

M1.(a)	nucleus labelled correctly	1
	cell membrane labelled correctly	1
(b)	mitosis	1
(c)	electron (microscope)	1
(d)	higher magnification	1
(e)	45 (mm)	1
	45 / 250 or 0.18 (mm) <i>allow ecf</i>	1
	180 (μm)	1
	<i>allow 180 (μm) with no working shown for 3 marks</i>	
(f)	0.2 μm	1

[9]

- M2.** (a) chromosomes 1
- (b) diagram showing four separate chromosomes two long and two short (as in diagram 1)
*allow each chromosome shown as two joined chromatids do **not** allow if chromosomes touching each other* 1
- (c) (i) any **two** from:
- can grow into any type of tissue / named tissue
 - used in medical research
 - used to treat human diseases
 - large numbers can be grown
- 2
- (ii) any **two** from:
- expensive
 - grow out of control / ref cancers
 - may be rejected
 - need for drugs (for rest of life)
- 2

[6]

- M3.** (a) cell division / bacterium divides / multiplies / reproduces
allow asexual / mitosis
ignore growth 1
- (b) 18 1
- 18 000 / 18×10^3 / 1.8×10^4
do not accept 1.8 / 1.8^{04} / 1.8^4
allow ecf from wrong count 1
- (c) to kill / destroy other microorganisms / named type
or to prevent contamination
ignore germs / viruses 1
- to prevent other microorganisms affecting the results
or other microorganisms would be counted
allow to give accurate / reliable results 1
- (d) prevent growth of pathogens / disease-causing microorganisms / dangerous
microorganisms
do not accept microorganisms become pathogenic
ignore germs / viruses
*ignore general safety / biohazards / harmful products
produced by bacteria* 1
- (e) to improve the reliability of the investigation / check for anomalies
do not accept accuracy / precision / fairness / validity
ignore averages / repeatability / reproducibility 1

[7]

M4. (a) asexual

1

(b) mitosis

1

(c) genes

1

[3]

- M5.** (a) 2 and 3 1
- (b) cell **P** has an X chromosome; cell **R** has a Y chromosome 1
- (c) any **two** from:
- (formed from) different egg / 2 eggs
 - (formed from) different sperm / 2 sperm
 - have different genes / alleles / chromosomes / DNA
allow genetics 2
- (d) (i) stem cells 1
- (ii) the cells divide 1
- the cells differentiate 1
- (iii) (medical) research / named eg growing organs
or
medical / patient treatment
allow (embryo) cloning
*do **not** allow designer babies / more babies* 1
- (iv) any **one** from:
- ethical / moral / religious objections
ignore cruel / not natural / playing God
 - potential harm to embryo
allow deformed
ignore harm to mother 1

[9]

- M6.** (a) comparisons are **not** required but should be credited
accept a clear indication of the statement even if incomplete
- can develop into most other types of cell 1
- each cell divides every 30 minutes 1
- low chance of rejection by the patient's immune system 1
- (b) any **three** from:
- cheaper / only costs £1000
*this **must** be comparative*
ignore costs £1000
 - can collect many (stem) cells
 - adults give permission for their own bone marrow to be collected
comparisons are not required but should be credited
 - safe
- 3

[6]

M7. (a) **A** = nucleus

allow phonetic spelling

1

B = (cell) membrane

1

(b) for repair / growth **or** to replace cells

ignore new cells / skin

1

(c) (i) embryos

1

(ii) paralysis

1

[5]