

Mark schemes

1

(a) (i) A = cytoplasm

1

B = (cell) membrane

1

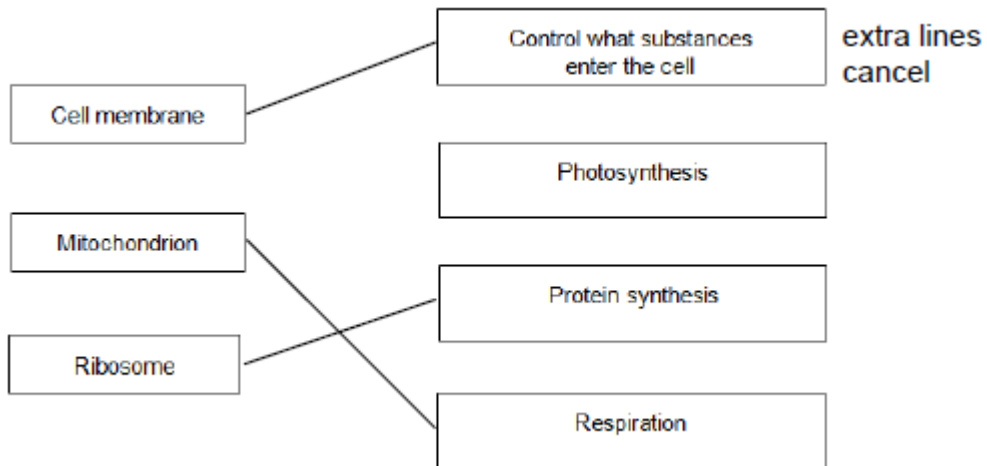
(ii) nucleus

accept chromosome / DNA / genes

accept phonetic

1

(b)



3

[6]

2

(a) B

1

(b) D

1

(c) A

1

[3]

3

(a) (i) (cell) membrane

1

(ii) vacuole

1

(b) any **two** from:

- (cell) wall
- chloroplast(s)
ignore chlorophyll
- vacuole
ignore cell sap

2

(c) diffusion

1

[5]**4**

(a) (i) makes / produces / synthesises protein / enzyme

1

(ii) plant cell has nucleus / vacuole / chloroplasts / chlorophyll
or plant cell is much larger

'It' = plant cell

allow correct reference to DNA or chromosomes

allow plant cell has fewer ribosomes

allow cellulose (cell wall)

1

(b) (i) 200

correct answer with or without working gains 2 marks

*if answer incorrect, allow 1 mark for $\frac{2 \times 50,000}{500}$ **or** $\frac{100,000}{500}$
or 100*

2

(ii) bacterial cell is too small / bacterial cell about same size as a mitochondrion / 'no room'

ignore references to respiration

1

[5]**5**

(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]

6

- (a) (i) diffusion is down the concentration gradient

for a description of diffusion

ignore along / across gradients

1

to enter must go up / against the concentration gradient

accept by diffusion ions would leave the root

or

concentration higher in the root / plant

or

concentration lower in the soil

1

- (ii) active transport

allow active uptake

1

(b) (i) (root hairs →) large surface / area

1

(ii) (aerobic) respiration

do not allow anaerobic

1

releases / supplies / provides / gives energy

accept make ATP (for active transport)

do not allow 'makes / produces / creates' energy

1

(iii) starch is energy source / store (for active transport)

allow starch can be used in respiration

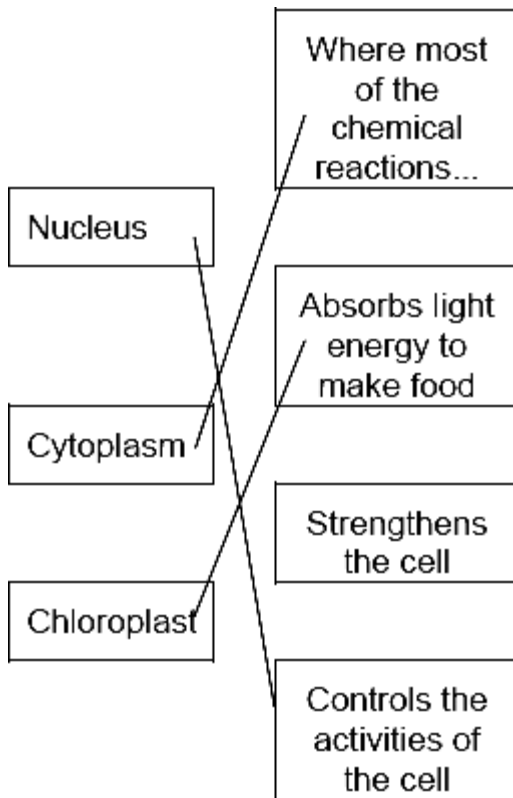
do not allow 'makes / produces / creates' energy

