



**Section – Criterion 2**

**Question 1**

- (a) Candidates needed to state one of the following:
- (i) the height of the plant over time; the amount of plant growth as dry weight
  - (ii) the amount (g) or number of barley seeds produced per pot
- (b) Two ways that this candidate has increased the reliability of results by using this experimental design are:
- (i) the random allocation of the treatment to the pots as seen in diagram which minimizes bias in terms of plant access to light , water etc
  - (ii) the replication of treatments (4 of each) which increases the reliability of results for any of the four treatments
  - (iii) inclusion of a control for comparison – treatment A
  - (iv) ten seeds per pot
  - (v) Varying fertiliser amount
  - (vi) Controlled variables such as: temperature, wind, moisture etc.
- (c) Candidates needed to list four of the following:
- (i) Soil type – different soil types can affect availability of nutrients and water as can pH of soil
  - (ii) Type of cultivation – different cultivation of barley may respond differently to soil and climate
  - (iii) Aspect and topography of the field, as this may have a significant impact on temperature, frosts and winds
  - (iv) Availability of water – whether or not the field trials are irrigated or dryland farming
  - (v) Climate – may influence growth in terms of rainfall, temperature, frosts etc
  - (vi) Type of barley cultivars used; Incidence of pests (insects/weeds) and disease and if using pesticides or herbicides; how fertiliser is applied.

*Answered well by most candidates.*

**Question 2**

- (a) 0.0 litres per hectare for Dithan and Chlorothalnil
- (b) To compare the yield of the control with the yields of the test treatments (2 different rates of fungicide)
- (c) Would recommend Chlorothalnil at 0.5l/ha as greatest increased yield compared to cost.

- (d) Candidates needed to explain two factors from the following:
- (i) The selling price (market price) of the chick peas to determine whether it is cost effective and therefore determine which fungicide and at what rate
  - (ii) The risk, if any of fungicide residues in chickpeas which prevent or delay consumption by humans or livestock
  - (iii) The impact the fungicide has on non target organisms in the general environment
  - (iv) Issues of resistance and biomagnification of the chemical in a food chain
  - (v) Is the infection present, don't apply unless necessary
  - (vi) Other factors they influence yield soil or water
  - (vii) Whether it may interfere with other agrochemicals

*All Candidates answered this question well.*

### Question 3

- (a) Heavy diesel powered trucks (mining industry vehicles) fitted with LPG Austogas systems reduce their fuel bills by 20%.
- (b) Candidates needed to give two reasons from the following:
- (i) Vehicles may vary in weight and therefore consume more fuel while undertaking similar activities
  - (ii) Driver behaviour may change significantly which would affect fuel consumption ie. Over accelerating, speeding etc
  - (iii) The type of terrain the vehicles operated in kilometres driving up will be more fuel demanding than driving on flatter terrain
  - (iv) Were the distances involving long haul or stop start vehicle movement will affect fuel consumption
  - (v) Was the same type of vehicle used that carried out the same type of movement, haulage as opposed to excavating etc
  - (vi) Condition of the vehicle, age, wear and tear, tyre pressure, engine volume and condition etc
  - (vii) Several vehicles tested may not give sufficient data to be reliable
- (c) Experimental design needed to include:
- Independent variable:** Trucks that use the LPG auto gas system and trucks that do not (1)
- Dependent variable:** Measure fuel consumption to determine (litres per kilometre)(1)
- (Control – used to compare km/l of Auto gas system to diesel) (1)**
- Sample size:** Needed to include sufficient number of trucks 15 – 20 in each group (one group with additional LPG auto gas system fitted and the other group without this system just diesel) to give a significant number that when averaged give reliable data. (1)
- Control variables:** All trucks used should be the same or both groups have the same combination of vehicle of the same models, ages and tasks. The drivers should be swapped between the two groups, so each group has the same range of driving styles.(1)

**Measure/Record/Graph:** Fuel consumption and distance travelled should be recorded weekly for 2 to 3 months.(1)

**Analyse results/ Conclude:** Compare results to determine if there is a 20% fuel efficiency improvement.

- (a) *Most candidates obtained full marks though some lost marks by not giving a measurable dependent variable – fuel consumption, kilometres travelled etc. or did not mention the expected 20% increase*
- (b) *All candidates answered this correctly*
- (c) *Most candidates were able to obtain at least half marks, but few were able to gain full marks. Most candidates spoke too generally, they needed to be more specific about variables, controls and sample sizes etc.*

