Q1.

(a) nucleus

1

(b) gene(s)

allow allele(s)

1

(c) copying of chromosomes

1

(d) mitochondria

1

(e) 60 − 45
or
120 − 105

1

15 (minutes)

1

*an answer of 15 (minutes) scores **2** marks*

(f) C

1

(g) 8

1

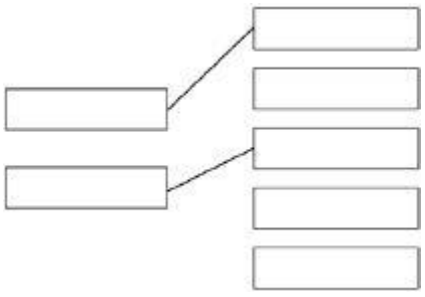
(h) to repair tissues

1

[9]

Q2.

(a)



additional line from a level of organisation negates the mark for that level of organisation

2

(b) palisade mesophyll

1

(c) $\frac{50}{8}$

1

6 / 6.25 / 6.3 (micrometres)

1

*an answer of 6 / 6.25 / 6.3 scores **2** marks*

(d) they have no chloroplasts / chlorophyll

allow they are underground

allow they don't get (access to) light

allow (because) photosynthesis needs light

allow they can't absorb light

ignore 'sun'

ignore 'it is dark'

1

(e) differentiation

1

(f) to protect endangered plants from extinction

1

(g) plants can be produced quickly

1

(h) any **one** from:

- glucose / sugars / starch
- amino acids / protein
- hormones

  allow named hormones e.g. auxin
- ions / minerals

  allow magnesium / nitrate
- vitamins

  allow named vitamins e.g. vitamin B
- water

  allow H_2O / H2O

  ignore oxygen / carbon dioxide / agar / nutrients / fertiliser

1

[10]

Q3.

(a) toxins / poisons (secreted by / from / in bacteria)

1

(b) any **two** from:

- wash hands after using toilet / being sick
  or
  wash hands before preparing / handling food
  or
  do not prepare food (whilst infected)

  ignore 'wash hands' unqualified

  ignore reference to coughing / sneezing
- isolate yourself

  allow examples of how isolation could be achieved

- disinfect clothes / surfaces
- do not share utensils / cutlery / towels

2

(c) antibiotics

allow named examples of antibiotics

1

(d) immune system is damaged / weakened **or** immune system doesn't function properly

allow immunocompromised
allow lack of / no white blood cells

1

white blood cells cannot kill bacteria / *Salmonella* (as effectively)

allow no / fewer antibodies so bacteria not killed
***or** less phagocytosis so bacteria not killed **or** no / fewer antitoxins to counter toxins*

1

(e) any **one** from:

- (give chickens) antibiotics
  allow (give chickens) monoclonal antibodies
- don't sell infected chickens / eggs
  allow don't sell the chickens / eggs
  ignore don't sell chickens / eggs
- keep infected chickens isolated / indoors
  allow keep the chickens indoors
  ignore keep chickens indoors
- slaughter the infected chickens
  ignore vaccination / chlorination / disinfection

1

(f) (cleaning liquid) B
and
greater reduction in number of bacteria (after cleaning) in both locations

ignore few bacteria in both locations
*allow neither / both **and** idea of experimental error*

1

(g) radius (of area with no bacteria growing)

allow diameter (of the area with no bacteria growing)
ignore πr^2 unqualified
allow idea of placing agar plate onto graph paper and counting the squares not covered with bacteria

1

(h) repeat **and** look to see if results are similar

ignore repeat unqualified

*allow repeat **and** look to see if results are different*

allow repeat and see if there are anomalies

ignore repeat and identify anomalies
ignore repeat and compare unqualified

1

(i) any **one** from:

- toxicity / side / health effects

ignore harmful / dangerous
allow reference to allergies

- effect on other types of bacteria / pathogens

allow not tested on other types of bacteria
ignore germs

- interaction with other cleaners
- ease of use
- dilution factor of each cleaner (vs. cost)

ignore concentration unqualified

- time cleaner is effective for

ignore how long the cleaner lasts for

allow reference to odour of cleaning liquid

ignore reference to cost unqualified
ignore environmental effects / flammability

1

[11]

Q4.

(a) kills microorganisms / bacteria / fungi / viruses / microbes

allow to remove microorganisms / bacteria / fungi / viruses / microbes

ignore germs

allow so mycoprotein is not contaminated

1

(which) compete for food / oxygen
or
which make toxins

allow so mycoprotein is safe to eat

or
which are pathogens
or
which might kill the fungus / *Fusarium*

1

(b) 30 °C

1

(c) for (aerobic) respiration

*do **not** accept anaerobic*

1

(which) releases energy (for growth)

*do **not** accept produces energy*

allow glucose is used to make other organic substances e.g. protein

1

(d) any **two** from:

so *Fusarium* can

- grow faster / better
- get sufficient food / glucose / minerals

allow more / enough

- get sufficient oxygen

allow more / enough

- get rid of sufficient carbon dioxide

allow more / enough
allow waste

- be kept at a (suitable) temperature

allow to avoid 'clumping'

2

(e) 200 grams

1

[8]

Q5.

