

M1. (a) 55%

2 marks for correct answer alone

accept 54 – 56

5.5 / 10 × 100 alone gains 1 mark

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets

ignore oxygen

max 1 named example of each for ions and hormones

allow minerals

3

(c) 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 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 description of pathogens with errors or roles confused.

or

the immune response with errors or roles confused.

Level 2 (3 – 4 marks)

There is a description of pathogens **and** the immune response with some

errors or confusion

or

a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)

There is a good description of pathogens **and** the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
credit memory cells / correct description
- this leads to immunity from that pathogen.

6

[11]

M2. (a) any **three** from:

- parts of organisms have not decayed
accept in amber / resin
allow bones are preserved
- conditions needed for decay are absent
accept appropriate examples, eg acidic in bogs / lack of oxygen
- parts of the organism are replaced by other materials as they decay
accept mineralised
- or other preserved traces of organisms, eg footprints, burrows and rootlet traces
allow imprint or marking of organism

3

(b) (i) teeth for biting (prey)

must give structure + explanation

1

claws to grip (prey)

accept sensible uses

1

wing / tail for flight to find (prey)

1

(ii) any **two** from:

- new predators
- new diseases
- better competitors
- catastrophe eg volcanic eruption, meteor
- changes to environment over geological time
accept climate change
allow change in weather
- prey dies out **or** lack of food
allow hunted to extinction

2

[8]

- M3 . (a) (i) sucrose 1
- (ii) fructose is sweeter than sucrose 1
- can use less fructose (for same sweetness) 1
- cheaper / can use in slimming food
allow 'less calories '
accept 'better for diabetics' 1
- (b) (i) carbohydrases 1
- (ii) denatured / shape changed
ignore 'inactivated'
allow 'enzyme / shape destroyed' 1
- (iii) faster reaction 1
- so more product made / product made in shorter time
allow '60 °C will kill microorganisms' 1
- (c) any **two** from:
- enzyme can be re-used / not wasted
 - constant-flow system
 - can be automated
 - product (= food) not contaminated by enzyme / enzyme may give allergic reaction / no need to separate P from E
allow 'people do not want to eat enzymes' 2

(d) any **three** from:

- volume is smaller so costs less to heat / to maintain temperature / to build
- temperature is cooler so costs less to heat / to maintain temperature / loses less heat to surroundings
- reaction time is shorter so reduces running costs (re. heating / stirring) or can make more product in time
- 1-stage product refining c.f. 4 stages, leading to reduced labour / time cost

need to qualify each point with respect to how it lowers costs

3

(e) (i) 4500

correct answer = 2 marks

allow 1 mark for: 1500 x 3

2

(ii) enzyme used for longer / less enzyme needed

1

less money spent on enzyme

1

[17]

- M4.** (a) (i) glycerol 1
- (ii) pancreas / small intestine 1
accept duodenum / ileum
ignore intestine unqualified
- (b) any **two** from:
- type of milk
 - volume / amount of milk
 - vol. bile equals vol. water
 - volume of lipase
 - concentration of lipase
 - temperature
- ignore time interval*
ignore solution unqualified
*do **not** allow pH*
ignore starting pH
ignore volume / amount of bile / water
ignore concentration of bile
accept amount of lipase if neither volume nor concentration given 2
- (c) (i) fatty acid (production) 1
- (ii) faster reaction / digestion (with bile) 1
or
 pH decreases faster (with bile)
or
 takes less time (with bile)
or
 steeper fall / line (with bile)
allow use of data
ignore easier
- (iii) all fat / milk digested 1
or
 same amount of fatty acids present
or
 (lower pH) denatures the enzyme / lipase
allow all reactants used up
ignore reference to neutralisation

allow enzyme won't work at low pH
*do **not** allow enzyme killed*

1
[7]

- M5.** (a) 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 in the Marking guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1–2 marks)

The method described is weak and could not be used to collect valid results, however does show some understanding of the sequence of an investigation.

Level 2 (3–4 marks)

The method described could be followed and would enable some valid results to be collected, but lacks detail.

Level 3 (5–6 marks)

The method described could be easily followed and would enable valid results to be collected.

Examples of the points made in the response:

- bean seedlings of same age
- cut material from same part of each organ (for repeats) e.g. top 1 cm of stem / a whole cotyledon / seed
- equal mass of each organ
 - accept weight for mass*
- grind / homogenise
- in equal amounts of water / buffer
- equal volumes of hydrogen peroxide solution
- equal concentrations of hydrogen peroxide solution
- same temperature
- temperature maintained in water bath
- quantitative measure of gas production eg height of foam in mm / collect gas in graduated syringe in cm³
- for same time period
- repetitions (3+ times)
- calculate mean for each.

6

- (b) (i) correct answer: 40

1 mark for 45 as the anomalous result has been included in the calculation

or

$$\frac{(38 + 41 + 42 + 39)}{4}$$

1 mark for 4

$$\frac{160}{4}$$

or 4

- (ii) vertical axis correctly labelled:
'Enzyme activity in arbitrary units'

2

- allow ecf from (b)(i)* 1
- points plotted correctly ± 1 mm
deduct 1 mark for each incorrect plot 2
- suitable line of best fit
not feathery, not point to point 1
- (iii) 6.0 / 6
allow ± 0.1
if 6.0 not given, allow correct for candidate's graph ± 0.1 1
- (iv) in range 0 to 14 units
allow correct for candidate's graph 1
- (v) enzyme denatured / enzyme (active site) shape changed
allow substrate no longer fits (active site)
ignore reference to temperature
do not allow enzyme dies 1

[15]