



General Certificate of Education

Human Biology 5413 *Specification A*

BYA3 Pathogens and Disease

Mark Scheme

2007 examination - January series

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Question 1

(a)	(i)	Ts opposite As and Cs opposite Gs;	1
	(ii)	Deoxyribose / pentose/5C sugar; Phosphate/phosphoric acid;	2
	(iii)	Hydrogen;	1
(b)	(i)	The sequence of bases determines the sequence of amino acids; Three bases code for one amino acid;	2
	(ii)	Makes stable / prevents degeneration of molecule / allows copying / replication;	1
Total			7

Question 2

(a)	Inhibit protein synthesis/ translation/ transcription; Inhibit DNA replication; Inhibit cell wall formation/ osmotic lysis; <i>Reject destroy cell wall / digest cell wall</i> Disruption of cell membrane function;	3 max
(b)	Viruses have no metabolism / do not need nutrients / no ribosomes/named organelle /cell wall / not living; Antibiotics only active against (living) cells / viruses acellular; Viruses inside cell;	2 max
Total		5

Question 3

(a)	(i)	95 - 100 minutes;	1
	(ii)	It shows the distance (between the sister chromatids) increases at this point; As they begin to separate/ move to opposite poles;	2
(b)		Chromatids cannot be seen; Valid reason, e.g. chromosomes have not condensed / too diffuse / still in interphase;	2
(c)	(i)	Zygote;	1
	(ii)	Avoids doubling of chromosomes number at each generation / maintains chromosome number from generation to generation / diploid/correct number/ 46 restored at fertilisation;	1
Total			7

Question 4

- (a) Restriction (enzyme)/ endonuclease/
named example cuts DNA/gene/plasmid; 2
Ligase joins DNA/gene/plasmid;
Allow one mark if the two enzymes are correctly named but no function given.
Enzymes can be in any order
- (b) (i) Plasmid contains the resistance gene / resistance gene is intact; 1
- (ii) Gene for resistance to Y is disrupted;
By inserted gene;
Cannot undergo transcription / produce mRNA /
cannot break down antibiotic; 2 max
- Total 5**

Question 5

- (a) (i) To visualize the results /
to produce a colour showing glucose concentration; 1
- (ii) Enzyme/ glucose oxidase has active site/ binding site (with particular shape);
Only (glucose) complementary/ able to fit; 2
- (b) Change in blood - leaks from pancreas damaged (by trypsin/ enzymes);
Change in faeces - less entering small intestine/gut;
Increase in blood and decrease in faeces; 3
- Total 6**

Question 6

- (a) (i) Requires time to synthesise enzymes/proteins / replicate DNA /
mathematical explanation based on the scale of the change; 1
- (ii) No limiting factors operate / plenty of nutrients; 1
- (iii) Build up of toxins / lack of nutrients; 1
- (b) (i) 15 1
- (ii) 563 / 562.5;; 1 mark for difference ÷ time 2
- Total 6**

Question 7

- (a) An organism that lives in/on another organism/host;
And it causes harm / feeds on it; 2
- (b) (i) Tegument/ resistant layer to prevent attack by host's immune system /
coats itself with molecules from host's red blood cells;
Suckers give firm attachment/ prevent being washed away; 2
Reject hooks
- (ii) Lives inside host cells so avoids attack by host / antigens not exposed/ hidden
so production of antibodies slowed;
Rapidly changing surface antigens; 2
- (c) (i) The higher the rainfall, the greater the incidence; 1
Accept converse
- (ii) High rainfall linked to presence of pools of water;
Mosquitoes breed in (pools of) water;
Malaria spread by mosquitoes/ secondary host / vector is mosquito; 2 max

Total 9

Question 8

- (a) They would not be able to release thromboplastin /
have lost all their thromboplastin;
 Which converts prothrombin to thrombin /
 triggers series of reactions to form a clot; 2
- (b) It would slow their growth/reproduction rates;
 [Reject inactive/dormant/no growth]
 Because it would slow enzyme/ chemical reactions/ metabolism; 2
- (c) Sterilising plasma would destroy/damage/kill platelets /
 denature thromboplastin/ enzymes; 1
- (d) Use platelets (suspended in plasma) without AFP;
 Keep at the same temperature/4°C / all other conditions the same; 2
- (e) Incubate with reverse transcriptase;
 To form cDNA/ single-stranded DNA molecule from the mRNA; 2
- (f) 1. DNA unwinds/splits/separates / hydrogen bonds break (*accept DNA 'unzips'*);
 2. mRNA produced;
 3. RNA nucleotides form sequence from DNA bases/ bind to complementary DNA bases;
 4. RNA polymerase / links RNA nucleotides together;
 5. Introns spliced out (of primary transcript);
 6. mRNA joins to ribosome (*accept travels to ribosome*);
 7. tRNA carries a specific amino acid;
 8. Codon-anticodon relationship / explained;
 9. Peptide bonds form between adjacent amino acids;

sub max. 4 on 1-6

6 max

Total 15

Question 9

- (a) Smokers with cholesterol reading above 9 and BP above 170 and aged 45 - 54;
1 omission/error = 1 mark
Omits quantities for blood pressure/cholesterol but mentions all 4 above = 1 mark
 2
- (b) Other risk factors involved;
Any 2 from stress/ activity/ heredity/ salt intake/ obesity etc;
 Risk factors will change over 10 year period;
 Smoking not quantified;
 3 max
- (c) **HIGH BLOOD PRESSURE**
 1. Damages endothelium/lining of artery; (accept epithelium)
 2. (Increases rate at which) cholesterol/ atheroma is laid down/ leads to plaque formation;
 3. Higher fibrinogen levels (in blood);
 4. Can lead to formation of thrombus/blood clot/embolus/aneurism;
 5. Increases thickness of muscle layer in artery wall;
 6. Narrows lumen of artery;
- SMOKING**
1-6 May be awarded here
 7. (Nicotine) causes platelets to stick together / causes vasoconstriction;
 8. Carbon monoxide associated with plaque formation/ damage to endothelium;
 9. Reduces ability of arteries to dilate / reduces elasticity;
Ignore: increases cholesterol / increases blood pressure
- PLASMA CHOLESTEROL**
 1. Damages endothelium;
 2. Fatty streaks / (increases rate at which) atheroma is laid down / leads to plaque formation;
 4. Can lead to formation of thrombus/blood clot/embolism/aneurism;
 6. Narrows lumen of artery;
- Max 3 for any one factor*
Max 2 for any second factor
If candidates write "they", comment must apply to all three
 6 max
- (d) *Two marks for two explanations, e.g.*
 If it went up, increase risk / obesity a risk factor;
 Increasing energy intake would increase plasma cholesterol;
 If intake went down could decrease CHD risk;
Reject it would affect the results
 2 max
- (e) Both diets have less saturated fat;
 Saturated fat associated with heart disease;
Credit any other valid suggestions;
 2 max

Total 15