1

[7]

7

(a)



1 mark for each correct line

mark each line from left hand box

two lines from left hand box cancels mark for that box

3

(b) energy

1

[4]

8

(a) (i) tissue

extra box ticked cancels the mark

1

(ii) organ

extra ring drawn cancels the mark

1

(b) (i) Layer B

each extra box ticked cancels 1 mark

1

Layer C

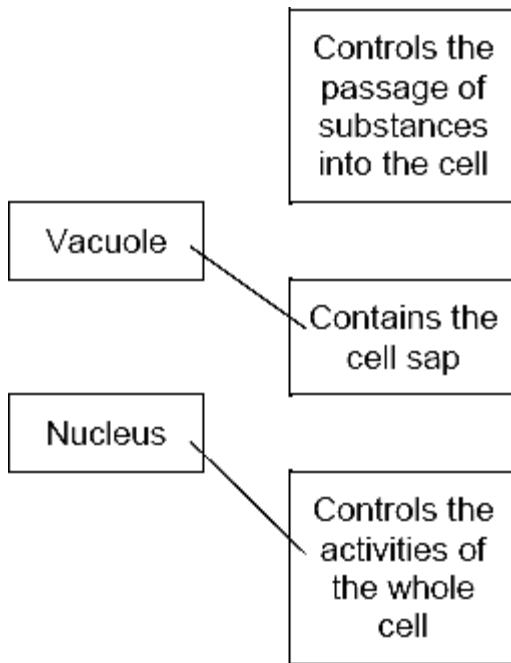
1

(ii) (contain) chloroplasts / chlorophyll

other parts disqualify

1

(c)



two correct = 2 marks

one correct = 1 mark

extra line from a part of a cell cancels the mark

2

[7]

9

- (a) because water enters (the cell / it / named cell)

*do **not** accept salt / sugar / solution entering*

1

by osmosis / diffusion

*if osmosis / diffusion not given accept concentration inside cell
greater than outside cell**assume concentration refers to solute concentration unless answer
indicates otherwise**allow water goes up the concentration gradient**allow water goes down its concentration gradient**do **not** accept if diffusion of salt / sugar*

1

through a partially permeable membrane

*allow semi / selectively permeable membrane **or** description*

1

- (b) (plant cells) have (cell)
- wall

*accept animal cells have no (cell) wall**ignore reference to cell membrane**do **not** accept reference to other organelles **or** any implication that
animal cells have a cell wall eg plant cells have a thicker cell wall*

1

[4]

10

- (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]**11**

(a) (i) sex cells

1

(ii) chromosomes

1

(b) (i) two

1

(ii) recessive

1

(c) (i) cell membrane

allow membrane

1

(ii) cytoplasm

1

(d) (i) A

1

(ii) B

1

[8]**12**

(a) root

1

(b) (i) chlorophyll

1

(ii) absorbs / traps / takes in light

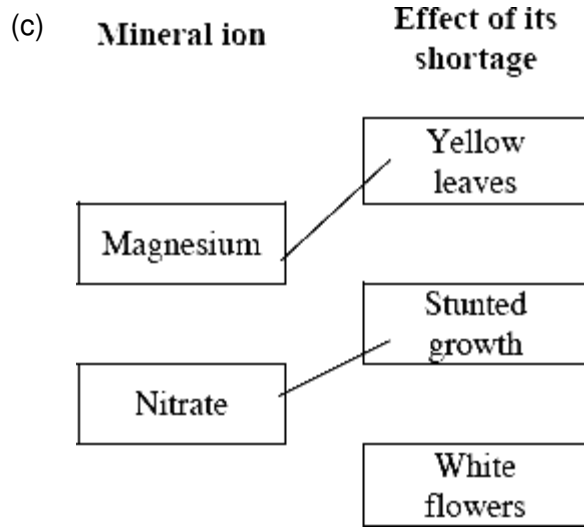
*do **not** accept attracts / solar energy / sunshine / sun*

