M1.(a) 1. Push hard – spread / squash tissue;

2. Not push sideways – avoid rolling cells together / breaking chromosomes.

Neutral – to see cells clearly

2

(b) No (no mark)
Yes (no mark)

1. Chromosomes / chromatids are (in two groups) at poles of spindle / at ends of spindle;

Do not accept 'ends of cell'

2. V-shape shows that (sister) chromatids have been pulled apart at their centromeres / that centromeres of (sister) chromatids have been pulled apart.

2

(c) 28.8 / 29.

If incorrect, allow:

$\frac{6}{200} \times 960$ *= 1 mark*

2

[6]

M2.(a) (D)CBEA.

1

(b)

Step	Reason
(Taking cells from the root tip)	Region where mitosis / cell division occurs;
(Firmly squashing	To allow light through /

the root tip)	make tissue layer thin;

2

(c) (Increase)

1. Chromosomes / DNA replicates;
   (First decrease)

2. Homologous chromosomes separate;
   (Second decrease)

3. Sister chromatids separate.

3

(d) 1. (DNA would) double / go to 2 (arbitrary units).

1

[7]

M3.(a) 1. Rank all STs in ascending order;

2. Find value with same number (of people) above and below.

Accept find middle value

2

(b) Not ethical to fail to treat cancer.

1

(c) Yes since with ipilimumab:

1. Median ST increased by 2.1 months;
2. Percentage of patients showing reduction in tumours increased from 10.3% to 15.2%;

No because:

3. No standard errors shown / no (Student) t- test / no statistical test carried out;
4. (So) not able to tell if differences are (statistically) significant / due to chance (alone);
5. Improvement might only be evident in some patients / no improvement in some patients;

6. Quality of (extra) time alive not reported;

If answers relate only to 'Yes' or □No', award 2 marks max

4 max

(d) 1. Faulty protein recognised as an antigen / as a 'foreign' protein;
2. T cells will bind to faulty protein / to (this) 'foreign' protein;
3. (Sensitised) T cells will stimulate clonal selection of B cells;
4. (Resulting in) release of antibodies against faulty protein.

3 max

[10]

M4.(a) Variable that is changed;

Reject 'the variable that changes'.

1

(b) 1. Idea of a confounding variable;

2. (So) genetically similar;

2. Do not accept 'genetically identical / same DNA'.

3. (So) have similar salt tolerance / response to salt water / response to watering treatment;

4. (So) have similar yield / mass of seeds;

Do not accept 'amount / number of seeds' or 'growth rate'.

2 max

(c) Mitosis;

Ignore cell division

1

(d) 1. Irrigation with sea water / **C** / **D** increased yield compared with no irrigation / **A**;

For 'yield' accept 'mass of seed' throughout.

2. Yield was lower when irrigated with sea water / **C** / **D** compared with fresh water / **B**;

Only penalise once for use of 'amount / number of seeds'.

3. Yield was lower when watered with sea water throughout growth and seed formation / **C** than when watered with sea water just at seed formation / **D**;

Accept use of figures from table.

'It' refers to watering with seawater / mixture.

2 max

(e) 1. Irrigation with sea water / **C** / **D** increases concentration of salt in soil;

Ignore reference to standard deviation / quality of the data.

2. Lower water potential in the soil linked to reduced uptake of water;

3. Salt concentration in the soil might / might not increase in the future;

Mark point 3 includes the principle for mark point 1 so mp3 gains 2 marks (for mp1 and mp3)

4. Might decrease plant growth / yield in the future;

5. Less food / fewer seeds for future planting;

Mp 3 and 4. Allow 'further' for the idea of 'in the future'.

3 max

[9]