## Section B – Criterion 4

### Question 4

- (a) Candidates needed to list two of the following:
  - (i) Farmed Salmon can be produced in a protected system, which increases the reliability of the product delivery
  - (ii) The product produced can be managed to a uniform and regular level of quality
  - (iii) More control over feeding / growth rates
  - (iv) A regular supply that can be modified to meet demand ensures prices for consumers are stable and can build a market base
  - (v) It is a sustainable process which results lower risk as the product is more reliable, ensures reliable local employment
  - (vi) Keeps money in the local/state economy rather than buying in from other states or countries
  - (vii) Can take pressure off wild fish stocks and offer an alternative when other fish are in short supply due to overfishing wild fisheries.
- (b) Tasmania provides an ideal environment for farming of salmon
  - (i) Climatic factors – temperature ideal for salmon production
  - (ii) Water quality – suitable water quality for salmon production
  - (iii) No wild salmon as not endemic so less threat of introduction of diseases from wild fish
  - (iv) Being an island, lots of coastline that can be suitable in terms of shelter from swells and storms, yet access
  - (v) Tasmania has a clean green image which is good marketing line as appeals to the health conscious and organically minded consumers who are prepared to pay higher prices
  - (vi) Lower population – more areas where fish farms can be established without pollution or interference from people or water craft, industry etc.

- (c) Two economic advantages needed to be given from the following:
- (i) The company can respond quickly to change in the market whether driven by the consumers, value of the dollar or disease outbreaks etc
  - (ii) The company is not reliant on having to buy eggs or ‘ fry’ from other suppliers so their supply of Salmon is in 100% control of the company
  - (iii) Can control costs as no other middle men or overheads to consider, can control the bottom line
  - (iv) Can control quality at all steps of development which can minimise losses and purpose breed to increase production efficiency for their particular processes.
- (a) *Most candidates answered this question well.*
- (b) *Most candidates were able to suggest two acceptable reasons, though some candidates lost marks due to being vague.*
- (c) *Most candidates answered this question competently*

### Question 5

- (a) Two key impacts on the region from the following:
- (i) Upgrading of road infrastructure to accommodate the increased heavy vehicle traffic during construction phase
  - (ii) Increase in population during the construction phase needing accommodation and spending in the local economy
  - (iii) Increased employment in the region; may need increased housing etc
  - (iv) Injection of income into the region in direct spending and indirect support facilities
  - (v) May impact land values positively or negatively
  - (vi) May have ecological impacts on wildlife
  - (vii) May result in visual or noise pollution causing problems for locals
  - (viii) May make electricity prices more competitive.

- (b) Economically - Increased revenue from the sale of electricity on the national grid means more money into the State and Local economies, which may reduce state cost of electricity. Lower costs running a wind farm compared to a coal fired station so lower electricity costs. Cheaper costs for electricity means lower running costs for householders and business more available money. May draw a carbon credit in future. More socially acceptable, renewable or green energy maybe able to offset the carbon footprint in the area, may have an economic advantage.

Socially – Increase in people living in the Bothwell area, which may increase the need for social support structure in terms of education, medical, business and entertainment services.

- (c) Possible responses:
- Conservation of use of traditional fossil fuels will only slow their rate of use, but not avoid the use of a ‘finite’ supply

- Use of alternative renewable sources of energy means that energy supply is virtually guaranteed if maintenance of farm is ongoing
- More efficient use of appliances lowers the draw on electricity supplies
- More efficient appliances developed resulting in more land fill with old appliances
- Many less traditional methods of energy generation are more cost effective and environmentally preferable
- Education of people to be more responsible in use of electricity is cheaper than having to generate more all the time to meet needs
- Until efficient renewable energy generation can be developed to meet our needs we need to be more conservative in our use of electricity to minimise the use of fossil fuel generated power due to its impact on the environment.

(a) *Well answered by all candidates.*

(b) *and (c) Most candidates were able to answer this question effectively.*

### Question 6

- (a) Two reasons needed to be discussed from the following:
- (i) Need to determine whether Tasmanian conditions can produce Ginseng in sufficient quantities and quality that can compete with imports
  - (ii) What is the internal market demand for Ginseng and Ginseng related products
  - (iii) What are set up costs like compared to future returns
  - (iv) Can our methods of harvest compete with the Asian labour force
  - (v) Is there a seasonal niche (off season) we can utilise where China and Korea are not producing and we can
  - (vi) Is the price and markets for Ginseng stable and likely to be viable into the future to justify risk in setting up a new crop
  - (vii) Will the growth of Ginseng have a negative impact on other crops or the environment.
- (b) New businesses may be developed to sell Ginseng products. Tourism Industry would benefit from related interest in Ginseng. Increased international trade all of which should impact positively on the states economy.
- (c)
- (i) Cultural acceptance of Ginseng grown outside of China/Korea
  - (ii) Out of season demand for product if any
  - (iii) How well does it travel for export

Explanation: culturally the Chinese and Koreans may not like the look of our Ginseng and so may not accept it or be prevented from buying Australian grown Ginseng by their governments.