1

(for) photosynthesis

accept to make food / glucose / sugar/ biomass

1



1 mark per correct line

extra line from a mineral ion cancels the mark

2

[6]

13

(a) (i) inoculating loop

1

(ii) V

1

W

either order

1

(iii) Z

1

(b) carbohydrates

1

[5]

14

(a) (i) C and D

1

(ii) cell wall

1

(b) (i) A

1

(ii) D

1

(c) respiration

1

[5]

15

(a) B

*no mark for "B", alone*large(r) surface / area **or** large(r) membrane*accept reference to microvilli**accept reasonable descriptions of the surface**do **not** accept wall / cell wall**ignore villi / hairs / cilia*

1

(b) (i) any **one** from:

- insulin / hormone

if named hormone / enzyme must be correct for pancreas

- enzyme / named enzyme

1

(ii) many ribosomes

1

(ribosomes) produce protein

*accept insulin / hormone / enzyme named is (made of) protein***or**allow many mitochondria (1)provide energy to build protein **or** to make protein (1)*accept ATP for energy*

1

[4]

16

(a) (i) root hair

1

(ii) any **two** from:

ignore food

- water
- ions / minerals / nutrients / salts / correct named eg nitrates
ignore N,P,K
- oxygen

2

(b) (i) stomata

1

(ii) diffusion

1

[5]

17

(a) (i) A cytoplasm

accept clear indications

1

B nucleus

1

(ii) any **two** from:

two required for **1** mark

- P
- R
- T

accept lower case letters

1

(b) sperm cells need a lot of energy to swim

1

[4]

18

(a) any **two** from:

- sterilise / kill microorganisms
ignore 'cleaning' / 'disinfect'
ignore 'germs'
- method of sterilisation eg apparatus / media sterilised in oven / autoclave
allow pressure cooker / boiling water
- pass flask mouth / pipette tip / loop / test tube mouth through flame
- work near a flame
- minimise opening of flask / test tube **or** hold non-vertical
*allow idea of sealing / covering **or** prevent entry of air*

2

(b) any **two** from:

- temperature
ignore references to time / type of bacterium
- concentration / amount of nutrients / ions
- type of nutrient
- volume / amount of solution
- amount of bacteria added
- agitation **or** amount of oxygen

2

(c) (i) 7.5

accept in range 7.4 – 7.6

1

(ii) use more pH values around / close to pH 7.5 / between 7 and 8

1

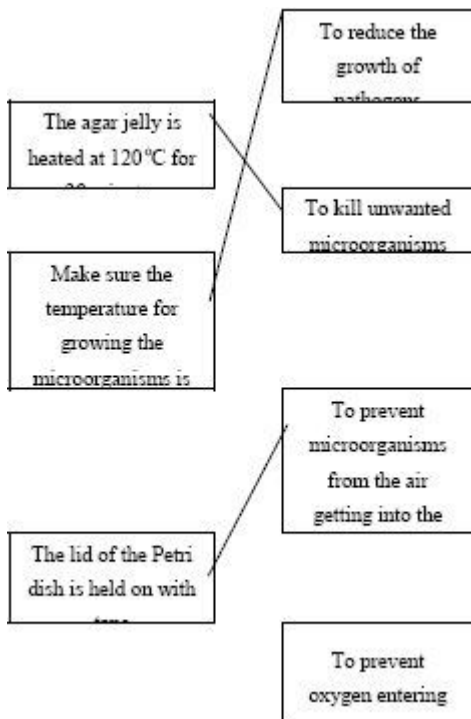
[6]

- 19** (a) it has many chloroplasts. 1
- (b) (has) cell wall 1
- (has) vacuole **or** large / permanent vacuole
*do **not** allow chloroplasts*
assume plant cell throughout
accept converse for animal cell 1
- [3]

