Mark schemes

Q1.

(a) (bacteria) release / produce toxins

allow (bacteria) release / produce poisons

ignore toxins unqualified

1

(b) **Level 2**: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

3–4

Level 1: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

1–2

No relevant content

0

Indicative content:

Vaccination of animal

- (animal's) white blood cells / lymphocytes produce antibodies (against *Salmonella* / vaccine / antigens)
- antibodies are specific / complementary / correct to *Salmonella* / antigens
- (specific) antibodies bind to *Salmonella* / antigens

Secondary response in animal

- if infected (specific) antibodies are produced quickly **or** in large numbers
- (so) white blood cells **or** antibodies would kill (live) *Salmonella*
- (so) fewer / no bacteria / pathogens / *Salmonella* in animals **or** in animal products (meat / milk / eggs)

Prevention of food poisoning in humans

- (so) fewer / no bacteria / pathogens / *Salmonella* eaten **or** in (named) food
- (so) number of bacteria never reaches a high enough level for infection to develop
- (so) fewer toxins produced (in humans).

For **Level 2** students must link immune response in animals to prevention of an outbreak in humans.

(c) any **two** from:

allow alternative descriptions of sterilising equipment such as UV light

ignore clean / wash surfaces / hands / equipment

- disinfect hands / work surface
- sterilise Petri dish **or** culture medium (before use)
- pass inoculating loop / forceps through a flame (before use)

  allow sterilise agar (before use)

  ignore sterilise equipment
- work near a flame
  or
  work in a fume cupboard
- tilt lid (of Petri dish) when placing discs on agar (to minimise contact with air / breath)

  allow example of other method to minimise contact with air / breath
- secure lid of Petri dish with adhesive tape

  ignore store dish upside-down

2

(d) (37 °C)

37 °C is human / body temperature

1

Salmonella / bacteria grows best / better at 37 °C

allow (so) bacteria grow best / better at human body temperature

1

(25 °C)

25 °C reduces / prevents the growth of bacteria that are harmful to humans / students

allow because it is too low for growth of human pathogens

1

(e) (acts as a) control

allow for comparison

allow to show that the results are not due to the paper disc

allow to show that the results are due to the antibiotic

ignore to show the effect / effectiveness

of the antibiotic

*do **not** accept as a control variable*

1

(f) (they) killed the most bacteria

allow prevented most bacteria growing / replicating

allow largest zone of inhibition (of bacteria)

ignore largest clear area unqualified

*ignore antibiotic **B** killed the most bacteria*

1

(g) measure the diameter / radius of each clear area

allow measure the diameter / radius of each region where the bacteria are killed

or

calculate / measure the area of each clear area

allow calculate the area of each region where the bacteria are killed

1

(h) bacteria must be <u>resist</u>ant (to antibiotic **B**)

*do **not** accept bacteria must be immune*

1

(i) water enters the (bacterial) cell

1

(water enters) by osmosis

allow (water enters) by diffusion through a partially / selectively / semi permeable membrane

*do **not** accept if description of concentrations is incorrect*

1

(so) damaged / incomplete / no cell wall cannot withstand pressure (of water)

allow (so remaining) cell membrane cannot stretch further

1

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Q2.

(a)

Hazard	Risk	Plan to minimise risk
Iodine solution is an irritant	May cause allergic reaction or skin rash	wash skin immediately (after contact) **or** wear gloves **or** clean up spills allow method to prevent spills e.g. use a dropper bottle ignore do not spill
Sharp knife	may cut you / someone / skin	cut away from the body **or** cut on a chopping board **or** keep fingers away from blade (when cutting) allow description of how to carry knife safely ignore use a blunt knife

1 mark for each correct row

2

(b) **thin layer**
(to) help see individual cells
allow so light can penetrate

1

iodine solution
(to) stain / see the parts of the cell
allow visible named sub-cellular structures e.g. nucleus, cytoplasm, cell wall, starch grains
ignore chloroplast
ignore (to) stain the cell

1

at an angle
(to) prevent / reduce air bubbles

1

(c) *recall of equation*

$$\text{maginification} = \frac{\text{size of image}}{\text{size of real object}}$$

allow

$$\textit{magnification} = \frac{\textit{length of image}}{\textit{length of real object}}$$

ignore use of equation triangle

1

rearrangement of equation

$$\text{size of real object} = \frac{\text{size of image}}{\text{magnification}}$$

allow

$$\textit{length of real object} = \frac{\textit{length of image}}{\textit{magnification}}$$

allow recall and rearrangement of equation implied at any stage

1

substitution

$$\frac{4.8}{400}$$

allow substitution of incorrectly converted value

1

0.012 (cm)

allow answer using incorrectly converted value

1

conversion

120 (μm)

allow conversion to μm at any stage

1

(d) any **two** from:

- include the magnification / scale
- use continuous lines **or** ensure no gaps in lines
- do not draw overlapping cells
- draw (wider) cell walls
- do not shade

  allow do not colour
- draw all the cells present
- draw correct cell shapes
- do not have gaps between cells
- draw nuclei in correct location
- label cell part(s)

  allow label named cell part(s)

  ignore make it neater

2

(e) (would) look more magnified / bigger

ignore reference to zoom

1

(cell would) have more detail
or
(would) be at a higher resolution
or
(could) see more sub-cellular structures
or
sub-cellular structures seen in detail

allow correct examples of sub-cellular structures such as ribosomes, mitochondria, cell membrane

ignore chloroplast

allow (could) be in 3D

allow would be in black and white

1

[14]