(a)

✗	✓	✓
✓	✗	✓

***1** mark for each correct row if no other marks awarded allow a mark for one correct column*

2

(b) a bacterial cell

1

(c) make / synthesise / produce protein

allow produce enzymes

1

(d) 0.0015 (mm)

allow 1.5×10^{-3} (mm)

1

(e) mitochondria are longer / bigger (than the cell)

allow too big

1

(f)

2^4

*an answer of 16 scores **2** marks*

allow 2 × 2 × 2 × 2 or a correct list showing doubling at each time interval

1

16

*allow 90 mins = 8 for **1** mark*

1

(g) (number of live cells / bacteria) stays level / the same until 11 hours

*answer must refer to number of live cells / bacteria (**not** the shape of the graph)*

allow (number of cells / bacteria) is very low until 11 hours
allow number in the range 10-11 hours

1

then (number of live cells / bacteria) increases rapidly to 2.5×10^8
or
from 11 hours to 14.5 hours

allow (then) increases exponentially

1

then (number of live cells / bacteria) stays at 2.5×10^8

allow (number of live cells / bacteria) stays the same for the next 5 hours

or
stays the same from 15 to 20.5 hours

*if no other mark awarded allow for **1** mark the idea that the graph is level, then increases, then levels off again*

1

(h) any **one** from:

- lack of food / nutrients / oxygen / space
  or
  competition for space
- build-up of toxins

  allow ethanol
- temperature too high

1

[12]

Q6.

(a) electron (microscope)

1

(b) $\frac{30000}{200}$

*an answer of 150 (µm) scores **2** marks*

1

150 (µm)

*if answer is incorrect allow for **1** mark sight of 0.015 / 0.15 / 1.5 / 15*

*allow ecf for incorrect measurement of line **X** for max **1** mark*

1

(c) **either**

large surface area

allow (vacuole contains) cell sap that is more concentrated than soil water (1)

1

for more / faster osmosis

create / maintain concentration / water potential gradient (1)

or

allow thin (cell) walls

for short(er) diffusion distance

1

(d) (on hot day) more water lost

allow converse for a cold day if clearly indicated

1

more transpiration
or
more evaporation

1

so more water taken up (by roots) to replace (water) loss (from leaves)

1

(e) (aerobic) respiration occurs in mitochondria

*do **not** accept anaerobic respiration*

1

(mitochondria / respiration) release energy

*do **not** accept energy produced / made / created*

1

(energy used for) active transport

1

to transport ions, against the concentration gradient
or
from a low concentration to a high concentration

1

[12]

Q7.

(a) 86

allow this answer only

*do **not** accept 85.7*

if no answer given, check for answer in the table

1

(b) as salt concentration increases, percentage of open stomata (in field of view) decreases (above 0.1 mol / dm^3)

or

allow percentage of open stomata stays the same between 0.0 and 0.1 (mol / dm^3 then decreases as salt concentration increases)

ignore references to number of open stomata

allow converse

allow idea that mean concentration (of salt) in guard cells is between 0.3 and 0.4 mol per dm^3

1

(c) use concentrations between 0.3 (mol / dm^3) and 0.4 (mol / dm^3)

or

draw a graph of the data and read off the value at 50% (open stomata)

allow a list of appropriate concentrations i.e. 0.32 mol / dm^3), 0.34 (mol / dm^3), 0.36 (mol / dm^3) etc.

1

(d) ($\pi \times 0.1875^2$) = 0.11 (mm^2)

*an answer of 36 scores **3** marks*

1

$$\frac{4}{0.11}$$

1

36 (per mm^2)

*allow 36.22 / 36.23 **or** 36.2*

*if answer is incorrect allow for **2** marks for sight of number of open stomata = 9 per mm^2 (diameter used instead of radius)*

*if no other marks awarded allow for **1** mark any **one** from:*

- *sight of area = 0.44(mm^2) (diameter used instead of radius)*
- *sight of number of open stomata = 9.1 / 9.05 / 9.06 per mm^2 (diameter used instead of radius and no rounding)*

1

(e) (potassium) ions increase the concentration of the solution (inside guard cells)

or

(potassium) ions make cell more concentrated / less dilute

allow (potassium) ions decrease concentration of water / water potential (of guard cells)

1

water moves into the (guard) cell by osmosis

1

cell swells unevenly (so stoma opens)

1

as inner wall is less flexible than outer wall **or** thick part of the wall is less flexible than the thin part (of the wall)

1

[10]

Q8.

(a) to kill microorganisms on / in the flask
or
so only microorganisms in the milk caused the results

allow bacteria / fungi / microbes
*do **not** accept viruses*
ignore germs

1

(b) heating

1

to over 100 °C

allow place in oven / pressure cooker
*do **not** accept disinfectant*
allow other suitable method – e.g. use of UV

1

(c) to prevent microorganisms entering from the air

allow bacteria / fungi / microbes for microorganisms
*do **not** accept viruses*
ignore germs

1

(d)

0	olive-green	**7**
1	olive-green	**7**
2	olive-green	**7**
3	orange-green	**6**

*all correct for **1** mark*

1

(e) (pH meter) – more accurate / more precise

allow more exact
allow can measure to 0.1 pH unit
***or** to smaller intervals of pH*

1

(leaving…6 days) – obtain greater pH change
or
because there was (very) little change in 3 days

allow more acid will be made

1

(f) scale > $\frac{1}{2}$ of x-axis
and
x-axis labelled (time in) days

1

points plotted correctly
*all 7 correct = **2** marks*
*5 or 6 correct = **1** mark*

2

line of best fit = smooth curve through points
*do **not** accept ruled point-to-point*

1

(g) (1st day) too few bacteria

1

(after day 1 more bacteria so more) acid made

1

(days 5-6) sugar / food used up
or
low pH denatures enzymes
or
low pH kills bacteria
allow enzymes do not work
*do **not** accept enzymes killed*

1

(h) (similarity) – same start pH /
pH7 and end pH / pH4.5
or
same pH change / change = 2.5

1

(difference) – faster

1

[16]

Q9.

