Section A – Criterion 4

Question 1

(a) Independent variable: The type of perennial grass grown.

(b) Dependent variable: The grass production (kgDM/ha/day).

(c) A hypothesis for this experiment:

Perennial coloured brome will have a higher production rate than perennial ryegrass in its second year of growth. Hypothesis does not necessarily have to include *'in its second year'; 'higher production rate'* is too general a term.

(d) Biotic factors: other species of grasses it may be grown with (competition); pest species it may be susceptible to (disease or predators). Abiotic factors: soil conditions such as structure, ph or available nutrients; water availability; light requirements; frost tolerance. *Biotic and Abiotic* were poorly understood terms.

(e) Experimental design:

Need to indicate plots of grass grown – reasonable size, number of sites chosen to reflect different farming conditions (different soils, aspect, climate ranges, dry land, irrigation etc). At each site should be 3 – 4 plots (replicants). Conditions for each site should be identical for all plots except for the type of grass grown (only variable should be the independent variable).

Measurement would need to be consistent, same technique, same person measuring. Raw data should be averaged and converted to kg Dm/ha/day for the site, averaged data for all sites combined for each year to obtain daily herbage production. Results would then be graphed. Many different experimental designs had to be considered but needed to follow accepted scientific experimental methodology.

(f) The raw data would likely to have been collected daily/weekly over a two year period. This raw data would need to be averaged for each year and then converted to Dm/ha/day for each of the grass types so this data could then be plotted on a graph.

(g) Any **four** of the following: Sowing rates; soil preparation requirements; water requirements; what pasture species combination would be most effective; life expectancy before needing to be re-sown; pest susceptibility; what grazing it can tolerate; palatability; toxicity possibilities. Many wrote about how to improve the experiment to gain more meaningful information.

Overall Question 1 was handled quite well, the best answered question in the paper.

Question 2

Some concern in how candidates interpreted the question due to possible ambiguities such as meaning of Mean seed-fall, was this per population, what were the units and was it just the seed or capsules or both? Examiner's took this into consideration so candidates were not penalised.

(a) Candidate would need to select an arbitrary figure deemed as low i.e. 8 or less seeds. F/M 90 through to D/J 95/96 would be poor seed growth in the gully.

(b) Causes of no seed fall could be unsuitable environmental or seasonal conditions such as too little water, temperatures too low or too high, lack of required nutrients, frosts etc. Consequences of no seed fall, no regrowth or seedlings present to replace adult trees in case of an adult tree death.

(c) Not based on the life cycle of such trees which can be in 100's of years, therefore 7 years is only a very small percentage of a tree's life cycle and may not take into account maturity levels, climatic abnormalities (drought, frost etc); disease; pests etc.

(d) Different parts of forest may have different light levels, water availability (depth or water tables, topography); soil types; levels of leaf litter, wind penetration; fire frequency; fauna and other flora present; human interference; forestry practice etc. Makes it hard to have a controlled experiment. *b, c and d* required justifications to support answers which was often lacking.

Overall Question 2 was reasonably well answered.

Section B – Criterion 8

Question 3

Some concern in how candidates interpreted the question due to possible ambiguities in the stem with candidates confusing 'net importer of oil' with 'self sufficient energy production' Examiner's took this into consideration so candidates were not penalised.

(a) One bushel of wheat provided $1.89, so against barrel pf oil $1.71 one bushel would have $0.17 over what would be needed to buy oil.

(b) 13 and a third bushels would have to have been sold, 13 would leave a short-fall of $1.30 so correct answer would be 14 bushels.

(c) Reasonably steady at 1 from 1950 – 1970, after this time the price of oil increases substantially resulting in an increasing ratio from 1975 – 1985, (3,8,7) a slight drop in oil price over the 1990 – 1995 (6,4) period and then another rise in oil price saw the ratio rise significantly (9,13) The term *'explain'* meant some candidates discussed why

the trends occurred rather than describe them. Examiner's took this into consideration so candidates were not penalised.