- 20** (a) A 1
- (b) (i) diffusion 1
- (ii) respiration 1
- (iii) mitochondria 1
- (iv) photosynthesis 1
- [5]

21

(a) **List A – Action** **List B – Effect**



*1 mark per correct line
each extra line cancels 1 mark*

3

(b) (i) dish 2 has (colonies of) microorganisms / bacteria / (but there are none in dish 1)

*allow fungi / pathogens / microbes / germs
allow more microorganisms in dish 2*

1

(ii) untreated milk contains living microorganisms

or

microorganisms killed by UHT

or

no living microorganisms in UHT milk

ignore microorganisms enter from the air

1

- (iii) dish 3 was not opened
do **not** allow no growth of microorganisms because of lack of air / oxygen

or

it was sterilised
ignore microorganisms cannot enter from the air

or

nothing / no milk was added

1

[6]

22

- (a) root hair

1

- (b) (i) 85

if incorrect unit added = 0

1

- (ii) 0.85

*ignore working or lack of working
accept correct answer from candidate's (i) for 2 marks*

$\frac{85}{100}$ *with no answer or wrong answer gains 1 mark*

accept ecf

2

(iii) absorb more water / ions

allow 'get / collect / take in / take up / soak up / suck up' for absorb

allow 'lots' for more

allow 'moisture' for water

allow 'minerals / salts / nutrients' for ions

*do **not** allow food or named foods*

*absorb water / ions gains **1** mark*

or

large surface area to absorb water / ions (2)

large surface area linked to incorrect function = 1

ignore small so short diffusion pathway

2

[6]

23

(a) **A** nucleus

1

B (cell) membrane

1

C cytoplasm

1

(b) any **two** from:

- (contain mitochondria)
- many (mitochondria)
- respiration (occurs in mitochondria)

2

[5]

24

(a) any **two** from:

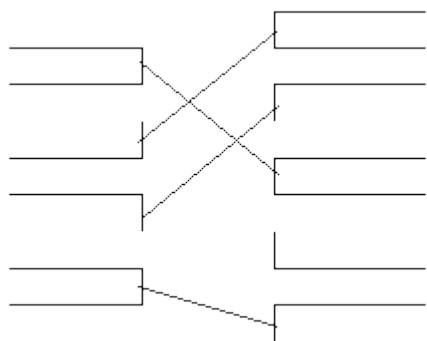
- amylase / carbohydrase
- protease
allow trypsin
- lipase

2

- (b) (i) high / above normal blood sugar
or cannot control blood sugar
allow other symptoms
*eg frequent / plentiful urination **or** sugar in urine **or** thirst **or** weight loss **or** coma*
ignore consequential effects eg blood pressure / circulation / glaucoma / tiredness
1
- (ii) any **one** from:
- small / regular meals
 - low sugar (meals) or low GI / GL **or** carbohydrates as starch
allow high fibre
ignore reference to low carbohydrate
1
- (iii) any **one** from:
- keep constant(blood) sugar **or** prevent high (blood) sugar
or reduces surge / rush of sugar into blood
 - reduce the need for insulin
1
- (iv) (take) insulin
allow pancreas transplant
1
- (c) protein / hormone / enzyme synthesis **or** synthesis of named example
or combine amino acids
1

[7]

25



1 mark for each line
extra line from List A Action cancels the mark

[4]

26

(a) any **two** from:

- transport up / against concentration gradient / low to high concentration
- uses energy
- use of protein / carrier

2

(b) microvilli – large(r) surface area
accept have carriers

1

mitochondria – release energy **or** make ATP
do not accept 'makes energy'

1

[4]

27

(a) **A** nucleus

1

B (cell) membrane

1

C cytoplasm

1

(b) (i) it is thin

1

(ii) diffusion

1

[5]

28

(a) (i) red cell

1

(ii) diffusion

1

(iii) haemoglobin

1

(iv) a nucleus

1

(b) (on diagram) arrow from any part of blood to air

1

[5]