(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)
allow ecf

1

180 (µm)

1

*allow 180 (µm) with no working shown for **3** marks*

(f) 0.2 µm

1

[9]

Q10.

(a) **C**

1

(b) cytoplasm **and** cell membrane dividing
*accept cytokinesis for **1** mark*

1

to form two identical daughter cells

1

(c) stage 4

1

only one cell seen in this stage

1

(d) (4 / 36) × 16 × 60

1

107 / 106.7

1

110 (minutes)
*allow 110 (minutes) with no working shown for **3** marks*

1

(e) binary fission
*do **not** accept mitosis*

1

(f) shortage of nutrients / oxygen

1

so cells die
or
death rate = rate of cell division

1

[11]

Q11.

Level 3 (5–6 marks):
A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of the human circulatory system . The response makes logical links between content points.

Level 2 (3–4 marks):
The response is mostly relevant and with some logical explanation. Gives a broad understanding of the human circulatory system. The response makes some logical links between the content points.

Level 1 (1–2 marks):
Simple descriptions are made of the roles of some of the following: heart function, gas exchange, named blood vessels, named blood cells. The response demonstrates limited logical linking of points.

0 marks:
No relevant content.

Indicative content

- dual / double circulatory system which means that it has higher blood pressure and a greater flow of blood to the tissues
- heart made of specialised (cardiac) muscle cells which have long protein filaments that can slide past each other to shorten the cell to bring about contraction for pumping blood
- heart pumps blood to lungs in pulmonary artery so that oxygen can diffuse into blood from air in alveoli
- blood returns to heart via pulmonary vein where muscles pump blood to the body via aorta
- oxygen carried by specialised cells / RBCs which contain haemoglobin to bind oxygen and have no nucleus so there is more space available to carry oxygen
- arteries carry oxygenated blood to tissues where capillaries deliver oxygen to cells for respiration and energy release
- thin walls allow for easy diffusion to cells
- large surface area of capillaries to maximise exchange
- waste products removed eg CO_2 diffuse from cells into the blood plasma
- blood goes back to the heart in veins which have valves to prevent backflow
- cardiac output can vary according to demand / is affected by adrenaline

accept annotated diagrams

[6]

Q12.

(a) (i) small amounts of dead pathogens

1

(ii) decrease

1

by 60 (%)

allow from 70(%) to 10(%)

allow other correct data treatment

1

(b) (i) penicillin

1

(ii) any **two** from:

- antibiotics only kill bacteria
  allow antibiotics do not kill viruses
- some bacteria are resistant (to antibiotics)
  allow MRSA not killed by antibiotics
- (correct) antibiotics not always used
  allow course not completed
- deficiency disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- inherited disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- 'lifestyle' diseases not caused by bacteria **or** cannot be treated by antibiotics
  eg heart disease / cancer

  *if no other mark given allow **1** mark for not all diseases are caused by bacteria **or** some diseases are caused by viruses*

2

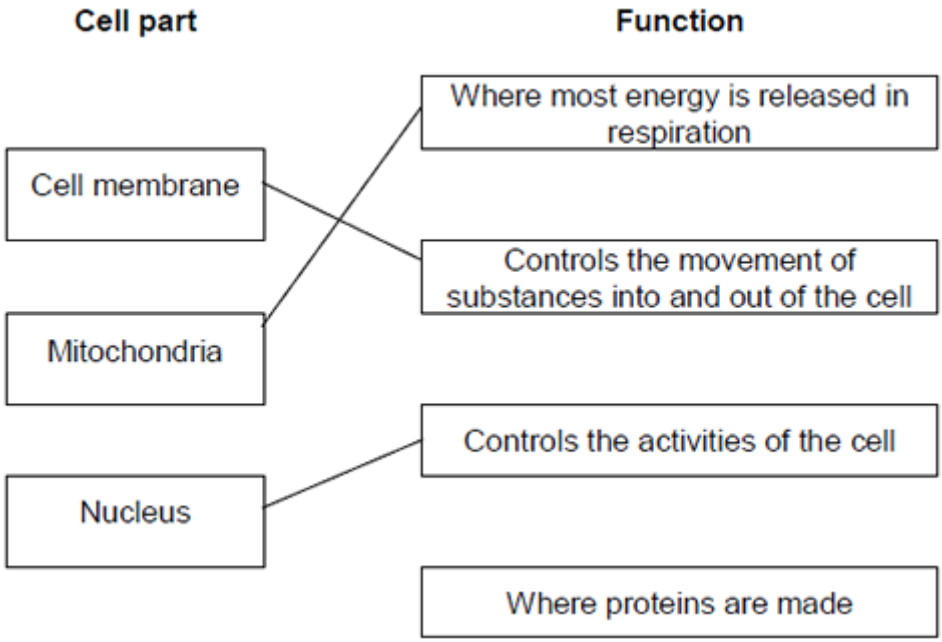
(c) bacteria grow faster

allow this is body temp (at which pathogens grow)

1

[7]

Q13.



(a)

extra lines cancel

3

(b) Cell wall

in either order

1

Chloroplast

allow (permanent) vacuole

1

[5]

Q14.

(a) a catalyst / speeds up a reaction

ignore it is not used up

1

it is a protein **or** it is specific / described **or** it has an active site

allow it only acts on one molecule

1

(b) cytoplasm

1

(c) **Advantage:**

any **one** from:
- heat would denature proteins in milk
- heat alters texture or flavour of milk
- catalase / enzyme is specific **or** only affects hydrogen peroxide
- less energy / fuel / lower temperature used so less expensive **or** less pollution

1

Disadvantage:

any **one** from:
- (some pathogens may survive) causing illness
- catalase / enzyme left in milk **or** may cause allergies **or** may alter taste

1

[5]

Q15.

