



General Certificate of Education

Human Biology 5413

Specification A

BYA3 Pathogens and Disease

Mark Scheme

2006 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Question 1

- | | | |
|---------|--|-------|
| (a) | molecule / part of molecule / protein / glycoprotein / named molecule;
that stimulates an immune response / eq; | 2 |
| (b) | divide by mitosis / form clones;
produce plasma cells;
(plasma cells) make antibodies;
(plasma cells) produce memory cells; | 4 |
| (c) (i) | glycoprotein AND
different shape to body proteins / RNA and reverse transcriptase inside virus /
phospholipids same as body's / on the surface of the virus; | 1 |
| (ii) | 187.5;; <i>Accept 187 - 188</i>
1 mark for HIV = 80nm; | 2 max |
| | Total | 9 |
-

Question 2

- | | | |
|---------|--|---|
| (a) | chromosomes: C = 8 <i>and</i> D = 4;
DNA: C = 300 <i>and</i> D = 150; | 2 |
| (b) (i) | testis / ovary;
<i>accept anther / carpel / stamen / testicle</i> | 1 |
| (ii) | to make chromosomes / chromatids / DNA / genetic material
visible; | 1 |
| | Total | 4 |
-

Question 3

- | | | |
|-----|---|---|
| (a) | P = prothrombin <i>and</i> Q = thrombin;
R = fibrinogen <i>and</i> S = fibrin;
T = calcium (ions); | 3 |
| (b) | fewer clots form in blood;
blockage of <u>coronary arteries</u> does not occur / less likely; | 2 |
| | Total | 5 |
-

Question 4

(a)	restriction (enzyme) / endonuclease / named example	1
(b)	unpaired bases / sticky ends / staggered; complementary / explained;	2
(c)	<i>1 mark for each correct outcome</i> plasmid with foreign DNA joined in ring; ring with plasmid only; ring of foreign DNA only <i>ignore linear structures</i>	3
	Total	6

Question 5

(a)	(i)	(host 1 =) human; (host 2 =) (freshwater) snail;	2
	(ii)	released into large volume of water/environment; small numbers / uneven distribution of hosts in water; increased chance of finding host / completing life cycle;	2 max
(b)	(i)	suckers provide attachment to walls of blood vessels; capsule/tegument prevents immune response/digestion; male and female together so continued mating / do not need to find mate; streamlined shape does not block blood vessels; large surface area for gas exchange with low oxygen in veins; absence of locomotory organelles since remain in blood; enzymes to rupture blood vessel wall;	2 max
	(ii)	enable movement to locate host;	1
	(iii)	penetration of / break open tissues/cells;	1
	Total		8

Question 6

(a)	prevent DNA replication; prevent protein synthesis/transcription/ translation/ribosome function; damage/inhibit formation of cell wall;	3
(b)	prevent further growth/multiplication of bacteria; allow time for immune response (to bacteria);	2
	Total	5

Question 7

- | | | |
|-------|--|---|
| (a) | bacterium (always) found in organisms with disease / not found in healthy;
can be isolated/cultured;
must cause same symptoms/disease when introduced into other organisms;
can be re-isolated; | 4 |
| (b) | <u>bacteria</u> airborne / breathed in;
released from / invade lungs; | 2 |
| (c) | TWO of: (sexual) intercourse / sharing needles / blood transfusions /
placenta / breast milk / other valid method; | 1 |
| (d) | HIV suppresses immune system / eq; | 1 |
| Total | | 8 |

Question 8

- | | | |
|-----|--|---|
| (a) | chemical carcinogens / named;
<i>accept cigarette smoke. Ignore nicotine/alcohol
radiation / named e.g.;</i> | 2 |
| (b) | increased exposure / more cell cycles/cell divisions;
(therefore) more chance of reaching critical number of/enough mutations; | 2 |
| (c) | G ₁ / interphase; | 1 |
| (d) | sensitive to / respond to / detect small concentrations;
specific; | 2 |
| (e) | test (with enzymes) can be done in surgery / at patient's home / by non-specialist;
results are instant / no (anxiety) waiting for results; | 2 |

(f) **Similarities:**

1. clones form;
2. by mitosis;
3. damage surrounding tissue;

Differences: *accept reverse arguments*

4. benign has slow rate of cell division/growth;
accept stop growth
5. benign can become encapsulated / covered in fibrous tissue;
6. benign cells do not break off initial tumour;
7. malignant cells spread / enter lymph / enter blood;
8. malignant cells invade other tissues /form secondary tumours ;

6 max

Total 15

Question 9

- (a) (i) base / named bases; 1
reject nucleotide or uracil
- (ii) it has been produced by semi-conservative replication / one old strand and one new;
one strand has ^{15}N bases and the other ^{14}N ; *accept light / heavy N*
(therefore) it is less dense / lighter; 2 max
- (iii) one band is in same position as generation 1;
one band higher;
accept a line. N.B. need a visible gap 2
- (b) (i) A = 31 and T = 31;
C = 19; 2
- (ii) viral DNA single-stranded / not double-stranded;
evidence from table e.g. not equal amount of A and T / C and G / all different;
ignore no base-pairing In this question assume 'It' means viral DNA 2
- (c) 1. DNA splits / separates / hydrogen bonds break;
accept DNA unzips
2. to make mRNA;
3. using RNA nucleotides;
4. via RNA polymerase;
5. complementary pairing / eq.;
6. introns/non-coding DNA spliced out;
accept junk DNA spliced out
- max. 4 on points 1-6*
7. mRNA joins to ribosome (*accept travels to ribosome*);
8. tRNA carries a specific amino acid;
9. codon-anticodon relationship / explained;
10. peptide bonds form between amino acids; 6 max

Total 15