ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Human Biology 5413

Specification A

BYA3 Pathogens and Disease

Mark Scheme

2007 examination - June series

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Question 1

(a) Thr-His-Thr-His-Thr; 1

(b) (i) TCA; 1

(ii) UCA; 1

(c) (i) A base from one triplet cannot be used in an adjacent triplet;
Accept each base used only once/once a triplet used, moves to next triplet/suitable diagram
Specified peptide contains only one amino acid/ overlapping code would produce other amino acids/Gln and/or Thr as well/peptide would have more than five amino acids; 2

(ii) Some amino acids coded for by more than one codon/triplet/ sequence of 3 bases;
ACC and ACA both code for threonine; 2

Total 7

Question 2

(a) 1.Similar (in shape) to adrenaline/noradrenaline/ β agonists;
Reject <u>same</u> shape as receptor
2.(Fit into) receptors on heart muscle/lining of artery;
3.Stops adrenaline/noradrenaline/β agonists binding;
4.Slow down heart rate/relax muscles in artery walls/enlarge lumen of arteries; 3 max

(b) 1.(Reduced hypertension means) less turbulence;
2.Thrombus/blood clot less likely to form;
Reject <u>no</u> blood clots
3. Which could block artery/ arteriole;
4. Less damage to artery wall;
5. Less atheroma formed/ less plaques formed;
6. Less likely to get aneurysm;
Accept converse for all points 3 max

Total 6

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Question 3

(a)	(i)	Attaches (chromosome) to spindle/holds (sister) chromatids together;	1
	(ii)	Separate chromatids/centromeres/chromosomes/ aligns chromosomes at equator;	1
(b)	(i)	n,n,2n;	1
	(ii)	X on arrow going from 2n to n;	1
		Total	4

Question 4

(a)		Glucose oxidase; Peroxidase;	2
(b)	(i)	Enzymes are specific/shape of active site(s); Substrate/heroin/morphine has complementary shape/fits;	2
	(ii)	Gives a colour change if heroin/morphine present;	1
		Total	5

Question 5

(a)	(i)	Cuts DNA/gene/genetic material/ vector; Reference to specific sites/sticky ends;	
	(ii)	Joins/binds/anneals DNA/genetic material/ sugar-phosphate backbone; Reference to sticky ends; *Credit sticky ends or eq in one section only*	3 max
(b)		Acts as antigen; Stimulates immune response/antibody production; Immune system <u>only</u> detects molecules on surface;	2 max
(c)		For comparison; To ensure that it was not just injection giving protection;	2
(d)		Allows time for memory cell formation;	1
(e)		Memory cells present; Stimulate antibody formation very quickly; Specificity of antibodies; Eliminate virus before it can cause symptoms;	3 max
		Total	11

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Question 6

(a) Contains carcinogens/cancer-causing substances;
Causes mutation/changes in DNA/genes/genetic material;
Of genes controlling cell division;
Tumour suppressor genes;
(proto)Oncogenes;
Leads to uncontrolled division/mitosis; 4 max

(b) 1.Graph 1 shows no data before 1930;
2.Smoking causes other diseases/other kinds of cancer which may cause death;
3.Average number of cigarettes smoked includes non-smokers/ no separate data for non-smokers;
4.Time delay between starting smoking and getting cancer;
5.Trend on the two graphs is different/lung cancer deaths drop after 1960 but cigarettes smoked does not show corresponding drop;
6.Correlation does not indicate cause/may be an associated factor causing lung cancer/ other causes of lung cancer; 3 max

Total 7

Question 7

(a) So it can stick/join/bind to (DNA) probe; 1

(b) (i) Single-stranded;
Base-sequence complementary (to gene); 2
[A-T/G-C not enough. Reject: matching/corresponding]

(ii) Probe is radioactive/fluorescent;
Shows up on (X-ray) film/in UV light; 2

Total 5

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Question 8

(a) (i)
1. Enters body in (contaminated) food/drink;
2. Any acceptable source of contamination (e.g. raw eggs, raw or undercooked meat, faeces);
3. Enters (epithelium) cells (lining small) intestine/digestive system/gut;
Reject: stomach
4. (Endo)toxin released when bacterium dies;
5. Toxin causes symptoms;
6. Diarrhoea/vomiting/abdominal pain/fever/headache;
Two symptoms per mark to max 1. Ignore: nausea/sickness/weight loss
7. Time delay before symptoms appear;
8. Toxin lowers water potential (in intestines);
9. Water moves in by osmosis (leading to diarrhoea); 6 max

(ii) 1 mark for each suitable rule of hygiene up to max 2, one mark for each explanation to max 3

Wash hands after going to the toilet;
Salmonella present in faeces;

Store food in fridge;
Low temperatures reduce rate of growth;

Boil/throw away dishcloths after use;
Bacteria can multiply/spread in cloth;

Thoroughly thaw food before cooking/cook food thoroughly;
Kills bacteria present in food;

Store uncooked meat below cooked foods (in fridge);
Prevents transfer of bacteria to cooked foods;

Wash hands/utensils in contact with raw meat before touching cooked foods;
Prevents transfer of bacteria to cooked foods;

Use different chopping boards for raw and cooked meats;
Prevents transfer of bacteria to cooked foods; 3 max

(b) (i) Hydrogen bonding;
Complementary base-pairing; (*Accept: U on mRNA to A on DNA/ A on mRNA to T on DNA/ C/G on mRNA to G/C on DNA)* 2

(ii) Each pathogen has different base sequence/DNA/genes/genetic code;
Therefore produce different mRNA;
DNA must be complementary to the different mRNAs; 2 max

(c) RNA has ribose, DNA has deoxyribose/they have different pentose sugars;
RNA has uracil/U, DNA has thymine/T; 2

Total 15

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Question 9

(a) 1. Transmitted by mosquito;
2. Penetrates new host;
3. Lacks locomotory structures;
4. Moved round human body in blood/ transported by human blood;
5. Changes antigens;
6. In red blood cells/ liver cells;
7. Avoids immune response;
8 High reproductive rate/ reproduces at several stages in life cycle;
9. Ensures survival/ increases probability of finding new host/ completing life cycle; 6 max

(b) Number (of children) may differ between communities;
Allows comparison; 2

(c) (i) (No. cases of malaria per 100 children per month in) villages within 3km of lake
(No. cases of malaria per 100 children per month in) villages 8-10km from lake

Or equivalent answer using suitable figures from table; 1

(ii) (Yes)
Shows malaria much higher near lakes;
Away from lakes, risk varies little with season;

(No)
May be other variables that study hasn't considered/named suggestion;
Other reasons for siting villages other than malaria incidence; 2 max

(d) Mosquitoes breed in (still) water;
More mosquitoes closer to lake; *Ignore swamps*
More chance of being bitten; 3

(e) Country A has better healthcare/ less virulent form of malaria/ die of something else/ emigrate;
Ignore:sickle cell anaemia/vaccines/resistance 1

Total 15

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