(a) *Most candidates made reasonable suggestions.*

(b) *Well answered by all candidates.*

(c) *Candidates answered this question well.*

## Section C – Criterion 7

### Question 7

- (a) Candidates need to list four of the following:
- (i) Proximity of your farm to the nearest main transmission lines
  - (ii) The strength and frequency of the prevailing winds in your area
  - (iii) How much will it cost to establish
  - (iv) Will there be excess energy to sell and is the buying price worth the effort
  - (v) Will there be problems with permits and licensing – legal costs
  - (vi) Are there the workers with the skill to build it and run it?
  - (vii) Access and infrastructure to support heavy construction traffic and for the provision of materials for construction
  - (viii) Will the site support construction of turbines (soil structure, drainage, erosion potential etc.)
  - (ix) Will it impact on the local community negatively?
  - (x) Proximity of your farm to ‘protected areas’ of cultural or environmental significance.
  - (xi) Proximity of eagle nests to the area being proposed for a wind farm
  - (xii) How long before a profit can be made – return of outlay costs
  - (xiii) Would the proximity of the wind farm affect operation of the dairy, cows etc. or land prices.
- (b) Candidates needed to discuss two management issues from the following:
- (i) The impact of the ‘Wind Farm’ operation on that of the ongoing dairy related activities
  - (ii) The necessary ongoing maintenance and repair of the wind turbines for the production of energy
  - (iii) Transmission line maintenance and tree pruning etc.
  - (iv) Access maintenance
  - (v) Sourcing skilled workers and employment issues OHS etc.
  - (vi) Environmental issues – wildlife, visual and noise pollution
- Again candidates answered this question well over all.
- (c) Candidates needed to list three factors from the following:
- (i) The market price of electricity – the return on the investment may not be enough to pay for the establishment costs.
  - (ii) The market price of milk – if the dairy side of the farm’s business was to collapse, the income from the wind farm may not be sufficient.
  - (iii) Change in weather patterns due to climate change. This would impact on the viability of the wind farm by altering wind strengths also could impact on dairy operation.
  - (iv) Available funds for repairs, maintenance, buying in food etc. may vary from year to year depending on world and domestic markets and value of the dollar.

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- (v) Unexpected breakdowns that put machinery such as the turbines or milk machinery out of action. Accessing skilled labour and parts may take time and can seriously impact on production.
  - (vi) Bird strikes – if birds, particularly endangered ones were being killed the turbines may have to be shut down.
  - (vii) Natural disasters – lightning, fire (can destroys transmission lines), earthquake, flood (may weaken turbine foundations), high wind that damages turbines, lines etc.
- (d) Candidates needed to choose one of the above factors and explain how they could minimise risk to the sustainability of the business.

Ensure both operations are managed as efficiently as possible and invest in insurance protection where possible.

- (e) The combined dairy/wind operation should be evaluated in terms of economic, social and environmental impacts on Tasmania as a whole. Its contribution to decreased green house gases, increased dollar and minimal use of fossil fuels. Also its sustainability and long term profitability.
- (a) *Candidates suggested a range of aspects that were important.*
  - (b) *Handled well overall.*
  - (c) *Most candidates were able to come up with at least two factors, some struggled with three.*
  - (d) *Candidates for the most part were able to come up with some way to minimise risk for their chosen factor.*
  - (e) *Candidates struggled with this question and few candidates were able to give an answer that was comprehensive enough to warrant full marks.*

## Question 8

Candidates needed to give an overview of information that would need to be considered to ensure the government can maintain a sustainable supply of energy for Tasmania despite predicted impacts of climate change. Up to date information gathered according to best practice models (access to the most reliable climate data for modelling). This would help with determining best locations for hydro dams and stations etc. (2) But need to know future energy state needs so need to: Consult widely with key stakeholders relevant to all aspects of energy usage. Match likely population growth with energy demands. Match likely areas of economic growth with energy demands. Match advances in technology with predicted advancements in the energy sector.(4) Look at alternative energy sources such as solar and geothermal. Ensure energy usage is monitored to ensure minimal wastage and maximum efficiency.(2)

*Most candidates discussed putting dams in the best places to take advantage of higher rainfall and other energy sources, but no candidates considered the information regarding future energy requirements for domestic or industrial use which should guide decision making to where and how much energy actually would need to be generated to meet the states needs.*

## Section D – Criterion 8

### Question 9

- (a) Rotation C – wheat/canola/wheat giving a wheat yield of 4t/ha in the final year.
- (b) Candidates needed to describe one way that crop rotations can increase crop yields:
- (c) Can minimise the build up of pests and diseases by disrupting their life cycles.
- (d) Replace nutrients used by previous crops
- (e) Can improve soil structure.