29

(a) (i) **A** = nucleus

1

B = (cell) membrane

1

(ii) (cell) membrane

1

(b) 70

if correct answer, ignore working or lack of working

$$\frac{63 + 78 + 69}{3} \text{ for 1 mark}$$

2

[5]

30(a) hold cells together **or** prevent flow of cells **or** trap cells

1

(b) 12500

if correct answer, ignore working / lack of working

$$\frac{100}{0.008} \text{ for 1 mark}$$

ignore any units

2

(c) (i) size RBC approximately same size capillary **or**
 no room for more than one cell **or**
only one can fit **or**
 RBC is too big

*allow use of numbers**do **not** accept capillaries are narrow*

1

(ii) more oxygen released (to tissues) **or**
 more oxygen taken up (from lungs)

1

and any **two** from:

- slows flow **or** more time available
- shorter distance (for exchange) **or** close to cells / capillary wall
- more surface area exposed

2

[7]**31**(a) **A** = nucleus*accept phonetic spelling only*

1

B = (cell) membrane*accept plasma membrane*

1

(b) any **one** from:

photosynthesis

makes sugar / starch / carbohydrate / organic material

accept 'makes food'

*do **not** accept makes chlorophyll*

ignore stores starch / food / light / chlorophyll

traps or absorbs light

1

(c) any **two** from:

Plant cell

- (has) vacuole **or** has cell sap
- (has) wall/cellulose
- (stores) starch **or** doesn't store glycogen

Animal cell

- no vacuole **or** small/temporary vacuole **or** no cell sap
- no wall/cellulose **or** only membrane
- doesn't store/have starch **or** stores glycogen

ignore reference to shape

must be clear indication in all four boxes

ignore reference to chlorophyll

2

[5]

32

(a) (i) haemoglobin / oxyhaemoglobin

must be phonetic

1

(ii) carries oxygen **or** forms oxyhaemoglobin

Ignore references to CO₂ / iron

cancel if extras like food / glucose

1

from lungs to tissues

1

- (b) no nucleus **or** biconcave disc (described)
ignore references to size
ignore vague references to being
'round' / 'donut' shaped etc.

1

[4]**33**

- (a) A cytoplasm

1

where (chemical) reactions take place

*do **not** accept where cell functions take place*

1

or

carries/holds the organelles/named organelles / named chemicals (including nutrients)

*do **not** accept keeps the shape of the cell*

or

contains water

or

presses out on the membrane

allow: keeps cell turgid

allows transport through the cell

B membrane

*do **not** accept by themselves:*

protects cell

gives shape

1

controls what enters/leaves the cell

1

or

contains the cell/holds the cell together

*do **not** accept keeps harmful substances out*

or

allows movement into and out of the cell C nucleus

1

contains the genetic material/DNA/genes/chromosomes

do not accept:

brain of the cell

stores information/instructions

tells cell what to do

or

controls (the activity) of the cell

1

- (b) (i) one mark for each correctly labelled part

cell wall

do not accept anything inboard of the inner edge vacuole

accept anything inboard of transplast

chloroplast: site of photosynthesis/ for photosynthesis

accept word equation or balanced equation

1

cell wall: supports the cell/keeps the shape/keeps it rigid

do not accept protects the cells

2

- (ii) vacuole: acts as reservoir for water / chemicals/(cell)/sap

3

or

keeps cell turgid/pushes content to edge

or

maintains concentration gradient

or

allows cell elongation (not growth)

1

[12]

34

- (i) the loop is sterilised

accept to kill anything on the loop

or

to kill any bacteria on it;

do not credit to clean the loop

1

- (ii) if hot it would kill bacteria picked up (from culture);

accept 'microorganisms' or 'microbes'

accept entry of contaminated air but reject entry of air unqualified

1

- (iii) to prevent entry (from the air) of unwanted bacteria or bacterial spores or fungal spores;
accept so can't breath on it
accept 'microorganisms' or 'microbes' 1
- (iv) so that the (petri) dish is not opened (after bacteria are cultured)
or to reduce evaporation
or drying of the agar,
accept 'microorganisms' or 'microbes'
accept to prevent anything relevant getting in/out
reject references to spillage 1

[4]

