

1)

(a)	(Plasma / cell) membrane;	1	Reject: nuclear membrane
(b)	Nucleus / nuclear envelope / nuclear membrane / nucleolus; Mitochondrion; (Smooth / rough) ER; Lysosome; Microvillus / brush border; Golgi; Linear / non-circular DNA / chromosome; 80S / denser / heavier / larger ribosomes;	2 max	Accept: membrane-bound organelles only if an example has not been given Neutral: villi Neutral: DNA strands Neutral: ribosomes
c)(i)	Higher resolution / higher (maximum) magnification / higher detail (of image); OR Allows internal details / structures within (cells) to be seen / cross section to be taken;	1	Accept: 'better' instead of 'higher' Neutral: shorter wavelength Reject: longer wavelength Reject: can be used on living specimens Q Do not accept 'clearer' image
c)(ii)	Thin sections do not need to be prepared / shows surface of specimen / can have 3-D images;	1	Accept: can be used on thick(er) specimens Reject: can be used on living specimens Neutral: refs. to staining / preparation / artefacts / colour
(d)	Two marks for correct answer of 0.42 – 0.46;; One mark for incorrect answers in which candidate clearly divides measured width by magnification;	2	Correct answer = 2 marks outright Accept: 0.4 or 0.5 only if working is correct for 2 marks Do not award a mark for 0.4 or 0.5 if there is no working out Ignore rounding up
(e)	As height increases, the number of deaths decrease / inversely proportional / negative correlation; Correct reference to increase / decrease at 14-30m;	2	Accept: converse statement Must give a trend and not simply give individual points Do not penalise for 'more likely to get cholera'

2)

(a)(i)	Active site / enzyme not <u>complementary</u> ; Active site changes (shape) / is flexible; (Change in enzyme allows) substrate to fit / E-S complex to form;	2 max	Active site becomes complementary / wraps around substrate = 2 marks For mark point 2. allow 'binding site' but not 'enzyme' For mark point 2. can only have enzyme changes (shape) if active site has been mentioned earlier Final mark point must have context Reject: active site on substrate for second marking point only Accept: diagrams only if suitably labelled or annotated
(a)(ii)	<u>Active site</u> does not change (shape) / is fixed (shape) / is rigid / does not wrap around substrate / (already) fits the substrate / is complementary (before binding);	1	Assume that 'it' refers to lock and key
(b)	Similar structure / shape (to PABA) / both complementary; Competes for / binds to active site / competitive inhibitor; Less PABA binds / less E-S complexes; OR Specific reference to different structure / shape (to PABA) using the diagram; Binds to position other than active site / binds to allosteric site / binds to inhibitor site / non-competitive inhibitor; Changes the active site so substrate cannot bind / less PABA binds / less E-S complexes;	3 max	Q Reject: same structure / shape Note: competitive inhibitor binds to active site = 1 mark (same mark point) Assume that 'it' refers to sulfanilamide Accept: PABA / substrate cannot bind Neutral: less product produced as in question stem Neutral: different structure / shape to PABA Reject: active site on substrate for second marking point only

3)

(i)	Glycosidic;	1	Accept: if phonetically correct Reject: ester bond
(ii)	Contains glycerol / <u>three</u> fatty acids / forms <u>three</u> ester bonds;	1	Neutral: contains less fatty acids Answers must refer to a triglyceride Ignore refs. to incorrect bond names Neutral: olestra has eight fatty acids / R groups Reject: contains three glycerols
(iii)	9;	1	

4)

(a)	Water will affect the mass / only want to measure water taken up or lost; Amount of water on cylinders varies / ensures same amount of water on outside;	2	Neutral: removes water Accept: '(sodium chloride) solution' for water Do not accept 'sodium chloride' Neutral: refs. to fair testing
(b)	4cm ³ (of 1.0 mol dm ⁻³ sodium chloride solution) <u>and</u> 16cm ³ (of distilled water);	1	Reject: factors and multiples of these figures e.g. 2cm ³ and 8cm ³ , as final volume should be 20cm ³
(c)	Allows comparison / shows proportional change; Idea that cylinders have different starting masses / weights;	2	Reject: if comparison is in context of the start and final mass of the same cylinder Neutral: different masses Neutral: different starting sizes
(d)	(Allows) anomalies to be identified / ignored / effect of anomalies to be reduced / effect of variation in data to be minimised; Makes the average / mean / line of best fit more reliable / allows concordant results;	2	Accept: 'outliers' instead of anomalies Q Reject: abnormalities Reject: idea of not recording anomalies / preventing anomalies from occurring Accept: 'cancels out anomalies' as bottom line response Q Reject: makes the average / mean more accurate Neutral: makes the average / mean more valid Neutral: makes 'it' / results / conclusion more reliable
(e)	0.35 (mol dm ⁻³)	1	

5)

(a)	Girls are not sexually active / not likely to carry HPV / vaccine may not work if already infected / few girls sexually active (at this age);	1	Neutral: girls are not sexually mature Neutral: to provide better protection Accept: provides immunity before sexually active Neutral: girls are less likely to have 'it' as could mean the vaccine from the question stem
(b)	Other (HPV) types have different antigens; No memory cells for other types / memory cells not activated; Antibodies cannot attach to antigen / correct antibodies not produced / antibodies are not complementary;	2 max	Accept: refs. to antigenic variability Accept: B cells for memory cells Accept: memory cells cannot recognise antigen for 'not activated' Accept: examples of memory cell activation
(c)	More antigen; More memory cells; So more antibodies produced / antibodies produced quicker (if infected);	2 max	Accept: 'many' / 'enough' instead of 'more' Neutral: primary / secondary response Accept: T cells / B cells / plasma cells instead of 'antibodies' Reject: the idea that vaccines contain antibodies Q Reject: antibodies 'fight' / 'antibiotics'

