Mark scheme

(a) award **3** marks per tube for each key idea

for tube 1:

expands **or** gets firmer **or** bigger **or** inflates

it gains water

because the concentration of water is less than its surroundings

make sure answer is about water movement and not sucrose solution

3

for tube 2

gets floppy **or** flaccid **or** contracts

it loses water

because the concentration of water is greater than its surroundings

3

(b) any **2** from:

uptake of water by root (hair) **or** movement from cell to cell within plant

*do **not** credit references to diffusion unless it is clear that the candidate is referring to the diffusion of water*

guard cell function

maintain turgor

water absorption in the large intestine

reabsorption of water from the nephron **or** collecting duct or in kidney **or** osmoregulation in kidney

allow osmosis in other animals if some use is shown

2

[8]

(a) (i) mitosis

correct spelling only

1

(ii) replicates / doubles / is copied / duplicates

accept cloned
ignore multiplied / reproduced

1

(b) fertilisation occurs / fusion (of gametes)

accept converse for asexual, eg none in asexual / just division in asexual

1

so leading to mixing of genetic information / genes / DNA / chromosomes

genes / DNA / chromosomes / genetic information comes from 1 parent in asexual
ignore characteristics

1

one copy (of each allele / gene / chromosome) from each parent
or
gametes produced by meiosis
or
meiosis causes variation

meiosis must be spelt correctly

1

[5]

(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]

Organisation

(a) stomach is acidic / has low pH

allow any pH below 7

ignore stomach is not alkaline

1

lactase works best / well in alkali / high pH / neutral / non-acidic conditions

allow any pH of 7 and above

accept works slowly in acid conditions

*allow figures from table with a **comparison***

ignore reference to temperature

1

(b) any **three** from

- (below 45(°C)) increase in temperature increases rate / *speed* of reaction
- reference to molecules moving faster / colliding faster / harder / more collisions
- optimum / best at 45(°C)

  allow value(s) in range 41 - 49
- high temps / above 45(°C) (rate slows due to) denaturation of enzyme /lactase

  *allow synonyms of denaturation but **not** killed*

  *denaturation at high **and** low temperature does **not** gain this mark*

  ignore body temperature

  ignore references to time / pH

3

(c) any **two** from

- acid neutralised **or** conditions made neutral / alkali

  accept bile is alkaline
- (allow) emulsification / greater surface area of fat / lipid

  allow description of emulsification eg fat is broken down / broken up into droplets
- enzymes (in small intestine) work (more effectively / better)

  allow better for enzymes

2

[7]

(a) solution in soil is more dilute (than in root cells)

concentration of water higher in the soil (than in root cells)

1

so water moves from the dilute to the more concentrated region

so water moves down (its) concentration gradient ***or*** *water moves from a high concentration of water to a lower concentration*

1

concentration of ions in soil less (than that in root cells)

1

so energy needed to move ions

or

ions are moved against concentration gradient

the direction of the concentration gradient must be expressed clearly

accept correct reference to water potential or to concentrations of water

1

(b) any **three** from:

- movement of water from roots / root hairs (up stem)
- via xylem
- to the leaves
- (water) evaporates
- via stomata

3

(c) (i) 0.67/0.7

accept 0.66, 0.6666666... or ⅔ or 0.6

*correct answer gains **2** marks with or without working*

if answer incorrect allow evidence of $\frac{100}{150}$ *for **1** mark*

*do **not** accept 0.6 or 0.70*

2

(ii) during the first 30 minutes

any **one** from:

- it was warmer
- it was windier
- it was less humid
- there was more water (vapour) in the leaves

1

so there was more evaporation

ignore 'water loss'

or

stomata open during first 30 minutes **or** closed after 30 minutes (1)

so faster (rate of) evaporation in first 30 min **or** reducing (rate of) evaporation after 30 min (1)

1

[11]

(a) (i) white blood cells

for 1 mark

1

(ii) e.g. contact with infected person unhygienic conditions

for 1 mark each

2

(iii) broken down, by enzymes into amino acids

any 2 for 1 mark each

2

(b) reproduce rapidly produce toxins

for 1 mark each

2

(c) antibiotic or named

for 1 mark

1

(d) mild or deal microbes introduced white cells produce antibodies
which can destroy disease microbes
idea of memory cells
idea that injecting antibodies give immediate production

any 3 for 1 mark each

3

[11]

(a) 345 to 350

ignore working or lack of working

use of 355 to 360 ***and*** *10 for* ***1*** *mark*

2

(b) any **two** from:

more sweating (at 37.6 °C)

