PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 6: MICROBIOLOGY AND PATHOGENS

CORE PRACTICALS

SCORE	PERCENTAGE
/39	%

STEMUP

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Mark Scheme

Q1.

Question Number	Acceptable Answer	Additional guidance	Mark
(a)	B		**(1)**

Question Number	Indicative content
***(b)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • Dilution plating takes longer to obtain a result but optical methods are quicker • Because incubation period needed for dilution plating • Because need to do serial dilutions to find correct concentration for dilution plating • Dilution plating counts living cells but optical methods measure living and dead cells • Dilution plating gives direct count but optical methods give turbidity reading • To calculate original concentration of bacterial cells, the volume of diluted suspension added to each agar plate needs to be known / optical methods require use of calibration curves • Dilution plating requires easily available apparatus but optical methods require colorimeter / spectrophotometer • Dilution plating has risk of error if colonies run into each other but optical methods produce error if tube not shaken

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made.
Level 2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made.
Level 3	5-6	A scientific judgement is made that is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made.

Question Number	Acceptable Answer	Additional Guidance	Mark
(c)	• $\log_{10} N_t = 8$ and $\log_{10} N_o = 2$ (1) • $\log_{10} N_t - \log_{10} N_o = 6$ (1) • t = 9 (1) • k =2.215 (1) [ecf applies for mps 2, 3 and 4]	Correct answer gains full marks with no working	**(4)**

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to four of the following: • medium allows only {*Salmonella* / certain bacteria} to grow (1) • {culture / colonies / bacteria} is spread out on the {agar / medium} (1) • because this separates out individual bacteria (1) • so that colonies are {discrete / separate / individual} (1) • so only one type of {bacteria / colony} can be picked up (1)	**ACCEPT** in context of {named media / antibiotic-containing media}	**(4)**

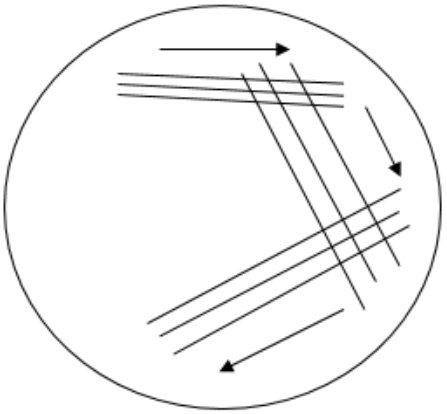
Question Number	Answer	Additional Guidance	Mark
(ii)	• log of the values taken (1) • substitution of values into equation (and evaluating correctly) (1) • k given to an appropriate number of decimal places (1)	log 5 x 10^3 = 3.6989700043 and log 4 x 10^6 = 6.6020599913 (6.6020599913 - 3.6989700043) ÷ (0.301 × 10) = 0.9644817233 **ACCEPT** correct value for rounded up values substituted 0.964 / 0.96 **CE applies from mp 1 only**	(3)

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to the following: • the value for t used in the calculated value is greater than the actual value (1) • therefore the calculated value for k will be smaller (1) • because the *Salmonella* will not be replicating (in lag phase) (1)	**ACCEPT** converse for actual value **ACCEPT** converse for actual value **ACCEPT** dividing / growing	**(3)**

Q3.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to two of the following: • {flame / sterilise / autoclave} apparatus to kill bacteria (1) • clean surfaces with {bleach / disinfectant / alcohol} to kill bacteria (1) • open lid of Petri dish slightly to prevent access by bacteria (1) • work near Bunsen flame to {create updraft / prevent bacteria settling} (1)	Accept microbes / spores for all points	**(2)**

Q4.

Question Number	Correct Answer	Additional guidance	Mark
(a)	 A description that makes reference to the following: • flame a wire loop / use of sterile swab (cotton bud) (1) • first streaks of sample in straight /zig-zag lines on surface of sterile agar plate (1) • at least 3 streaks in total (1) • second and third streak must pass through lines of previous streak (1) • incubate and take off individual colonies with wire loop (1)	Accept points from an appropriately labelled diagram (must be labelled if not described in text)	**(5)**

Question Number	Correct Answer	Additional guidance	Mark
(b)	An explanation that makes reference to the following: • above 30 °C close to human body temperature (1) • so risk of incubating human pathogens which could infect students (1)	Reject higher temperature might kill off some bacteria	**(2)**

Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculation of difference (1) • calculation of % increase (1)	Example of calculation 2400 – 400 = 2000 24 – 4 = 20 $\frac{2000}{400}$ x 100 = 500 (%) $\frac{20}{4}$ x 100 = 500 Correct answer with no working gets 2 marks	**Grad (2)**

Question Number	Answer	Additional Guidance	Mark
(ii)	• correct answer (1)	384 (x 10^2 per cm^3) Accept 360 to 400 (x 10^2 per cm^3)	**Grad (1)**

Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculation of $\Sigma (x - \bar{x})^2$ (1) • divided by {4 / n-1} (1) • calculation of SD (1)	Example of calculation 31.2 7.8 2.8 2.498 / 2.5 gets mp1 if some working shown (31.2 divided by 5) Correct answer with no working gains 3 marks	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer including the following: • SD for times 0, 1.5, 3 and 4.5 hours are non-overlapping, so this conclusion is likely to be valid (1) • SD for 6 hours overlaps with SD for 4.5 hours, so this conclusion is not likely to be valid (1) • description of possible error (1) • value of 43 may be an anomalous result (so this conclusion may not be valid) (1)	Accept SD for 6 hours overlaps with SD for 4.5 hours with comment on difference / significance Accept eg dilution error, measurement error, counting error	**Exp (3)**