35

- (a) **award one mark for each key idea**

energy released **or** energy transferred **or** respiration

allow provides or gives

do not allow produces or makes

3

near to the site of movement **or**
 energy available quickly **or** more
 energy

accept allows more mitochondria to fit in

(mitochondria) packed (around
 filament) **or** efficient arrangement **or**
 spiral arrangement

- (b) contains chromosomes **or** genes **or**
 DNA

not genetic material

1

(which) contribute half (the genes) to
 the fetus **or** offspring

23 chromosomes or half the genes

*or reference to X,Y chromosome determining sex (if the notion of
 halfness is there)*

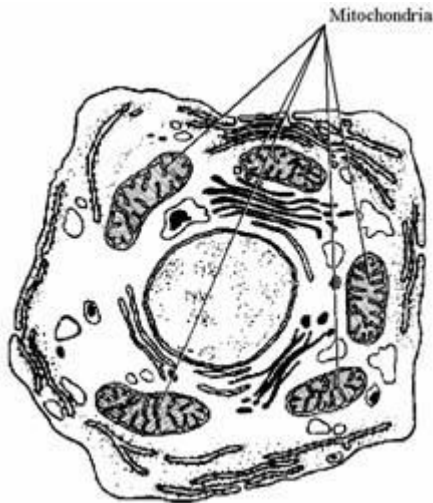
nucleus contains half genes for the offspring = 2 marks

1

[5]

36

(a) (i)



award 1 mark for any of the mitochondria correctly labelled if a number are labelled and one is incorrect award 0 marks

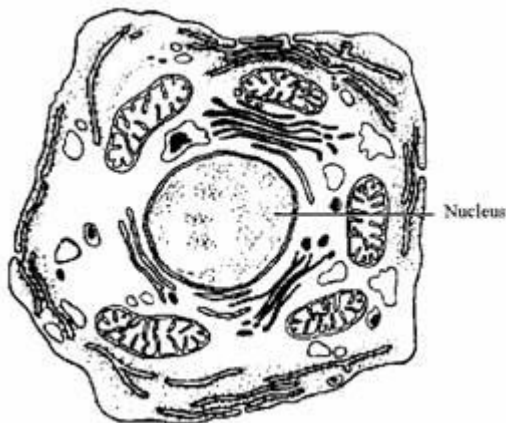
1

(ii) respiration **or** the release **or** transfer of energy **or** it contains the enzymes for respiration

*do **not** accept energy produced*

1

(b) (i) nucleus (named and correctly labelled)



*arrow **or** line must touch **or** go inside the nuclear membrane*

1

(ii) DNA **or** genes **or** nucleic acids

*accept protein **or** histones **or** nucleotides **or** ATGC*

1

(c) enzymes **or** nucleus

*do not accept factors that affect the rate rather than control it eg pH
or temperature*

1

[5]**37**

(a) mesophyll / / / / (all correct) sperm / / x / (all correct)
for 1 mark each

2

(b) (i) absorbs light/to produce food/photosynthesis
*(allow references to gaseous exchange)
for 1 mark*

1

(ii) has chlorophyll/chloroplasts to absorb light/produce food
*for 1 mark each
(if linked to gas exchange allow – moist surface/
dissolve gases)*

2

[5]**38**

(i) cytoplasm
(cell) membrane
nucleus

*all correctly labelled
each for 1 mark*

3

(ii) 0.5

*gains 2 marks
(5/100 × 10 or ½ /1 gains 1 mark if 0.5 not given)*

2

[5]

39 cytoplasm reject protoplasm
(cell) membrane
nucleus

*all correctly labelled
each for 1 mark*

[3]

40 (a) (cell) wall
(cell) membrane
cytoplasm
vacuole

for 1 mark each

4

(b) (i) A

(ii) B

for 1 mark each

2

(c) diffusion (reject osmosis)

for 1 mark

1

[7]

41 (a) 6 6 6

all required

*accept a '6n 6 n n 6n' version of the balanced equation provided it
is correct in every detail*

1

(b) any **two** of

- (presence of) chlorophyll **or** (amount of) chloroplasts
accept green leaves (or other green parts)
- (sufficient) light (intensity)
- (light) of **a** suitable wavelength
*any light other than green light
do not credit Sun's energy or sunshine or Sun*