(a) (i) nucleus

1

(ii) diffusion

1

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

ignore large surface area to volume ratio

1

(c) (i) sugar / glucose

accept amino acids / other named monosaccharides

1

(ii) against a concentration gradient
or
from low to high concentration

1

(iii) (active transport requires) energy

1

(from) respiration

1

(d) minerals / ions

accept named ion ignore nutrients

do not accept *water*

1

[8]

Q16.

(a) A (inoculating / wire) loop

1

B Petri dish

allow (agar) plate

ignore ref to culture medium

1

(b) (i) to kill (unwanted) bacteria / microorganisms / microbes

allow fungi

ignore viruses / germs

1

(ii) Using a flame

1

(iii) any **one** from:

- so bacteria / microorganisms / microbes / pathogens / fungi (growing in dish) do not get out

  ignore reference to gases

  ignore viruses / germs

- so bacteria / microorganisms / microbes / pathogens / fungi (from the air) do not get in.

  ignore viruses / germs

1

(c) 25 °C

1

[6]

Q17.

(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]

Q18.

(a)

Structure	Organ	Organ system	Tissue
Stomach	✓		
Cells lining the stomach			✓
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine		✓	

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

2

(b) (i) diffusion

allow phonetic spelling

1

(ii) glucose

1

(iii) mitochondria

1

[5]

Q19.

(a) contract / shorten

ignore relax
*do **not** allow expand*

1

to churn / move / mix food

accept peristalsis / mechanical digestion
ignore movement unqualified

1

(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

2

(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

1

by (aerobic) respiration **or** from glucose

*do **not** allow anaerobic*

*energy released **for** respiration = max 1 mark*

1

(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

[8]

Q20.

(a) (i) chloroplast

1

(ii) cell wall

1

(b) (i) osmosis

accept diffusion

1

(ii) cell wall (prevents bursting)

1

(c) (i) carbon dioxide

allow correct formula

1

glucose

allow sugar / starch

1

(ii) any **two** from:

- light sensitive spot detects light
- tells flagellum to move towards light

- more light = more photosynthesis

2

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

1

short (diffusion) distance

allow correct description

1

(diffusion) via cell membrane is sufficient / good enough

or

flow of water maintains concentration gradient

1

[11]

Q21.

(a) (i) xylem

1

(ii) water

1

minerals / ions / named example(s)

ignore nutrients

1

(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

1

(ii) sugars are made in the leaves

1

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

1

(c) (i) mitochondria

1

(ii) for movement of minerals / ions

Do not accept 'water'

1

against their concentration gradient

1

[9]

Q22.

(a) any **two** from:

- only one 'chromosome'
  allow one strand of DNA
- circular
  allow loop
- may have plasmids
- not in a nucleus / no nucleus

2

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

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

1

(ii) increases
Included figures must be correct

1

(iii) overall slight increase
accept 'doesn't change much'

1

variable / goes up and down

1

(c) (i) both axes correctly labelled

x = Year

y = Number of cases

1

correct points
*all correct = **2** marks*
*1-2 errors = **1** mark*
*> 2 errors = **0** marks*

2

suitable line of best fit
accept straight line or smooth curve

1

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

1

(d) provides immunity / protection (to TB)
ignore 'stops people catching it'
ignore 'resistance'

1

prevents TB spreading

accept ref to herd immunity

1

[13]

Q23.

(a) (i) Chromosomes

1

(ii) Characteristics

1

(iii) Classify

1

(b) Plants

ignore algae

1

[4]

Q24.

(a) (i) A = (cell) membrane

1

B = cytoplasm

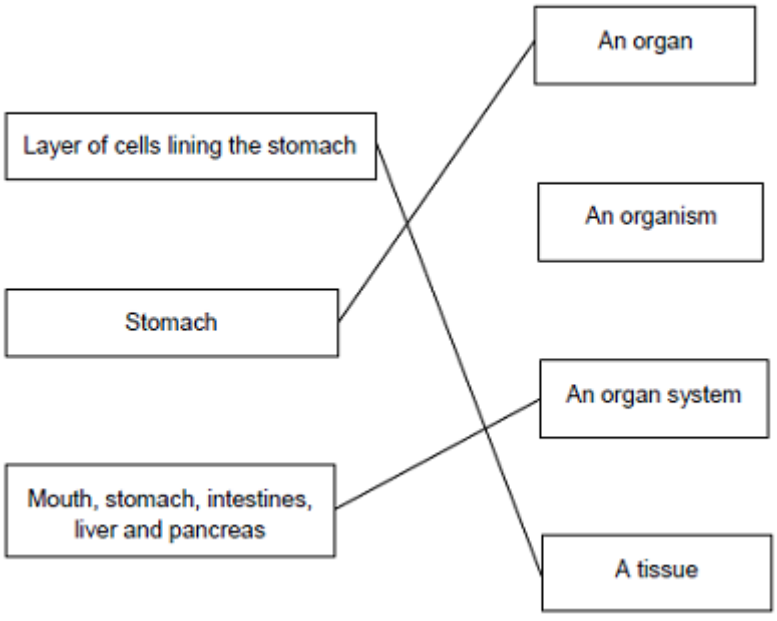
*do **not** accept cytoplast*

1

(ii) To control the activities of the cell

1

(b)



extra lines cancel

3

[6]

Q25.

(a) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a brief description of at least one of the stages (pre-inoculation, inoculation, post-inoculation).

Level 2 (3-4 marks)
There is a simple description of at least two stages and an explanation of at least one of them.

Level 3 (5-6 marks)
There is a clear description of all three stages and an explanation of at least two of them.

