Version 2.0: 0808

ASSESSMENT and QUALIFICATIONS ALLIANCE

## General Certificate of Education

# Human Biology 5413

*Specification A*

## BYA3 Pathogens and Disease

# Mark Scheme

*2008 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.

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***Question 1***

(a) (i) Ribosome; 1

(ii) AUC; 1

(iii) GCT ATC ATA GTA; 1

(b) Frameshift mutation/ribosome reads (all) codons differently /alters base sequence;
(All) amino acids changed/ sequence of amino acids has changed;
Different (shape) protein made; 2 max

Total 5

***Question 2***

(a) (B)DAC; 1

(b) Chromatids/chromosomes separating (accept splitting);
(They are) pulled;
by spindle (fibres);
Ignore references to phases 2 max

(c) (i) Chromosomes visible / can be counted ; 1

(ii) To stop cells during mitosis/in prophase/metaphase/
To stop cells getting to anaphase/
Chromosomes are visible in many cells/
To ensure chromosomes are spread out; 1

Total 5

***Question 3***

(a) Pancreas/duct blocked/damaged;
Leaks into blood; 2

(b) (i) So that drug treatment was the only variable/groups similar; 1

(ii) So that there was no bias; 1

(iii) Unethical/not fair not to treat pancreatitis; 1

(iv) Reduces amylase level more quickly;
Keeps amylase lower; 2

Total 7

***Question 4***

(a) Fewer cells/smaller tumours present;
Will not have spread/metastasised/broken off; 2

(b) (i) Each kind of HPV has different antigens;
Antibodies against one strain wrong shape for another strain; 2
*Ignore references to memory cells*

(ii) So that men cannot infect to women; 1

Total 7

***Question 5***

(a) Anthrax antigens detected by B cells/antigen presentation;
B cell becomes activated/clonal selection/clonal expansion;
Produces (clones) of plasma cells;
Plasma cells secrete (specific) antibodies; 3 max

(b) Memory cells present;
Produce secondary response;
(Secondary response is) quicker; 2 max

Total 5

***Question 6***

(a) (i) 11; 1

(ii) 2750 cells in $1mm^3$ ;;; 3
*Allow max 2 for correct answer based on wrong counting of cells in square*
*Allow one mark for finding volume = 0.1 x 0.2 x 0.2 = 0.004 ($mm^3$)*
*Allow one mark for 1/0.004 = 250*

(b) Any two suitable points
e.g.
Clean bench with disinfectant;
Dispose of haemocytometer in disinfectant after use;
Use sterile equipment;
Flame necks of flasks containing bacteria;
Wear plastic gloves;
Use Bunsen burner to heat air; 2 max

Total 6

***Question 7***

(a)

| Name of microorganism | Type of microorganism | Disease caused | How microorganism enters body |
|---|---|---|---|
| ***Mycobacterium*** **Accept** ***M.bovis/M.tuberculosis*** | Bacterium | Tuberculosis | **Inhaled/droplet (infection)/in milk** |
| **HIV/Human immunodeficiency virus** | **Virus** | AIDS | By having unprotected sex with an infected partner |
| *Salmonella* | **Bacterium** | Food poisoning | **(With) contaminated food or drink** |
| ***Plasmodium*** | Protoctist | Malaria | **Mosquito (bite)** |

*1 mark for each correct row* 4

(b) (i) Headache/fever/diarrhoea/nausea/abdominal pain; any 2 1

(ii) Allows *Salmonella* to replicate;
To reach infective dose/ idea that many bacteria needed to cause disease;

OR

Temperature increases enzyme activity;
*Salmonella* can grow faster; 2

Total 7

***Question 8***

(a) (i) Fatty deposits/plaque;
in wall of artery/under endothelium; 2

(ii) Blocks coronary artery;
Reduced oxygen/glucose to heart muscle;
Cells die; 2 max

(b) Sex/obesity/lack of exercise/genetic factors/hypertension/diabetes/age/smoking;
any 2 1

Total 5

***Question 9***

(a) Three bases/codon code for one amino acid;
Look up genetic code using table/find mRNA codons/DNA sequence;
Synthesise DNA with correct base sequence; 2 max

(b) (i) Means of getting new DNA into cell/host/gene carrier; 1

(ii) Codes for characteristic that is easy to detect / gives valid example;
Allows identification of modified cells/cells that have taken up the gene/DNA/vector/plasmid with the gene; 2

(c) To ensure that the (antibacterial) protein is produced;
To show that the (antibacterial) protein is effective;
To check that no by-products/toxins produced/
To ensure people do not become allergic / no side effects/safe; 2 max

(d) To prevent cross-breeding/pollination with other rice crops;
Prevent new gene transferring to other plants;
Example of disadvantage, e.g. consumer opposition; 2 max

(e)

1. DNA splits / separates / hydrogen bonds break; *Accept DNA unzips*, *Ignore unwinds*
2. Make mRNA/using RNA nucleotides;
3. Via RNA polymerase;
4. Complementary pairing / eq.;
5. Introns/non-coding DNA removed; *Accept junk DNA removed*

max. 4 on points 1-5

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 amino acids; 6 max

Total 15

***Question 10***

(a) 1. High reproductive rate; *Accept constant reproduction*
2. Increases likelihood of finding new host;
3. Male and female together;
4. Produce enzyme to stop blood clotting;
5. Suckers to attach (NB context);
6. Coat themselves in host molecules/cells;
7. Have thick tegument/described;
8. So not attacked by immune system;
9. Reduced nervous system/digestive system/locomotion;
10. Larva/stage in water/named stage is motile/can bore through skin; 6 max

(b) (i) Less chance to build up resistance/ more likely to enter water/less aware of ways to avoid the disease; 1

(ii) Presence of eggs indicates infection;
Eggs leave body in urine;
Non-invasive/easy to get sample; *Reject just easy* 2

(iii) People are different sizes;
Same concentration; 2

(c) (i) 256;;
68/100 x 800 or 32 x 8 allow one mark; 2

(ii) Every year/52 weeks/41-52 weeks;
Infection rate increases at 52 weeks/reduction in eggs falls; 2

Total 15