	377

(1) Calendar year, not financial year

- \* Raw is coal as extracted from the ground.
- # Saleable is coal that has impurities (eg clay) and moisture removed.
- Average impurities in Tasmanian Coal is estimated at about 18%.

(a) What is the average yield of black coal over the 1985-1994 period for:

(i) Total raw coal? (1 mark)

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(ii) Saleable coal? (1 mark)

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**Question 6 (continued)**

- (b) During this period '85 – '94 what was the average percentage of coal that is saleable? (Show working) (2 marks)

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- (c) (i) What was the highest level of consumption of coal in Tasmania during the 1984 – 1992 period? Justify your answer. (2 marks)

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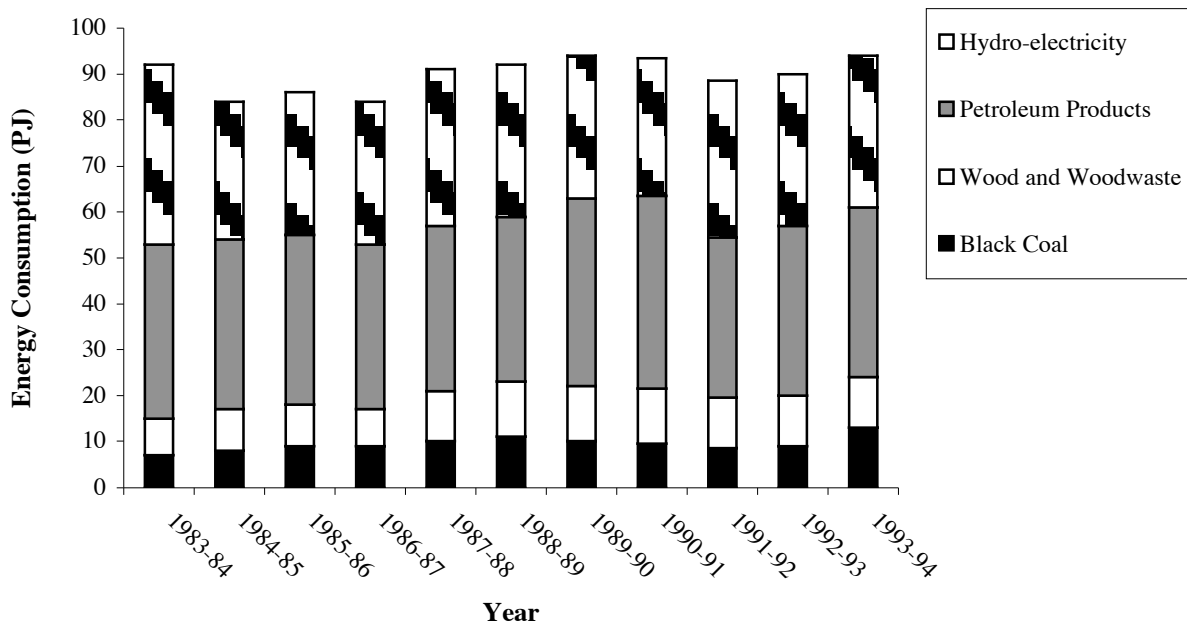
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- (ii) What consumer used the most coal during this period? (1 mark)

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**Figure 1: Tasmania's Total Energy Consumption 1983–94**



(Source: Australian Bureau of Agricultural and Resource Economics 1995)

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**Question 6 (continued)**

- (d) Looking at Figure 1 what would be the approximate consumption of energy (PJ) from the following sources during the 1993 period:
- Hydro electricity
  - Petroleum products
  - Wood and wood wastes
  - Black coal
- (4 marks)

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- (e) Looking at Figure 1 and Table 2 and considering the coal consumption of Goliath cement in 1992 was approximately 20% of total coal consumption. What would have been the approximate energy consumption (PJ) of Goliath cement during 1992?
- (4 marks)

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- (f) By the year 2050 what would you expect an energy consumption graph such as figure 1 to look like.
- (3 marks)

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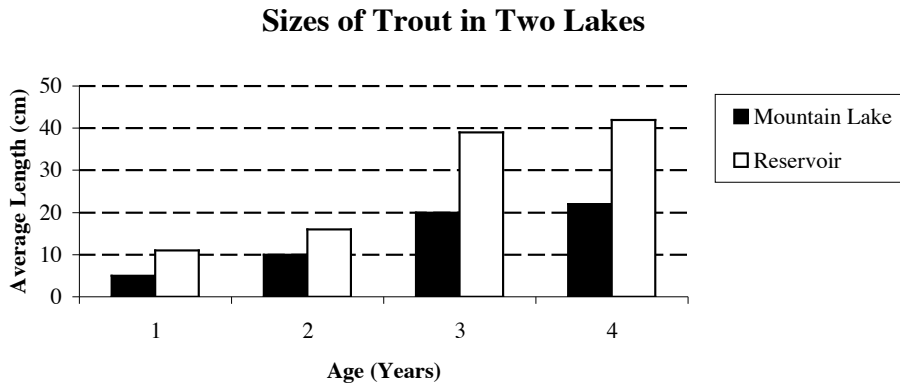
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**Question 7**

An investigation was made into the size of trout of two different ages in two lakes. The average length of trout from a mountain lake was compared with trout from a reservoir in a lowland agricultural area. The results are shown in the graph below.



- (a) Give **one** reason why length was used as a measure of growth rather than any other measure. (1 mark)

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- (b) (i) Compare and contrast the growth patterns of the two populations of trout as shown on the graph. (2 marks)

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- (ii) Suggest **two** important differences between the two lakes and explain how each of these could help account for the differences in average length between the two populations. (4 marks)

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