M1.(a) 1. Geographic(al) isolation;

2. Separate gene pools / no interbreeding / gene flow (between populations);

Accept: reproductive isolation

This mark should only be awarded in context of during the process of speciation. Do not credit if context is after speciation has occurred.

3. Variation due to mutation;
4. Different selection pressures / different abiotic / biotic conditions / environments / habitats;

Neutral: different conditions / climates if not qualified

Accept: named abiotic / biotic conditions

5. Different(ial) reproductive success / selected organisms (survive and) reproduce;

Accept: pass on alleles / genes to next generation as equivalent to reproduce

6. Leads to change / increase in allele frequency.

Accept: increase in proportion / percentage as equivalent to frequency

6

(b) 1. Capture / collect sample, mark and release;
2. Method of marking does not harm lizard / make it more visible to predators;
3. Leave sufficient time for lizards to (randomly) distribute (on island) before collecting a second sample;
4. (Population =) number in first sample × number in second sample divided by number of marked lizards in second sample / number recaptured.

4

(c) 1. High concentration of / increase in carbon dioxide linked with respiration at night / in darkness;
2. No photosynthesis in dark / night / photosynthesis only in light / day;

Neutral: less photosynthesis

3. In light net uptake of carbon dioxide / use more carbon dioxide than produced / (rate of) photosynthesis greater than rate of respiration;
4. Decrease in carbon dioxide concentration with height;

More carbon dioxide absorbed higher up

Accept: less carbon dioxide higher up / more carbon dioxide lower down

5. (At ground level)
less photosynthesis / less photosynthesising tissue / more respiration / more micro-organisms / micro-organisms produce carbon dioxide.
Neutral: less leaves unqualified or reference to animals

5

[15]

M2.(a) 1. Oxidation of / hydrogen removed from pyruvate <u>and</u> carbon dioxide released;

2. Addition of coenzyme A.
Accept: NAD reduced for oxidation

2

(b) (i) 1. Change (in shape) of active site / active site moulds around the substrate;
Reject: reference to inhibitor
Accept: change in tertiary structure affecting active site

2. (Substrate / active site) now <u>complementary</u>.
Neutral: references to two active sites

2

(ii) 1. Is a competitive inhibitor / attaches to active site;
Neutral: reference to inhibitor forming an enzyme-substrate complex

2. Reduces / prevents enzyme-substrate / E-S complex forming.
Accept: Reduces / prevents acetylcoenzyme A binding to enzyme / citrate synthase

2

(c) (i) 1. Regenerates / produces NAD / oxidises reduced NAD;

2. (NAD used) in glycolysis.
Accept: description of glycolysis
Accept: glycolysis can continue / begin

2

(ii) (Pyruvate used) in aerobic respiration / (lactate / lactic acid) is toxic / harmful / causes cramp / (muscle) fatigue.

Accept: (pyruvate) can enter link reaction

Accept: reduces cramp / (muscle) fatigue

Neutral: 'reduces muscle aches'

1

[9]

M3.(a) 1. No aerobic respiration / electron transfer / oxidative phosphorylation;

Reject reference to anaerobic respiration.

2. (Because) no (respiratory) substrate / nothing to respire;

Reject idea of 'little' or 'less' − this would result in a change in oxygen concentration.

Accept the idea of no residual respiratory substrate in the mitochondria.

2

(b) (i) (Oxygen concentration falls because)

1. Aerobic respiration (uses oxygen);

Accept 'oxidative phosphorylation / electron transfer takes place'.

2. Oxygen is terminal / electron acceptor;
3. (oxygen combines with) protons / H^+ **and** electrons / e^- **to form** water / H_2O;

All aspects are required to gain mark.

2 max

(ii) Phosphate (ions) / inorganic phosphate / P_i;

Reject 'phosphorus' or 'P'.

Accept 'PO_4'.

1

(c) 1. Oxygen concentration continues to fall in plants but stays constant in animals;

For 'plants' accept 'line R to T', for 'animals' accept 'line R to

S'.

MP1 and MP2. Accept answers in terms of 'use' of oxygen rather than change in concentration.

2. (Oxygen concentration) falls more slowly in plants than before cyanide added;
3. (Because aerobic) respiration continues in plant (mitochondria);

Accept (because aerobic) respiration stops in animal (mitochondria).

4. (Because) electron transfer / oxidative phosphorylation continues in plant (mitochondria);

Accept (because) electron transfer stops in animal (mitochondria).

*Accept for **one additional mark***

(up to 4 max) use of Resource A i.e: idea that plant cytochrome oxidase is (more) resistant to cyanide

OR

idea that animal cytochrome oxidase not resistant to cyanide.

4

[9]

M4.(a) 1. Equilibrium reached.

Accept equilibrate

2. Allow for expansion / pressure change in apparatus;
3. Allow respiration rate of seeds to stabilise.

Ignore seeds acclimatise

3

(b) 1. Optimum temperature / temperature for normal growth of seeds;
2. (Optimum temperature) for enzymes involved in respiration.

2

(c) 1. Oxygen taken up / used by seeds;
2. CO_2 given out is absorbed by KOH (solution);
3. Volume / pressure (in **B**) decreases.

3

(d) 0.975 / 0.98.

If incorrect,
0.26 × 6 / or incorrect numbers divided by 1.6 for 1 mark

2

[10]

M5.(a) Prevents <u>oxygen</u> being taken up / entering / being absorbed;
Accept: any idea of no contact with oxygen.
Neutral: for anaerobic respiration / anaerobic conditions.
Neutral: prevents entry of air.
Reject: prevents entry of oxygen and another named gas.

1

(b) (i) 0.0155 / 0.016 = 2 marks;;

0.0775 / 0.077 / 0.078 / 0.08 = 1 mark

/ 0.62 = 1 mark

2

(ii) Glucose decreases / is a limiting factor / increase in ethanol / yeast / cells die / toxins build up;
Accept: glucose is used up.

1

(iii) 1. (Stays the) same / level / (relatively) constant;

2. Same volume / amount of oxygen uptake and carbon dioxide release;
Note: if m.p.1 is awarded m.p 2 can be obtained without referring to 'same volume / amount'.

2

(c) 1. Oxygen is final / terminal (electron) acceptor / oxygen combines with electrons and protons;

2. Oxidative phosphorylation / electron transport chain provides (most) ATP / only glycolysis occurs without oxygen / no Krebs / no link reaction;

2

[8]