Examples of Biology points made in the response:

Pre-inoculation

- Petri dish and agar sterilised before use
- to kill unwanted bacteria
- inoculating loop passed through flame / sterile swab
- to sterilise / kill (other) bacteria

Inoculation

- loop/swab used to spread/streak bacterium onto agar

Allow other correct methods, eg bacterial lawns

- lid of Petri dish opened as little as possible
- to prevent microbes from air entering

Post-inoculation

- sealed with tape
- to prevent microbes from air entering
- incubate
- to allow growth of bacteria

6

(b) (i) bacteria killed / destroyed

ignore fights / attacks / stops growth / got rid of

1

(ii) *Might be correct*

largest area / space where no bacteria are growing

allow most bacteria killed

1

Might not be correct

(need more evidence as) D may be harmful to people / animals / surfaces

ignore ref to cost / dangerous or harmful unqualified

1

or may work differently with different bacteria

or disinfectants may be different concentrations

ignore different amounts of disinfectant unless reference to different drop size

or may not last as long

ignore take longer to work

allow reference to anomalous result or not repeated

[9]

Q26.

(a) (i) A = nucleus

1

B = (cell) membrane

1

(ii) any **two** from:

ignore shape

- no (cell) wall
- no (large / permanent) vacuole
- no chloroplasts / chlorophyll

2

(b) because high to low oxygen / concentration **or** down gradient

allow 'more / a lot of oxygen molecules <u>outside</u>'

ignore along / across gradient

1

(c) a tissue

1

[6]

Q27.

(a) (i) mitochondrion / mitochondria

must be phonetically correct

1

(ii) carbon dioxide / CO_2

1

water / H_2O

1

in either order
*accept CO2 but **not** CO^2*
*accept H2O **or** HOH but not H^2O*

(iii) diffusion

1

high to low concentration

allow down a concentration gradient

1

through (cell) membrane **or** through cytoplasm

*do **not** accept cell wall*

1

(b) ribosomes make proteins / enzymes

1

using amino acids

1

part A / mitochondria provide the energy for the process

allow ATP
*do **not** accept produce or make energy*

1

[9]

Q28.

(a) **A** sperm

1

B egg

1

C fertilised egg

1

D embryo

1

(b) insert into mother

ignore fertilise / check fertilisation / check viability

1

womb / uterus

1

(c) (i) one quarter

1

(ii) no / little chance of success over 42

1

reference to table of only two women in the age bracket 40-42 years became pregnant

*the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains **2** marks*

1

(iii) so fewer twins / multiple births
or
multiple births more dangerous

1

[10]

Q29.

(a) (i) **C** and **D**

no mark if more than one box is ticked

1

(ii) any **one** from:

*do **not** allow if other cell parts are given in a list*

- (have) cell wall(s)
- (have) vacuole(s)

1

(b) (i) **A**

apply list principle

1

(ii) **D**

apply list principle

1

(c) respiration

apply list principle

1

[5]

Q30.

(a) **B**

*no mark for "B" alone, the mark is for B **and** the explanation.*

large(r) surface / area **or** large(r) membrane

accept reference to microvilli
ignore villi / hairs / cilia
accept reasonable descriptions of the surface eg folded

membrane / surface

*do **not** accept wall / cell wall*

1

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

- (salivary) amylase
- carbohydrase

1

(ii) <u>many</u> ribosomes

*do **not** mix routes. If both routes given award marks for the greater.*

1

ribosomes produce <u>protein</u>

accept amylase / enzyme / carbohydrase is made of protein

or

(allow)

<u>many</u> mitochondria (1)

mitochondria provide energy to build / make <u>protein</u> (1)

accept ATP instead of energy

1

[4]

Q31.

(a) both parents **Aa**

*accept other upper and lower case letter without key **or** symbols with a key*

allow as gametes shown in Punnett square

1

aa in offspring correctly derived from parents
or
aa correctly derived from the parents given

ignore other offspring / gametes

for this mark parents do not have to be correct

1

offspring **aa** identified as having cystic fibrosis

*may be the only offspring shown **or** circled / highlighted / described*

1

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

accept converse if clear, eg if you (only) took one it might have cystic fibrosis / might not be fertilised

- (more) sure / greater chance of healthy / non-cystic fibrosis egg / embryo / child

accept some may have the allele

reference to 'suitable / good embryo' is insufficient

- greater chance of fertilisation

1

(ii) **advantages**

to gain 3 marks both advantage(s) <u>and</u> disadvantage(s) must be given

max 3

any **two** from:

ignore references to abortion unless qualified by later screening

- greater / certain chance of having child / embryo without cystic fibrosis / healthy
- child with cystic fibrosis difficult / expensive to bring up
- cystic fibrosis (gene / allele) not passed on to future generations

disadvantages

any **two** from:

- operation dangers / named eg infection
  ignore risk unqualified
- ethical or religious issues linked with killing embryos
  accept wrong / cruel to embryos accept right to life argument
  ignore embryos are destroyed
- (high) cost of procedure
- possible damage to embryo (during testing for cystic fibrosis / operation)

plus

conclusion

a statement that implies a qualified value judgement
eg it is right because the child will (probably) not have cystic fibrosis even though it is expensive
or
eg it is wrong because embryos are killed despite a greater chance of having a healthy baby

***note**: the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage is made*

*do **not** award the mark if the conclusion only states that advantages outweigh the disadvantages*

1

(c) any **three** from:

- osmosis / diffusion

  *do **not** accept movement of ions / solution by osmosis / diffusion*

- more concentrated solution outside cell / in mucus

  assume concentration is concentration of solute unless answer indicates otherwise or accept correct description of 'water concentration'

