Questions

Q1.

The pathogenic effects of bacteria can be due to the toxins they release.

Endotoxins are released by Gram negative bacteria.

(i) Name **one** type of Gram negative bacteria that releases endotoxins.

(1)

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(ii) Give **one** difference between the structure of Gram negative bacteria and Gram positive bacteria.

(1)

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(Total for question = 2 marks)

Q2.

Endotoxins are usually less toxic than exotoxins.

The LD_{50} value is the mass of the chemical per kg of body mass that would kill half the number of rodent animals.

The LD_{50} value can be used to indicate how toxic a chemical is.

One endotoxin has an LD_{50} value of 11 ng kg^{-1}.

The mean body mass of a group of rodents is 28 g.

Calculate the mass of endotoxin given to each rodent that would kill half of the rodents in this group.

(1)

Answer ..... ng

(ii) State **two** differences, other than toxicity, between endotoxins and exotoxins.

(2)

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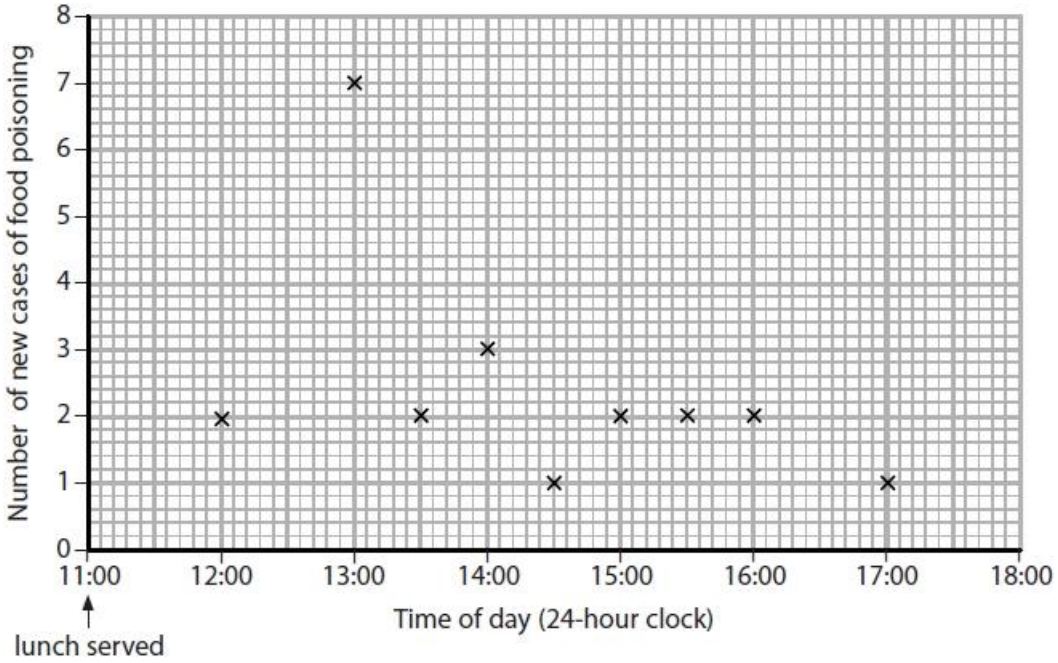
(Total for question = 3 marks)

Q3.

Food poisoning can be caused by food that is contaminated with pathogenic microorganisms.

A number of different bacteria can cause food poisoning.

The graph shows the number of new cases of food poisoning after a lunch party.



(i) Explain why it is likely that this food poisoning resulted from food contaminated with *Staphylococcus* rather than with *Salmonella*.

(3)

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(ii) Describe the techniques microbiologists could use to confirm that this food poisoning was caused by *Staphylococcus*.

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(Total for question = 7 marks)

Q4.

Salmonella are Gram negative bacteria found in the large intestine of humans.

Which is the correct statement about *Salmonella*?

(1)

- ☒ **A** *Salmonella* has a thick peptidoglycan cell wall and produces endotoxins
- ☒ **B** *Salmonella* has a thick peptidoglycan cell wall and produces exotoxins
- ☒ **C** *Salmonella* has a thin peptidoglycan cell wall and produces endotoxins
- ☒ **D** *Salmonella* has a thin peptidoglycan cell wall and produces exotoxins

(Total for question = 1 mark)

Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
(i)	• *Salmonella* (species) (1)	Candidates may name other types of bacteria, each of which will need looking up **ACCEPT** phonetic spellings **ACCEPT** *Shigella, Neisseria, Escherichia, Pseudomonas, Klebsiella, Proteus, Providencia, Escherichia, Morganella, Aeromonas, Citrobacter* **ACCEPT** specific examples e.g. *E.coli* **IGNORE** pathogens **DO NOT ACCEPT** gram positive bacteria e.g. *Actinomyces, Clostridium, Mycobacterium, Streptococci, Staphylococci, Nocardia*	(1) EXP

Question Number	Answer	Additional Guidance	Mark
(ii)	• gram negative bacteria have {a thinner peptidoglycan cell wall / an (outer) lipopolysaccharide (layer) / an outer membrane } (1)	**ACCEPT converse for gram positive bacteria** **ACCEPT** less peptidoglycan murein for peptidoglycan larger periplasm (space) no teichoic acid (in cell wall)	(1) GRAD

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	• 0.308 / 0.31 / 0.3 (1)		(1) GRAD

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to two of the following: • endotoxins released from Gram negative bacteria (only) but exotoxins released from both Gram negative and Gram positive bacteria (1) • endotoxins are lipopolysaccharides but exotoxins are proteins (1) • endotoxins released from {dead / broken down} bacteria but exotoxins are released from living bacteria (1) • effect of endotoxins is later (1)	**DO NOT PIECE TOGETHER**	(2) EXP

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of the following: • because the food poisoning was happening {after one hour /within a few hours} of the meal **(1)** • indicating that exotoxins caused the food poisoning **(1)** • because endotoxins are only present after {about 12 hours / several hours / when the bacterial cells are estroyed} **(1)** • *Staphylococcus* releases exotoxins / endotoxins come from *Salmonella* **(1)**	**Accept** soon after meal / quickly / by {12 / 1} o clock **Do not accept** *Staphylococcus* is an exotoxin / *Salmonella* is an endotoxin	**(3)**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description that makes reference to any four of the following: • isolate the bacteria from the {food / patient / faeces / vomit} **(1)** • look at the colonies to see if they have a {characteristic / named characteristic} (of *Staphylococcus*) **(1)** • use Gram stain to show presence of Gram positive bacteria **(1)** • grow on selective media that identify {*Staphylococcus* / eliminates other bacteria} **(1)** • use antibodies against *Staphylococcus* **(1)**	**Accept** a description of how this is done e.g. streak plating from a faecal sample **Accept** *Staphylococci* will appear purple with Gram stain **Accept** differential media / selective agar / named example e.g. mannitol salt agar / with antibiotics	**(4)**

Q4.

Question Number	Answer	Mark
	The only correct answer is C ***A*** *is not correct because Salmonella are gram negative bacteria so will have a thin peptidoglycan cell wall* ***B*** *is not correct because Salmonella are gram negative bacteria so will have a thin peptidoglycan cell wall and they produces endotoxins* ***D*** *is not correct because Salmonella produces endotoxins*	**(1)**