**M1.** (a) to kill virus
**or**
to prevent virus spreading

**1**

(b) take (stem) cells from meristem
**or**
tissue culture
*allow take cuttings*

**1**

(c) use Benedict's solution

**1**

glucoses turns solution blue to orange

**1**

(d) **Level 2 (3–4 marks):**
A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain why plants with TMV have stunted growth.

**Level 1 (1–2 marks):**
Simple statements are made, but not precisely. The logic is unclear.

**0 marks:**
No relevant content.

**Indicative content**
- less photosynthesis because of lack of chlorophyll
- therefore less glucose made
  so
- less energy released for growth
- because glucose is needed for respiration
  and / or
- therefore less amino acids / proteins / cellulose for growth
- because glucose is needed for making amino acids / proteins / cellulose

**4**

**[8]**

**M2.** (a)

| | Mitosis only | Meiosis only | Both mitosis and meiosis |
|---|---|---|---|
| How cells are replaced | ✓ | | |
| How gametes are made | | ✓ | |
| How a fertilised egg undergoes cell division | ✓ | | |
| How copies of the genetic information are made | | | ✓ |
| How genetically identical cells are produced | ✓ | | |

*if more than one tick per row then no mark*

*ignore first row*

1
1
1
1

(b) (i) (adult) bone marrow

*accept (umbilical) cord blood, skin, amniotic fluid / membrane*

1

(ii) cells will not be rejected by the patient's body (if they have been produced by therapeutic cloning)

*allow easier to obtain linked to embryo stem cells*

**or**

(embryo stem cells) can develop into many different types of cells

*allow doesn't need an operation linked to bone marrow*

**or**

(embryo stem cells) not yet differentiated / specialised or undifferentiated

*accept embryo cells are pluripotent*

1

**[6]**

**M3.** (a) (i) mitosis

*correct spelling only*

1

(ii) replicates / doubles / is copied / duplicates

*accept cloned*
*ignore multiplied / reproduced*

1

(b) fertilisation occurs / fusion (of gametes)

*accept converse for asexual, eg none in asexual / just division in asexual*

1

so leading to mixing of genetic information / genes / DNA / chromosomes

*genes / DNA / chromosomes / genetic information comes from 1 parent in asexual*
*ignore characteristics*

1

<u>one</u> copy (of each allele / gene / chromosome) from each parent
**or**
gametes produced by meiosis
**or**
meiosis causes variation

*meiosis must be spelt correctly*

1

**[5]**

**M4.** (a) circles round right hand **X** and **Y** gametes

*put two ticks **or** crosses by the circles*

**2**

(b) 50:50 **or** 1:1 **or** 50% **or** 0.5 **or** ½ equal **or** evens

*credit even*

*do not accept 2:1 **or** 50 / 50*

**1**

(c) (i) 23

**1**

(ii) 23

*credit the same as the one above to be marked consequential*

**1**

(d) DNA

*do not accept nucleic acid*

**1**

(e) same

**1**

**[7]**