- water moves from dilute to more concentrated solution

  allow correct references to movement of water in relation to concentration gradient

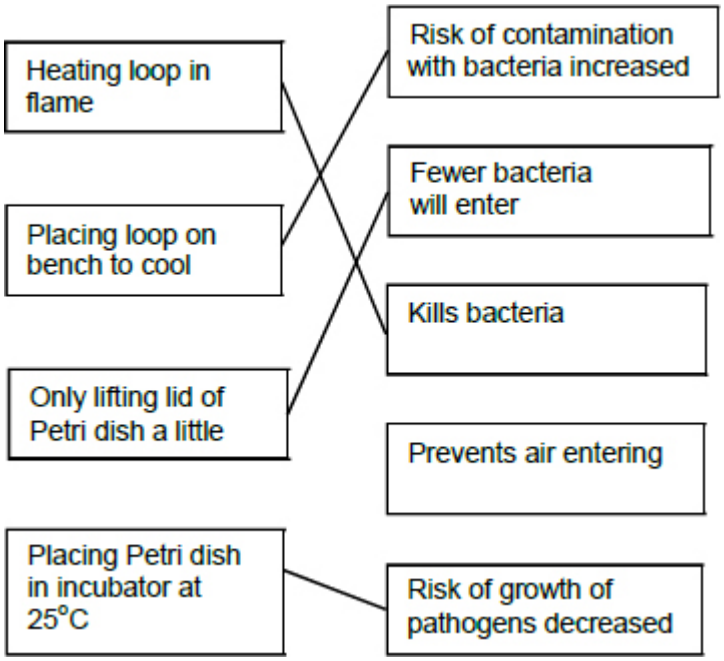
- partially permeable membrane (of cell)

  allow semi / selectively permeable

3

[11]

Q32.



any box on the left joined to > 1 other box - cancel

[4]

Q33.

(a) (i) A = (cell) wall

ignore cellulose

1

B = cytoplasm

1

(ii) any **one** from:

accept has DNA instead of a nucleus, but not just has DNA

- bacterial cell / it has no nucleus
  allow no mitochondria
- DNA free in cytoplasm
  ignore size
- has no vacuole / no vesicles
  ignore strands of DNA

1

(b) (i) yeast grows best / better / well **or** optimum temperature for yeast / more yeast present
allow yeast works best / better / well

1

(yeast) makes CO_2 **or** respires / respiration
allow fermentation

1

(ii) bacterium grows best / better / well / more bacteria present **or** optimum temperature for bacterium
ignore microorganisms / microbes
allow works / respires best / better / well

1

(bacterium) makes (lactic) acid
*do **not** allow wrong acid*

1

[7]

Q34.

(a) (i) **A** − (cell) wall

1

B − cytoplasm

1

C − plasmid

1

(ii) bacterium cell has cell wall / no nucleus / no mitochondria / plasmids present
accept its DNA / genetic material is not enclosed / it has no nuclear membrane
it = bacterium cell
accept converse for animal cell
ignore flagella

1

(iii) any **one** from:

- chloroplast

ignore chlorophyll

- (permanent) vacuole

1

(b) (Long tail) moves the sperm / allows the sperm to swim

1

towards the egg

allow correct reference to other named parts of the female reproductive system

1

(Mitochondria) release <u>energy</u> (for movement / swimming)

allow supply / produce / provide

1

in respiration

1

[9]

Q1.

(a) (i) 25°C

1

(ii) pathogens

1

(b) **D**

1

more / most bacteria killed

accept biggest area / ring where no bacteria are growing

1

(c) viruses live inside cells

1

[5]

Q2.

(a) **A** cytoplasm

in this order only

1

B (cell) membrane

*do **not** accept (cell) wall*

1

(b) (i) synapse

1

(ii) (as) chemical

accept neurotransmitter or named

ignore references to how the chemical is passed

*do **not** accept electrical*

1

(c) (from light-sensitive cell to connecting neurone) to sensory neurone

ignore references to synapses accept 'nerve cell' for neuron(e) throughout penalise 'nerve' for neurone once only

1

(sensory neurone) to brain / CNS

allow (sensory neurone) to relay neurone / spinal cord

1

(brain / CNS) to motor neurone

allow (relay neurone / spinal cord) to motor neurone

1

(motor neurone) to (eyelid) muscle

ignore effector

1

[8]

Q3.

(a) (i) A = cytoplasm

1

B = (cell) membrane

1

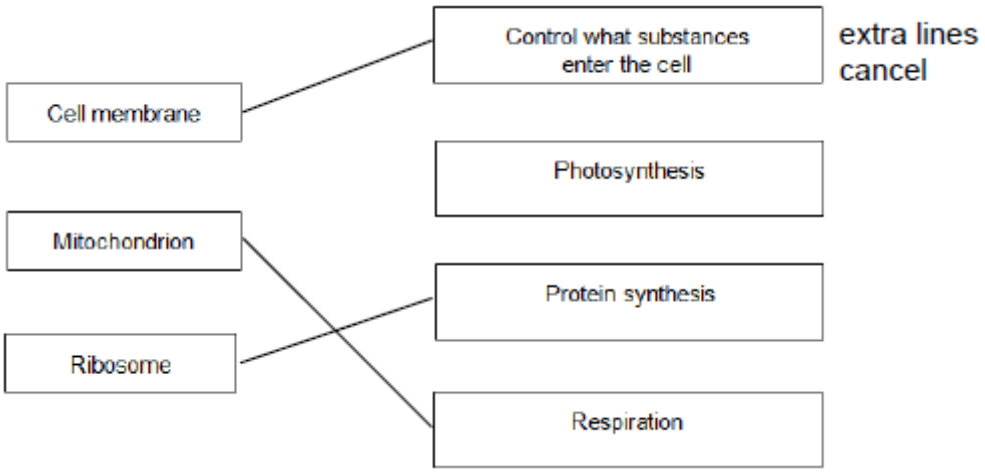
(ii) nucleus

accept chromosome / DNA / genes

accept phonetic

1

(b)



3

[6]

Q4.

