Mark schemes

Q1.

(a) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

4–6

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–3

No relevant content

0

Indicative content

- microorganisms / bacteria / fungi (cause decay)
- (named) enzyme used in decay / digestion
- digestion **or** large molecules to small molecules

- respiration by microorganisms
- production / release of carbon dioxide
- carbon dioxide is released into the air

- carbon dioxide taken in by stomata / leaves
- carbon dioxide used in photosynthesis
- making glucose / sugar / starch / cellulose / other named example

- release of nitrate (ions) into the soil
- nitrate (ions) taken in (by roots)
- nitrate (ions) taken in by active transport
- nitrate (ions) for making amino acids / proteins / DNA / other named example

For **Level 2**, the response needs to refer to both breakdown and use of nitrogen and carbon compounds

(b) any **one** from:

- use more temperatures
- measure pH at smaller time intervals
- use a data logger (for continuous monitoring)
- measure pH at same time of day
- same type of milk

allow example, such as same fat content of milk

- repeat (at each temperature) and calculate a mean **or** repeat (at each temperature) and eliminate anomalies
- cover / uncover all beakers

ignore same pH probe / meter

ignore extend beyond 4 days

ignore age of milk

1

(c) points for days 1, 2 and 3 correctly plotted

allow a tolerance of ± ½ small square

*allow 2 correct plots from days 1, 2 and 3 for **1** mark*

*do **not** accept an incorrect plot for day 0 / 4*

2

correct curved line of best fit

ignore line joined point to point with straight lines

ignore extrapolation

*do **not** accept a single straight line*

1

(d) tangent drawn to the 15 °C curve at 2 days

*do **not** accept if there is an incorrect tangent at 2 days*

1

$$\frac{6.5 - 4.5}{4}$$

allow a tolerance of ± ½ small square

1

0.5

1

$$\frac{0.5}{0.3} = 1.67$$

allow any number of decimal places

allow answer to student's incorrectly calculated rate divided by 0.3

*do **not** accept if a unit is given*

1

(e) enzymes more active **or** more bacteria produced

allow enzymes work more quickly

ignore enzymes work better

1

lipids broken down more quickly

allow fats broken down more quickly

1

<u>fatty acids</u> produced more quickly (which changes pH)

ignore glycerol

*do **not** accept incorrect products of lipid breakdown, eg amino acids or glycogen*

alternative route

allow more (kinetic) energy (at higher temperature) (1)

molecules move faster

***or** more (successful) collisions*

***or** lipids broken down more quickly (1)*

<u>fatty acids</u> produced more quickly (which changes pH) (1)

1

[17]

Q2.

(a) evaporation

allow vaporisation

1

(b) osmosis

allow diffusion

ignore absorption

1

(c) any **two** from:

- photosynthesis
- support

allow turgor

allow to fill vacuole

allow opening of stomata

allow to prevent wilting

- (solvent for) transport

allow (as a) solvent

or
translocation
or
for the transpiration stream

allow (as a) medium for chemical reactions

allow hydrolysis / digestion / breakdown of stored food

allow cooling

allow making cytoplasm

2

(d) *substitution*

$$\frac{21\,800}{1\,700\,000} \times 100$$

1

1.282(3529)

allow 1.28 ***or*** *1.3*

1

comparative efficiency

$$\frac{4.098}{1.282}$$

1

3.196.....

allow an incorrectly calculated value for efficiency correctly substituted

1

significant figures
3.20

*do **not** accept 3.2*
*do **not** accept if a unit is given*

1

(e) less energy lost as heat

allow less heat lost
allow less energy lost keeping warm
***or** less energy for maintaining body temperature*

1

less energy lost in movement

ignore less movement

ignore less energy lost unqualified
ignore controlling diet

*do **not** accept energy used for respiration*
*do **not** accept energy produced / made / created*

1

(f) any **two** from:

- increased spread of disease

or

increased use of drugs / antibiotics (to reduce disease))

allow diseases spread (more) easily

- more antibiotics in meat / milk
- (extra) cost of heating / lighting / food / drugs

allow (extra) energy used for heating / lighting
ignore (extra) cost unqualified

- aggressive behaviour (causing harm)

or

'emotional' stress reduces productivity

ignore cruelty / unethical
ignore need to clean out barns / sheds
ignore need to maintain / build barns

2

[13]

Q3.

(a) any **one** from:

a change in
- DNA
- base code **or** nucleotide sequence
- a base (in DNA)
- a gene / allele
- part of a chromosome
- number of chromosomes
- genetic code / material

ignore genetic information

1

(b) 16 / sixteen

1

(c) *volume of sample in mm^3*
0.004

1

number of cells in 1 mm^3 ***diluted*** *pond water*
14 ÷ 0.004

allow 14 ÷ (0.2 × 0.2 × 0.1)

allow use of an incorrectly calculated volume of 0.04

1

3 500

allow ecf from answer to part (b) for number of algal cells

1

correct dilution factor
¼

allow dilution = ×4

or *4 times*

1

number of cells in 1 mm^3 ***undiluted*** *pond water*
3 500 × 4

allow a calculation based on a dilution factor of 5

1

14 000 **or** 1.4×10^4

1

(d) to make it easier to count

ignore easier to see ***or*** *more spread out*

ignore quicker to count

1

(e) smaller volume

allow (some) liquid / cells would leak out (from under the cover slip)

1

so fewer cells **or** lower cell count

*allow this mark **only** if there is an attempt at an explanation*

1

[11]

Q4.

(a) lack of oxygen for (aerobic) respiration

*do **not** accept ref to respiration in dead plants*

1

(so) less / no energy (released)

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

1

(for) microorganisms / bacteria / fungi / microbes / decomposers

OR

low pH denatures enzymes (1)

allow low pH / acidity reduces enzyme activity

(so) less / no (chemical) reactions / metabolism / respiration **or** less **/** no energy released (1)

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

in microorganisms / bacteria / fungi / microbes / decomposers (1)

1

(b) 34 g/m^2/year

1

(c) DNA

1

(d) protein

1

(e) increase in temperature

allow global warming

allow heat (energy) is trapped

1

(because) carbon dioxide is released (from the peat bog)

1

(because) carbon dioxide is produced by burning / decay of peat

ignore reference to greenhouse gases

ignore methane is released from burning / decay of peat

allow fewer plants to take in carbon dioxide (for photosynthesis)

1

(because) methane is released (from the peat bog)

1

[10]