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 <u>on</u> <u>enzyme</u>

1

[17]

M4. (a) (i) glycerol

1

(ii) pancreas / <u>small</u> intestine

accept duodenum / ileum

ignore intestine unqualified

1

(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) <u>fatty</u> acid (production)

1

(ii) fast<u>er</u> reaction / digestion (with bile)
or
pH decreases fast<u>er</u> (with bile)
or
takes less time (with bile)
or
steeper fall / line (with bile)

allow use of data

ignore easier

1

(iii) all fat / milk digested
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 cm^3
- 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*

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

or 4

2

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

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]