*(a) and (b) Well answered by all candidates*

### Question 10

- (a) The forest would be dominated by Species B both as mature trees and as seedlings. There would be viable seeds of Species A in the soil and after the first fire they would germinate, however, Species A would only develop if the canopy is not closed. Species C would be able to produce seedlings only if there were seeds in the soil that were less than 6 months old. Any Species A and C seedlings would then be wiped out in the fire in the second year and they would have been too young to have set seed. Therefore, unless some seeds still remained from the first year the only species left would be Species B. Species A and C would have been eliminated.
  - (b) No fires would result in the following:  
In the absence of fires you would end up with a mixed forest of Species A, B and C but in time the forest would move towards a forest dominated by Species C as mature A and B trees died and are replaced by C as it is the only species able to germinate under a closed canopy, however, the seeds of Species C need fire to germinate and only last 6 months in the soil. As the canopy opened up as mature trees aged and die, the seeds of Species B could germinate and the forest would eventually be taken over by Species B.
  - (c) A dry environment would probably be prone to fires so Species B being well adapted to regular fires would probably suit a dry environment. Alternatively, seeds of Species A would survive a long time and it is adapted to fire, though Species B maintains older trees rather than being killed like Species A.
- (a) Most candidates attempted the question but got confused about the difference between seeds and trees and so lost marks.*
- (b) Many candidates did not refer to all the information about germination conditions and so only gave partial answers to this question.*
- (c) Answered well by most candidates with most choosing Species B, those who chose Species A needed to explain well to achieve 1 mark out of the 2 available.*

### Question 11

Candidates need to refer to at least two of the following points: The reseeded of logged areas would occur from adjoining unlogged/old growth areas. This is a sustainable way to provide trees as by the time the last coupe is logged the pattern should be ready to be repeated. This pattern also allows movement of wildlife along old growth corridors. Also prevents the complete destruction of habitats, while allowing a natural balance and biodiversity to redevelop from adjoining old growth areas. Only small areas are exposed to lose of nutrients from leaching and run off or soil loss. There will also be less soil compaction from heavy machinery. The old growth areas also act as a natural reservoir of seeds.

*Candidates all referred to at least one reasonable explanation to account for success of logging pattern, but a number did not get full marks as they referred to only one aspect of the logging operation, the removal of the trees. (did not mention reseeded or wild life movement)*

### Question 12

- (a) A down turn in the trade of oil as prices become higher and an increase in the research and manufacture of alternative (renewable) energy sources to oil, gas and coal (fossil fuels).
- (b) (i) Titanium will last 100years.  
(iii) Silver, lead and zinc will last 7 years.
- (c) The trend is that the higher the Carbon content the greater the energy yield.
  - (i) Higher carbon content so more available energy. Best form for use in a combustion engine.
  - (ii) Maybe easier and less dangerous to store, less volatile and dangerous for domestic heating use than more volatile petrol. Does not need the same level of refining and so cheaper for the consumer.

- (a) *Some candidates lost marks by not referring to an economic effect, most candidates answered the question well.*
- (b) *and (c) Answered well by most candidates.*

### Question 13

- (a) Average concentration of Mercury is 2.32ng/l in water and 24.06ng/l in sediment. The ratio is 2.32ng/l in water : 24.06ng/l in sediment which becomes a ratio of 1:10.37
- (b) The water is more likely to contain heavy metal pollution from West Coast mines.
- (c) Macquarie harbour is used for fish farming and commercial fishing. Biomagnification of Mercury through the food chain, resulting in potentially toxic amounts in the fish and organisms such as birds.

- (a) *Most candidates were able to complete the calculations needed, but some did not include the ratio requested.*
- (b) *Many Candidates answered well but a number did not connect the mining to the contamination.*
- (c) *Though answered well overall, some candidates left this unanswered.*

### **Case Study Report**

The hard work of the candidates in planning and carrying out the case studies was evident. The experiments were generally well developed and interpreted, but some candidates struggled to analyse and draw conclusions with detailed responses. Knowledge and understanding were generally well demonstrated. A common error was made in referring to percentage germination of seeds in different soil types, rather than the rate of germination.

Care should be taken to label graphs accurately, as things such as ‘fertiliser height’ appeared which obviously was intended to be ‘Plant height in fertiliser X’. Graphs relevant to the aim of the experiment were included, but in some instances a number of irrelevant graphs were also included. A number of case studies could have been improved with careful proof reading.

**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](mailto:reception@tqa.tas.gov.au)  
Internet: <http://www.tqa.tas.gov.au>