(a) B

1

(b) D

1

(c) A

1

[3]

Q5.

(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]

Q6.

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

1

(ii) plant cell has nucleus / vacuole / chloroplasts / chlorophyll
or plant cell is <u>much</u> 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]

Q7.

(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]

Q8.

(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

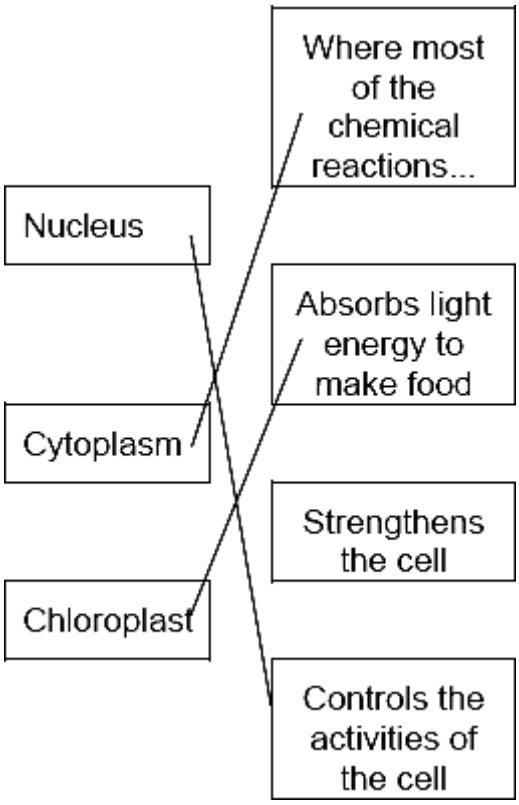
*do **not** allow 'makes / produces / creates' energy*

1

[7]

Q9.

(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]

Q10.

(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

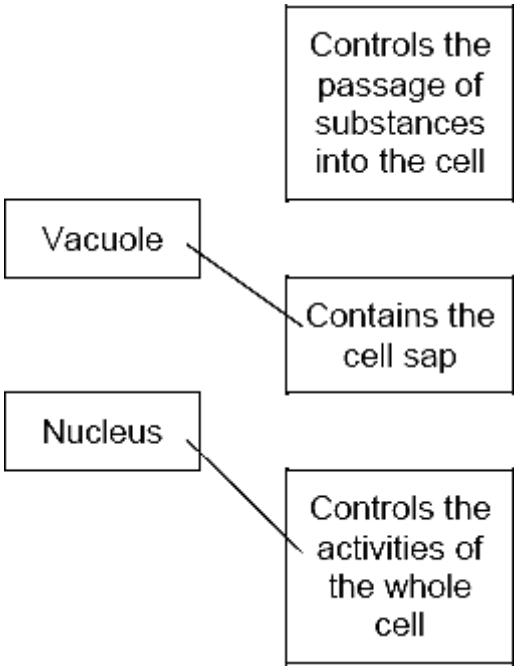
1

(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]

Q11.

(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 <u>up</u> the concentration gradient

allow water goes <u>down its</u> 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) <u>wall</u>

accept animal cells have no (cell) <u>wall</u>

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]

Q12.

(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]

Q13.

(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]

Q14.

(a) root

1

(b) (i) chlorophyll

1

(ii) absorbs / traps / takes in light

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

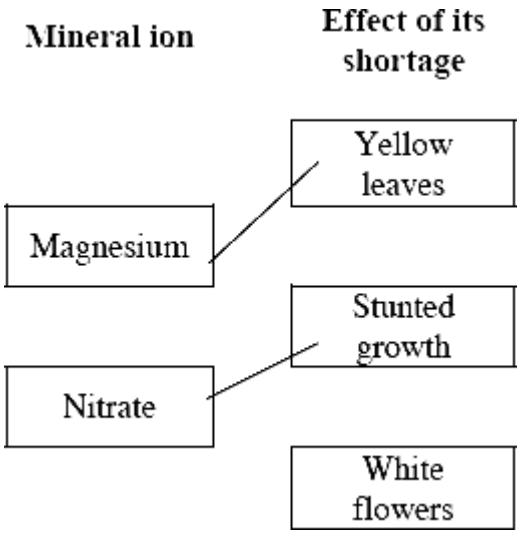
1

(for) photosynthesis

accept to make food / glucose / sugar/ biomass

1

(c)



***1** mark per correct line*

extra line from a mineral ion cancels the mark

2

[6]

Q15.

(a) (i) inoculating loop

1

(ii) V

1

W

either order

1

(iii) Z

1

(b) carbohydrates

1

[5]

Q16.

(a) (i) C and D

1

(ii) cell wall

1

(b) (i) A

1

(ii) D

1

(c) respiration

1

[5]

Q17.

(a) B

no mark for ÉBÉ, 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]

Q18.

(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]

Q19.

(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]

Q20.

(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]

Q21.

(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]

Q22.