2

(c) **guard cells**any **two** of

* control by osmosis

* the movement of gases

*accept movement of carbon dioxide **or** oxygen **or** water vapour**beware movement of CO₂ out**accept a diagram or description*

* through the stoma

2

palisade cellsany **two** of

* near the upper surface

* contain (a great) many **or** more chloroplasts

* (so) contain the most chlorophyll

2

(d) any three of

* for respiration

* conversion to (insoluble) starch

or to food store **or** to (other) carbohydrates* (conversion to) sucrose **or** to food store **or** to (other) carbohydrates**or** polysaccharides*do not credit just to grow **or** live****or** survive**accept conversion to food store****or** to (other) carbohydrates once only** (conversion to) lipids **or** fats **or** oils* (conversion to) amino acids **or** (plant) proteins **or** auxins **or** (plant) hormones **or** enzymes

3

[10]

42

- (a) (i) the three features correctly labelled on cheek cell (which are referred to in part (ii))

label lines should touch or end very close to part no marks if leaf cell labelled

nucleus

cytoplasm

cell membrane

mitochondrion

accept mitochondria or one of these could be labelled vacuole

3

- (ii) any **three** from

feature

function

nucleus

controls cell

*accept contains genetic material **or** genes **or** chromosomes **or** stores information*

do not credit the brain of the cell

cytoplasm
occurs

where respiration

*accept contains food **or** mitochondria*

or reactions occurs

membrane
chemicals

less water **or**

*accept surrounds the cell or lets some things in but not others
do not credit keeps things out **or** protection*

in and **or** out

mitochondria

where energy released

ecf from leaf cell labelling

*accept chloroplasts make sugar **or** glucose*

accept vacuole contains sap

*accept if cell wall mis labelled on cheek cell, support **or** hold together*

3

- (b) fight **or** ingest **or** kill bacteria **or** germs **or** viruses **or** microbes
accept produce antitoxins or antibodies fight disease (organisms)
do not credit fungus

1

(transport) oxygen **or** carry haemoglobin

accept transport carbon dioxide or helps form scabs

1

[8]**43**

- (i) 6 in both spaces
do not credit if any formula has been altered

1

- (ii) glucose
allow fructose or dextrose

1

- (iii) mitochondria
accept organelles

1

[3]**44**

- (a) (i) water (molecules) enter(s) (the cell)
or water (molecules) pass(es) through the (semi-permeable) cell membrane

1

by osmosis

or because the concentration of water is greater outside (the cell than inside it the vacuole)

accept because of the concentration gradient provided there is no contradiction

1

(ii) any **one** from

(it is) elastic

(it is) strong

(it is fully) permeable (to water)

or water can pass through it

do not credit semi-permeable

do not credit cell membrane is semi-permeable

1

(b) (the piece of) potato shrinks

or loses its turgor

or becomes flabby

or becomes flaccid

or plasmolysis occur

or cytoplasm pulls away from the cell wall

(because) concentration of sugar

or because concentration of water

1

(solution) is greater than concentration inside the cell / vacuole

inside the cell / vacuole is greater than concentration (of water) outside

1

water is drawn out of the cell

1

[6]

45

(a) 23

1

(b) chromosome nucleus gene cell
 2 3 1 4

1

(c) (i) any **one** from

(cells which are bigger) take up more space

(cells) have to get bigger **or** mature to divide

1

- (ii) chromosomes duplicate **or**
make exact copies of self
accept forms pairs of chromatids

1

nuclei divide
*accept chromatids **or**
chromosomes separate*

1

identical (daughter) cells formed
*accept for example, skin cells make
more skin cells **or** cells are clones*

1

- (d) any **two** from

Differentiation mark

babies need **or** are made of different types of cells **or** cells that have
different functions

*accept different cells are needed
for different organs*

Division or specialisation mark

as fertilised egg starts to divide each cell specialises to form a part of the body

*accept specialised cells make
different parts of the body*

Growth mark

specialised cells undergo mitosis to grow further cells

*accept cells divide **or** reproduce
to form identical cells*

2

[8]