(d) Consequences on Australian society would be petrol price becoming prohibitive, so car size dropping, car pooling and use of public or alternative transport increasing so government responsibilities to modify infrastructure and more hybrid or alternative fuel cars joining the Australian fleet. People travelling less for recreation and living closer to work place, schools etc. increase in urbanisation etc. Many consequences had to be considered especially as wheat and oil only two of many commodities that make up the balance of trade.

(e) Bushel of wheat has gone up from a minimum of $1.49 in 1970 to a maximum of $4.82 at its highest in 1995 (about 282% increase), whereas the highest a barrel of oil has reached $52.00 in 2005 compared to its lowest $1.71 in 1950 (about a 3041% rise) The term '*explain'* meant some candidates discussed why the trends occurred rather than describe them. Examiner's took this into consideration so candidates were not penalised. Some candidates gave good reasons for the different price increases.

Question 4

A wide range of answers were accepted as some of the data difficult to interpret due to the legend. Examiner's took candidates interpretations into account and so candidates were not penalised.

(a) Dominant species prior to harvesting in SW48/1 is predominantly *E. obliqa*, then *E.viminalis*, *E.tenuiramis* and a small amount *of E.delegatensis.* In SW48/2 the predominant species is *E.tenuiramis* and to a much lesser extent *E.viminalis* and a small percentage of *E.ovata*

(b) Approximate percentages of seed sown: 25% - *E. tenuiramis*; 60 % *E. obliqa*; 5% - *E.globulus*; 10% - *E.viminalis. Most gave the % of the species but not the type e.g E. viminalis.*

(c) In the original un-logged forest in SW48/3, the dominant species was *E.tenuiramis* which occupied about 90% and *E.viminalis* took up the remaining 10% of the plot, in the re-sown plot *E. tenuiramis* was 25% of the seed sown and *E.viminalis* was about 10% yet by 9 – 10 years *E. tenuiramis* had increased to nearly 80% while *E.viminalis* was about 8% of the plot. *E.tenuiramis* had dropped to about 70% of the plot while *E. viminalis* had returned to nearly the original 10% after 21 – 22years of regeneration. *Most answered well.*

(d) The eucalyptus species that were not in the original forest but are now present after 21 p- 22years later are:

SW 48/1 – same no different species present.

SW 48/2 – same no different species present.
SW 48/3 – *E. obliqa* and *E. delegatensis*. Most candidates answered well.

(e) Eucalyptus seed is very light and could have been carried by wind, birds, animals, water or forest workers. May have been present at the site but only appropriate conditions for germination was in older forest or changed conditions due to growth of larger trees at the site to protect from wind, browsing animals, frost etc. The original sown seed may have been contaminated with other seed. As there was no information given regarding the logging method used, candidates found it difficult to answer this correctly. Obviously the remnant trees and species would have been the most important factor affecting the success of the reseeding, many possible answers accepted.

(f) Overall not very successful as SW48/1 had different proportions of tree species and SW48/3 different proportions and some totally different tree species from the original sites. Only SW48/2 had a similar proportion and mix of tree species to the original site. Obvious conclusion is the futility of resowing if the method of logging is not correct.

Question 5

(a) Possible anaerobic sites are those with redox values less than 50 mV redox potential, so at 0cm below sea floor S1 only, at 1c below sea floor S1, S11, S16 (not 2001) at 4cm below sea floor S1, S3 (not 2001), S6, S8 (not 2001), S9 – S11, S14 , S16. Answers were accepted depending on frame of reference candidate took.

(b) (i) False: Oxygen demand has changed it has dropped as redox potential has rien from 128 to 462 mV at 0cm, 60 to 443mV at 1cm and 2 to 134 mV at 4cm below sea floor.

(ii) False: All sites show Oxygen demand increasing with increased depth as redox potential shows a drop with depth except S3 where redox value rises from 51 to 53 m V between 1cm and 4cm below sea floor.

(iii) False: As all controls show an increase in Oxygen demand from 0 to 4 cm below sea floor seen by a drop in redox value ie S17 (1997) at 0cm 343 at 4cm below sea floor 96 mV.

Candidates appeared confused with the double negative questions. Candidates had to assume that S meant sites, examiners' took this into consideration and marked accordingly.