(d)	Cancer takes years to develop / develops later in life; Takes time for females to become sexually active / females must become sexually active to obtain data; Few people / only teenagers vaccinated;	2 max	Neutral: will take time to vaccinate 80% of young girls Accept: do not develop cancer instantly
(e)	(Cervical cancer) can be caused by other types of HPV / other factors / example given; OR (Some) women may have been infected (with HPV) before receiving the vaccine; OR (As a precaution) in case vaccine does not work / a way of monitoring if the vaccine has worked ;	1	Accept: 'caused by other types of HPV' in the context of mutation Neutral: to check for abnormal cells / that they are immune to the virus
(f)	Virus cannot replicate / is destroyed / is not carried (in vaccinated people); Non-vaccinated people more likely to contact vaccinated people;	2	Neutral: 'do not spread virus' as in question stem Must be in context of the individual and not the population as in question stem Q Do not allow 'disease is destroyed' Neutral: 'herd effect' as given in the question stem

6)

(a)	Cell wall; Starch (store); Chloroplast;	2 max	Accept: phonetic spelling
(b)	Insoluble; Reduces/'stops' water entry/osmosis / does not affect water potential / is osmotically inactive;	2	Accept: description for first point e.g. 'does not dissolve'.
(c)	Light sensitive eyespot / eyespot detects light; Flagellum enables movement towards light; Chloroplast/chlorophyll absorbs light/ for photosynthesis;	3	Do not penalise references to 'many chloroplasts'.

7)

(a)(i)	Spindle formed / chromosome/centromere/chromatids attaches to spindle; Chromosomes/chromatids line up/move to middle/equator (of cell);	2	Do not award second mark for answers referring to chromosomes 'pairing up'. Ignore reference to homologous chromosomes unless context suggests pairing which negates second mark. Neutral: Details on nuclear membrane. Accept: Diagram for second marking point
(a)(ii)	Chromosome/centromere splits / chromatids/ 'chromosomes' separate/pulled apart; To (opposite) sides/poles/centrioles (of cell);	2	Reject: Homologous chromosomes separate for first marking point. Accept: Diagram for second marking point. Chromatids/ 'chromosomes' move to poles/sides/centrioles = 2 marks.

(b)(i)	Form/replace cells quickly/rapidly / divide/multiply/replicate rapidly;	1	Neutral: Repair cells. Answers must convey idea of 'speed'.
(b)(ii)	Correct answer = 774 minutes/ 12 hours 54mins = 2 marks;; Incorrect answer but indicates 3 cell cycles involved = one mark;	2	
(c)	Prevents/slow DNA replication/doubling; Prevents/slow <u>mitosis</u> ; New strand not formed / nucleotides(of new strand) not joined together / sugar-phosphate bonds not formed;	2	First marking point must be in context of DNA replication not cell replication. Do not negate first marking point if role of DNA polymerase is described incorrectly e.g. Reject: 'joins bases/strands together'. Role of DNA polymerase must be correct for last marking point.
8)			
(a)(i)	Antibiotics kill other bacteria / <i>Clostridium</i> is resistant; Less/no competition so (<i>Clostridium</i>) reproduces/replicates/multiplies/increases in number;	2	Reference to bacteria being 'immune' negates first marking point. Reference to mitosis negates second marking point.
(a)(ii)	Immune system less effective / more likely to have other infections/been in hospital;	1	Accept: 'Weak/lower' immune system'.
(b)	Attaches to <u>active site</u> (of enzyme); (Methicillin) is a competitive inhibitor / prevents monomers/substrate attaching (to enzyme);	2	'Competes for active site = 2 marks. Neutral: 'Prevents monomers joining/attaching to each other'. Allow one mark max for answers relating to non-competitive inhibitor changing active site / preventing substrate attaching. Do not penalise Methicillin forms an enzyme/substrate complex
(c)(i)	Have other illness/medical condition/'weak' immune system/disease/infection;	1	Reject: Due to 'other factors', 'are smokers', 'are obese' unless related to disease or illness.
(c)(ii)	Increase up to 2006/20 (per 100 000) then decreases;	1	
(c)(iii)	Correct answer in range of 52 – 59.1% = two marks; Incorrect answer but shows change as between 4.8 – 5.2 / shows correct subtraction giving this change e.g. 14 - 9 = one mark.	2	

(d)	<ol style="list-style-type: none"> 1. (Antibiotic) resistant <u>gene/allele</u>; 2. Vertical (gene) transmission; 3. Resistant bacteria (survive and) reproduce / population of resistant bacteria increases; 4. Increase in frequency of (resistant) allele/gene (in future generations); 5. Horizontal (gene) transmission; 6. Plasmid; 7. Conjugation / pilus (tube); 8. (Horizontal transmission/ conjugation) can occur between bacteria of different <u>species</u>; 	6 max	<p>Penalise reference to mitosis <u>once</u> when linked to either marking point 2 or 3.</p> <p>Penalise reference to immunity <u>once</u> when linked to either marking point 1, 3 or 4.</p> <p>Accept: Binary fission for reproduction in marking point 3.</p> <p>Accept: 'Transfer' for transmission.</p>
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