(a) A

1

(b) (i) diffusion

1

(ii) respiration

1

(iii) mitochondria

1

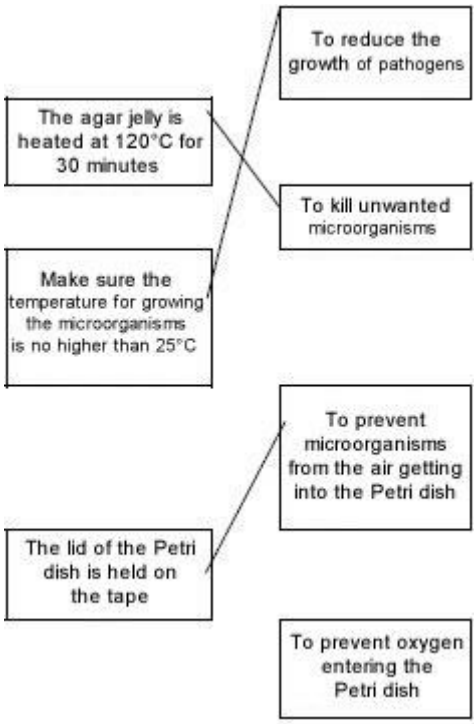
(iv) photosynthesis

1

[5]

Q23.

(a) **Liast 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 <u>living</u> microorganisms

or

microorganisms killed by UHT

or

no <u>living</u> 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]

Q24.

(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]

Q25.

(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 <u>more</u> 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

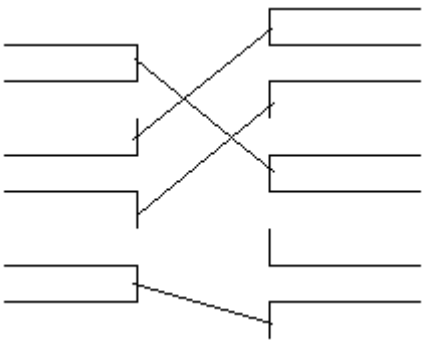
<u>large</u> surface area to absorb water / ions (2)

large surface area linked to incorrect function = 1
ignore small so short diffusion pathway

2

[6]

Q26.



***1** mark for each line*

extra line from List A Action cancels the mark

[4]

Q27.

(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]

Q28.

(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]

Q29.

(a) **A** nucleus

1

B (cell) membrane

1

C cytoplasm

1

(b) (i) it is thin

1

(ii) diffusion

1

[5]

Q30.

(a) (i) red cell

1

(ii) diffusion

1

(iii) haemoglobin

1

(iv) a nucleus

1

(b) (<u>on diagram</u>) arrow from any part of blood to air

1

[5]

Q31.

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

1

B = (cell) <u>membrane</u>

1

(ii) (cell) membrane

1

(b) 70

if correct answer, ignore working or lack of working

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

2

[5]

Q32.

(a) hold <u>cells</u> together **or** prevent flow of <u>cells</u> **or** trap <u>cells</u>

1

(b) 12500

if correct answer, ignore working / lack of working

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

ignore any units

2

(c) (i) size RBC approximately same size capillary **or**
no room for more than one cell **or**
<u>only</u> one can fit **or**
RBC is <u>too</u> 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]

Q33.

(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	Animal cell
• (has) vacuole **or** has cell sap	• no vacuole **or** small/temporary vacuole **or** no cell sap
• (has) wall/cellulose	• no wall/cellulose **or** only membrane
• (stores) starch **or** doesn't store glycogen	• 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]

Q34.

(a) (i) haemoglobin / oxyhaemoglobin

must be phonetic

1

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

Ignore references to CO_2 / 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]

Q35.

(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 transplant

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]

Q1.

(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]

Q2.

(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

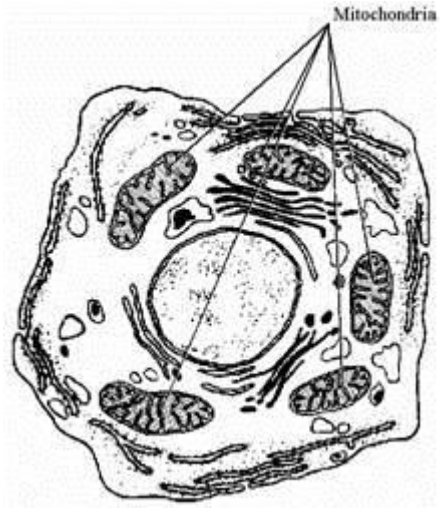
*23 chromosomes **or** half the genes*
***or** reference to X,Y chromosome determining sex (if the notion of halfness is there)*
nucleus contains half genes for the offspring = 2 marks

1

[5]

Q3.

(a) (i)



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

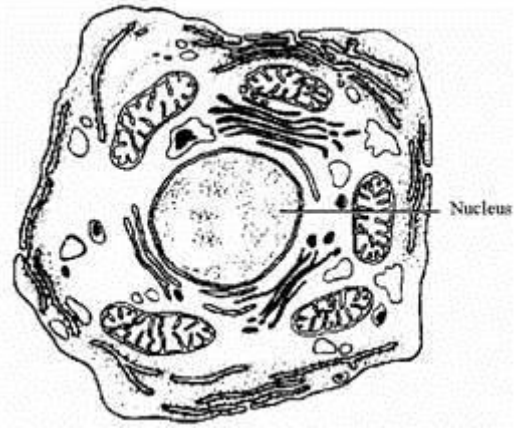
1

(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]

Q4.

(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]

Q5.

(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]

Q6.

cytoplasm reject protoplasm
(cell) membrane
nucleus

all correctly labelled
each for 1 mark

[3]

Q7.

(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]

Q8.

(a) 6 6 6

all required

accept a 'ʼn 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 CO_2 out*
  accept a diagram or description
* through the stoma

2

palisade cells

any **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]

Q9.

(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	where respiration occurs

*accept contains food **or** mitochondria*

or reactions occurs

membrane	less water **or** chemicals

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]

Q10.

(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]

Q11.

(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]

Q12.

(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]