Section C – Criterion 7

Question 6

Answers will vary depending on the chosen enterprise.

(a) Candidate need to name a specific industry/resource or enterprise and must clearly and accurately give its location and distribution, also why it is found where it is located to account for distribution.

(b) Needs to identify some aspect of the industry that generates CO_2 directly or indirectly, must be a scientific explanation i.e. Agriculture stubble burning, machinery use etc. Needs to explain how the CO_2 is formed.

(c) Two aspects of the industry where a change or modification will result in less emissions of CO_2. i.e. reduced ploughing (Carbon sink)means reduced petrol use etc.

(d) Candidates need to choose one of the two innovations they have discussed and discuss how some management aspects / practices will be different or changed because of the innovation (i) positively and (ii) negatively.

(e) Candidates need to think and express where their chosen industry will need to look to improve or change its current practices to ensure its viability and sustainability in the future. Need to discuss in terms of future trends for research and development.

Most candidates were able to relate this topical issue to their chosen enterprise /industry /resource reasonably well. It was apparent a number of candidates did not read the questions thoroughly as they did not address the question asked. Overall this section was reasonably well answered. Looking at a resource from this perspective was not likely anticipated by most candidates and so may have taken candidates longer to address, this was taken into consideration in the marking of this section.

Investigative Project

The reports were quite variable in their standard a number having particularly poor experimental design and obviously did not follow the folio guidelines. A number of reports were clearly not up to a standard that could be deemed satisfactory a pre tertiary level and high lighted the need for candidates to read folio guidelines very carefully. A number of the better reports involved testing quite simple concepts but in each instance sound scientific methodology was evident. The major problems seen by the examiners' were the following: A number of candidates did NOT address any background information (Cr10) and/or the impact of the investigation (Cr6) in their reports (in some cases a 't' was awarded as these aspects were not addressed in any context). Several candidates scored lesser awards due to basic experimental design components not being included such as variables, controls etc. The presentation of data was another area that was not covered appropriately by some candidates, either too few or too many tables with or with out accompanying graphs were included. The data in graphs in some instances was poorly plotted, scaled or labeled incorrectly. Some candidates presented graphs or tables that lacked titles, units or were irrelevant or did not acknowledge the source of the data. Candidates should have included a topic page and a table of contents in the investigative report. More specific guidelines need to be made for Cr 10 (background information) to ensure candidates can use this information to adequately and in

context discuss results and conclusions. Candidates needed to discuss their results by referring to their data rather than leaving the examiner to make the interpretation. Candidates needed to clearly and specifically state conclusions that addressed the hypothesis. Candidates need to evaluate their investigations in terms of validity and ability to support or disprove their hypothesis. Candidates should also be encouraged to consider dependent variables that are quantifiable as some used were very subjective and so scored poorly.

Resource Research Essay

The essays varied in quality and much of this was due to not addressing the stated criteria adequately. The examiners' have made the following suggestions: Candidates must refer to the criteria indicated in the guidelines and those set specifically each year. Presenting the research under the appropriate criterion headings would ensure the candidate cover all aspects rather than a general essay on a topic that does not refer to the some of the criteria at all. It was of concern that some candidates did not cover the impact of science on society and environment or criterion 6 which was a major component of the essay and so scored poorly or were awarded a 't' on this criterion. For the most part, the essays were done reasonably well; however, not all sections were covered to the same depth. Resources researched should be Tasmanian and should be based on the actual resource here in Tasmania e.g. not Canadian salmon practices or on Industries not based in Tasmania such as Pearl shell production. Research needs to have scientific detail and not emotive generalisations that have no scientific data to back them, apparent in some essays. Candidates need to keep in mind the general questions of the course to discuss their chosen Tasmanian resource in terms of what the resource is, its value, where and why it is found where it is, how it is accessed and processed and distributed for sale and of course the management practices involved.

All correspondence should be addressed to:
Tasmanian Qualifications Authority
PO Box 147, Sandy Bay 7006
Ph: (03) 6233 6364 Fax: (03) 6224 0175
Email: reception@tqa.tas.gov.au
Internet: http://www.tqa.tas.gov.au