GCSE Biology

Stem Cells

Mark Scheme

Time available: 60 minutes
Marks available: 56 marks

1. any **four** from:

- cells used to treat diseases do not go on to produce a baby
- produces identical cells for research
- cells would not be rejected
- allow cells can form different types of cells
- (immature) egg contains only genetic information / DNA / genes / chromosomes from mother **or** there is only one parent
- asexual / no mixing of genetic material / no sperm involved / no fertilisation **or** chemical causes development
- baby is a clone
- reference to ethical / moral / religious issues

  allow ethically wrong
  NB *<u>cloning</u> is illegal gains **2** marks*
  ignore unnatural

- risk of damage to the baby

  in correct context

[4]

2. (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

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3. (a) an undifferentiated / unspecialised cell

1

that can differentiate / become / change into (many) other cell types

1

(b) (malignant tumours) invade / spread to other tissues via the blood (benign don't)
or
(malignant tumours) form secondary tumours in other organs

ignore cancer unqualified

allow converse

allow metastasises

1

(c) mitosis

correct spelling only

1

(d) glucose

answers in any order

ignore sugar

1

protein / amino acids

1

(e) no need to wait for a donor
or
can be done immediately

1

(so) no risk of rejection
or
no need for immunosuppressant drugs

*if no other marks awarded, allow for **1** mark idea of ethics surrounding the use of tissue from another / dead person*

1

(f) stent opens up the trachea

1

allowing air to flow through
or
allowing patient to breathe

1

(g) **Level 3 (5-6 marks):**
A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

Level 2 (3-4 marks):
Some logically linked reasons are given. There may also be a simple judgement.

Level 1 (1-2 marks):
Relevant points are made. They are not logically linked.

Level 0
No relevant content

Indicative content

embryos advantages
- can create many embryos in a lab
- painless technique
- can treat many diseases / stem cells are pluripotent / can become any type of cell (whereas bone marrow can treat a limited number)

embryos disadvantages
- *harm / death to embryo*
- *embryo rights / embryo cannot consent*
- *unreliable technique / may not work*

bone marrow advantages
- no ethical issues / patient can give permission
- can treat **some** diseases
- procedure is (relatively) safe / doesn't kill donor
- tried and tested / reliable technique
- patients recover quickly from procedure

bone marrow disadvantages
- *risk of infection from procedure*
- *can only treat a few diseases*
- *procedure can be painful*

both procedures advantage

can treat the disease / problem

both procedures disadvantages
- *risk of transfer of viral infection*
- *some stem cells can grow out of control / become cancerous*

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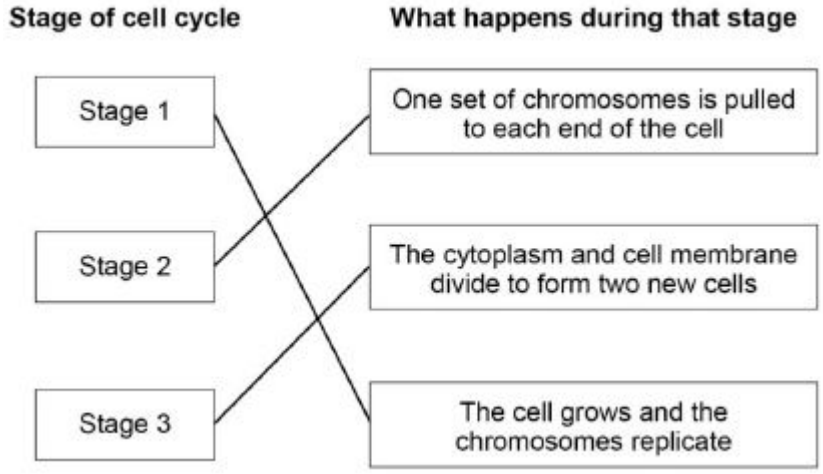
4. (a) mitosis

1

(b) all lines correct = **2** marks
1 or 2 lines correct = **1** mark



additional line from a box on the left negates the credit for that box

2

(c)

$\frac{7}{10} \times 100$

allow $\frac{252}{300} \times 100$

1

70(%)

allow answer calculated from angle in range 250° to 254°

*if no other mark awarded, allow 0.7 for **1***

1

(d) 3

1

(e) DNA

allow deoxyribonucleic acid for 1

1

(f) a gene

1

(g) (bone marrow) cells differentiate into many / other types of (named) cell

allow (bone marrow) cells can become many / other types of (named) cell

1

(so) will cure diseases where new cells are needed
or will cure diseases where cells are damaged

*allow (so) will cure anaemia / leukaemia **or** blood cancer **or** blood disorders*
allow (so) will cure paralysis / diabetes

1

[10]

5. (a) the movement of particles from a high concentration to a low concentration

1

(b) (gills) have (many) projections

allow description of projections
allow have lots of / five gills

1

(for) large(r) surface / area

or

(gills) are on the outside of the body (1)

for good access to water (1)

1

(c) differentiation

1

(d) mitosis

*do **not** accept meiosis*

1

(e) hair

1

(f) axolotls are cheap to feed

1

axolotls are easy to breed

1

(g) D

1

(h) trachea

allow windpipe
allow cartilage (ring)

1

(i) pulmonary artery

1

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6. (a) (i) release energy

allow provide / supply / give energy

*do **not** accept produce / create / generate / make energy*

*do **not** allow release energy for respiration*

1

(ii) contain half the (number of) chromosomes **or** contains one set of chromosomes **or** contains 23 chromosomes

allow genetic information / DNA / genes / alleles instead of chromosomes

accept haploid

1

(b) any two from:

- (stem cells) are unspecialised / undifferentiated

  allow description eg 'no particular job'

- are able to become differentiated **or** can form other types of cell / tissue / organ

- stem cells can / able to divide / multiply

2

[4]

7. (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]