'more' at least once in the first 2 points

more water loss **or** dehydration occurs

do ***not*** *accept prevents dehydration only*

blood becomes (more) concentrated / (more) salty **or** need to replace water

stimulation of the hypothalamus

2

(c) any **three** from:

evaporation

of water

do ***not*** *accept just water loss unqualified*

cools skin **or** uses heat from skin

cools blood / heat from blood (passing through skin)

related to sweating
cooling the blood
ignore vasodilation

3

[7]

(a) (i) gravitropism / geotropism

not '…trophism'

ignore 'positive' or 'negative'

1

(ii) any **two** from:

- anchorage
- takes in water
- takes in ions / minerals / salts / correct named example

allow nutrients

do not accept food

2

(iii) auxin

1

(b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response.
Examiners should also refer to the information on page 5, and apply a best-fit approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
There is a basic description of a simple method involving seedlings and light.

Level 2 (3 – 4 marks)
There is a description of a method involving seedlings in 1-sided light, and a control, with a correct observation.

Level 3 (5 – 6 marks)
There is a description of a method involving groups of seedlings in 1-sided light, and in control conditions. It includes some correct measurements or observations.

examples of Biology points made in the response:

- use of scissors to cut tips from some shoots / cut hole in box
- use of forceps for handling seedlings
- use of ruler to measure lengths of shoots at start and at end
- other factors controlled – eg temperature / water
- use of lamp + box re. one-sided lighting
- repetitions – each treatment ≥ 3 times
- control in total darkness / all-round light
- time taken = several hours to a few days
- sample results: tip exposed to 1-sided light→bend to light, tip removed→vertical, control→vertical

Inheritance

(a)
- caused by a recessive* gene / allele
  (allow non / not dominant)
- both parents heterozygous / carry the gene / allele
  for 1 mark each

offspring needs two recessive genes to have / inherit disease
for 2 marks

or

- Nn × Nn
- NN Nn Nn nn
  for 1 mark each

nn identified as having the disease*
for 2 marks

4

(b) any reference to DNA
gains 1 mark

but
different genes means difference in DNA
gains 2 marks

idea of
different codes / instructions for making proteins
or
different (order of) amino acids (in proteins)
for 1 mark

3

[7]

Quality of written communication

*for correct use of at least **two** scientific terms eg mutation, resistant (**not** just 'antibiotic-resistant', **not** 'immune') / selection / natural selection / survival / reproduction / gene / allele / DNA*

1

any **two** from:

mutation occurs in bacteria or change in DNA / gene occurs

cancel if mutation 'caused by' antibiotic

(when antibiotic used) only resistant bacteria survive **or** non-resistant bacteria are killed **or** reference to 'natural selection'

resistant bacteria pass on the gene / allele

allow pass on the mutation
*do **not** accept just 'pass on resistance'*

2

[3]

Ecology

(a) (i) (white) clover

1

(ii) reed sweet-grass

allow reed

allow grass

1

(iii) (only) found in swamp and aquatic zones **or** <u>only</u> found in water
or doesn't grow in marsh

ignore wet conditions

1

(b) 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 apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1-2 marks)
There is a basic description which describes how a quadrat **or** a metre tape could be used to collect data

Level 2 (3-4 marks)
There is a clear description of how a quadrat **and** a metre tape could be used to collect data along a line

Level 3 (5-6 marks)
There is a clear, logical and detailed description of a method that will produce valid, repeatable results across / at intervals along the stream.

examples of procedural points made in the response:

- use of tape measure to produce transect
- placing of quadrats
- transect placed across stream
- score presence of each plant species
- use quadrat at regular intervals along tape
- repeat transect several times (≥ 3)
- along stream
- at random **or** regular intervals

6

[9]

(a) use of quadrat / point frame

allow description

1

randomly placed / random sampling

ignore reference to transects

1

(b) (i) 6

1

(ii) more light in A / in field / where sunny

ignore sun

1

more / better / faster photosynthesis in A / with more light

allow converse

1

(iii) use light meter / measure light intensity in both habitats

1

take many measurements at same time of the day

1

or

laboratory / field investigation with 2 batches high light and low light (1)

count or number of flowers in each (1)

counting point is dependent on investigation point

(c) more glucose / energy available

allow other named product eg protein

allow if more energy produced

1

for growth

dependent on 1st mark

1

[9]

Bioenergetics

idea
provide (more) light
provide (more) CO_2
provide (plenty of) water
if any one of these is low it will limit the reaction
[Do not allow answers referring to temperature,
as optimum is specified in question 3)

any three for 1 mark each

[3]

(a) respiration

reject start respiring / respire only at night

1

no photosynthesis because no light

1

(b) photosynthesis rate greater than respiration rate

1

reject no respiration / photosynthesis only

photosynthesis since light

1

[4]