### Mark schemes

#### (a)

<table>
<thead>
<tr>
<th></th>
<th>Mitosis only</th>
<th>Meiosis only</th>
<th>Both mitosis and meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>How cells are replaced</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How gametes are made</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>How a fertilised egg undergoes cell division</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How copies of the genetic information are made</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>How genetically identical cells are produced</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

*Ignore first row*

#### (b)

(i) (adult) bone marrow

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

(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*
(a) (i) nucleus

(ii) diffusion

(b) increases / larger surface area (for diffusion)

   *ignore large surface area to volume ratio*

(c) (i) sugar / glucose

   *accept amino acids / other named monosaccharides*

(ii) against a concentration gradient

   *or*

   from low to high concentration

(iii) (active transport requires) energy

   *(from) respiration*

(d) minerals / ions

   *accept named ion ignore nutrients*

   *do not accept* water

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(a) A = nucleus

   *allow phonetic spelling*

B = (cell) membrane

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

   *ignore new cells / skin*

(c) (i) embryos

(ii) paralysis

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[5]

[8]
(a) | Structure | Organ | Organ system | Tissue |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells lining the stomach</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>Mouth, oesophagus, stomach, liver, pancreas, small and large intestine</td>
<td></td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

all 3 correct = 2 marks  
2 correct = 1 mark  
1 or 0 correct = 0 marks

(b) (i) diffusion  
allow phonetic spelling  

(ii) glucose  

(iii) mitochondria

(a) contract / shorten  
ignore relax  
do not allow expand  
to churn / move / mix food  
accept peristalsis / mechanical digestion  
ignore movement unqualified

(b) 400  
acceptable range 390-410  
allow 1 mark for answer in range of 39 to 41  
allow 1 mark for answer in range of 3900 to 4100

(c) to transfer energy for use  
allow to release / give / supply / provide energy  
do not allow to ‘make’/ ‘produce’/ ‘create’ energy  
allow to make ATP  
ignore to store energy
by (aerobic) respiration or from glucose

do not allow anaerobic
energy released for respiration = max 1 mark

(d) (i) to make protein / enzyme
    ignore ‘antibody’ or other named protein
    1

(ii) too small / very small
    allow light microscope does not have sufficient magnification / resolution
    allow ribosomes are smaller than mitochondria
    ignore not sensitive enough
    ignore ribosomes are transparent
    1

(a) (i) alveoli / alveolus
    allow air sacs
    allow phonetic spelling

    1

(ii) any one from:
    • protection (of lungs / heart)
    • help you breathe / inflate lungs.
    1

(b) (i) diffusion

    1

(ii) capillaries

    1

(iii) any two from:
    • (have many) alveoli
    allow air sacs
    • large surface / area
    • thin (exchange) surface or short diffusion pathway
    accept only one / two cell(s) thick
    • good blood supply / many capillaries
    allow (kept) ventilated or maintained concentration gradient.
    2
(a) (i) water / $H_2O$
   
   *accept oxygen*
   
   *allow $H_2O$*
   
   *do not allow $H^2O$ or $H2O$*

(ii) the mineral ions are absorbed by active transport

   the absorption of mineral ions needs energy

(iii) have (many root) hairs

   (which) give a large surface area (for absorption)

(b) carbon dioxide in

   or

   oxygen out

   or

   control water loss

   *accept gas exchange*

   *ignore gases in and out*

   *ignore gain / lose water*

(c) (i) guard cells

(ii) (stomata are) closed

   *allow there is no gap / space*

(iii) plant will wilt / droop

   *ignore die*

[9]

(a) (i) diffusion

(ii) carbon dioxide

   *accept $CO_2$ / CO2*

   *do not accept $CO^2$*

(iii) red blood cells
(b) 70

if no / incorrect answer then
70 000 000

or

280 x 0.25 gains 1 mark
ignore doubling the answer

(c) allows more gas / oxygen / CO₂
(exchange)
do not accept air

(a) (i) chloroplast

(ii) cell wall

(b) (i) osmosis

accept diffusion

(ii) cell wall (prevents bursting)

(c) (i) carbon dioxide

allow correct formula

allow sugar / starch

(ii) any two from:

• light sensitive spot detects light
• tells flagellum to move towards light
• more light = more photosynthesis

(d) (cell has) larger SA:volume ratio

short (diffusion) distance

allow correct description
(diffusion) via cell membrane is sufficient / good enough

or

flow of water maintains concentration gradient

(a) (i) xylem

(ii) water

minerals / ions / named example(s)

ignore nutrients

(b) (i) movement of (dissolved) sugar

allow additional substances, eg amino acids / correct named sugar
(allow sucrose / glucose)

allow nutrients / substances / food molecules if sufficiently qualified

ignore food alone

(ii) sugars are made in the leaves

so they need to be moved to other parts of the plant for respiration / growth / storage

(c) (i) mitochondria

(ii) for movement of minerals / ions

Do not accept ‘water’

against their concentration gradient

(a) any two from:

• only one ‘chromosome’

  allow one strand of DNA

• circular

  allow loop

• may have plasmids

• not in a nucleus / no nucleus
(b) (i) any one from:

- London is much higher  
  or converse
- more variable / wider range  
  allow ‘on average it is 5 / 6 times greater’

(ii) increases  

Included figures must be correct  

(iii) overall slight increase  

accept ‘doesn’t change much’

variable / goes up and down  

(c) (i) both axes correctly labelled  

x = Year

y = Number of cases

Correct points  

all correct = 2 marks  

1-2 errors = 1 mark  

> 2 errors = 0 marks

Suitable line of best fit  

accept straight line or smooth curve  

(ii) doesn’t fit the pattern / line of best fit  

(d) provides immunity / protection (to TB)  

ignore ‘stops people catching it’  

ignore ‘resistance’

prevents TB spreading  

accept ref to herd immunity