



General Certificate of Education

Biology (Human) 5413

Specification A

BYA3 Pathogens and Disease

Mark Scheme

2008 examination - January series

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Question 1

- (a) (i) Nucleus; 1
- (ii)

Statement	DNA Replication	Transcription
Involves mRNA synthesis	✗	✓
Requires free nucleotides	✓	✓
Involves complementary base pairing	✓	✓

; ; 2

I mark for each correct column

Mark blank spaces and hybrid tick-crosses as incorrect

- (b) 12 000;
- One deoxyribose per nucleotide / base; 2

Total 5

Question 2

- (a) Interphase/S-(phase)/synthesis; 1
- (b) (i) B;
Acts during DNA replication;
Ignore references to wrong named stage 2
- (ii) This is when chromosomes/chromatids are separating;
Pulled by spindle fibres : 2

Total 5

Question 3

- (a) *Mycobacterium (tuberculosis);* 1
- (b) (i) *Any **two** of:*
 Persistent cough;
 Blood-stained mucus/sputum;
 Chest pain;
 Fluid accumulation in pleural cavity;
 Breathlessness;
 Fever;
 Night sweats;
 Loss of appetite;
 Weight loss; 1
- (ii) People living in overcrowded conditions;
 Inhalation of TB bacteria/droplet infection more likely;
Or
 Immigrants;
 From countries where TB more common/not vaccinated;
Or
 Infected with HIV;
 Immune system less effective; 2
- (c) (i) Antibodies made in response to antigen;
 Indicates that bacteria have entered body / passenger has been exposed to antigen / bacteria could have been removed and antibodies remain; 2
- (ii) Droplet infection;
 (Pathogen) inhaled / enters via gas exchange system;
More droplets near infected person / idea that droplets settle out at greater distances; 3

Total 9

Question 4

- (a) (i) (Bacteriostatic) stops bacteria dividing / slows down growth rate;
(Bacteriostatic) does not kill / bacteriocidal kills; 2
- (ii) Stops/inhibits cell wall synthesis / osmotic lysis;
Reject destroys/digests cell wall
Stops/inhibits DNA replication;
Stops/inhibits protein synthesis / transcription / translation / RNA synthesis;
Disruption of cell membrane function; 2 max
- (b) (i) *Penicillium* has grown; 1
- (ii) *Penicillium* produces penicillin/antibiotic;
Diffuses into agar;
Stops bacteria growing / inhibits bacteria / kills bacteria;
B and D resistant / unaffected / A and C inhibited;
'Bands' due to bacterial colonies growing (outwards) / reproducing / dividing;
C most susceptible / least resistant to antibiotic; 3 max

Total 8

Question 5

- (a) Pancreatic duct blocked;
Enzymes cannot enter gut;
- OR
- Pancreatic cells destroyed/damaged;
Enzymes enter blood / less enzymes produced; 2
- (b) Combines with glucose;
Produces colour change / detects hydrogen peroxide; 2

Total 4

Question 6

- | | | | |
|-----|------|---|---------|
| (a) | (i) | Thromboplastin released (by damaged tissue);
Converts prothrombin to thrombin;
Enzyme / thrombin converts fibrinogen to fibrin; | 2 max |
| | (ii) | Blocks coronary artery;
Stops oxygen/glucose getting to heart <u>muscle</u> ;
Heart muscle/cells die/cannot respire; | 3 |
| (b) | | (Digesting fibrin) releases trapped cells / breaks up/removes clot; | 1 |
| | | | Total 6 |

Question 7

- | | | | |
|-----|-------|--|---------|
| (a) | (i) | Joins inserted DNA to host DNA; | 1 |
| | (ii) | Contains inserted gene/ /gene from other organism;
Vector/carries gene into (microbial) cells; | 2 |
| | (iii) | Distinguishes modified microbial <u>cells</u> from non-modified cells; | 1 |
| (b) | (i) | Cells grow in size (but don't divide);
Cells may be dormant at beginning;
Takes time to synthesise new enzymes/proteins/replicate DNA; | 2 max |
| | (ii) | All conditions at an optimum/no limiting factors;
Reference to named factor, e.g. oxygen, nutrients;
No/few toxic waste products; | 2 max |
| | | | Total 8 |

Question 8

- (a) 1. Three bases code for one amino acid;
 2. Determine sequence of bases/codons needed;
 3. Synthesise DNA with correct base sequence/codons;
 4. Second strand complementary to first / DNA codons complementary to RNA codons; 3 max
- (b) (b) 1 DNA splits / separates / hydrogen bonds break;
Accept unzips
 2 Make mRNA/ use RNA nucleotides;
 3 Via RNA polymerase;
 4 Complementary sequence / eq.;
 5 Introns/junk/non-coding DNA spliced out;
Maximum of 4 marks from 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
- (c) (i) Protein/immunoglobulin;
 Made by plasma cell / B cell ;
 Specific to one antigen; 2 max
- (ii) Macrophage presents antigen;
 B-cell activated/ clonal selection;
 Divide/clonal expansion;
 Produces plasma cells;
 Plasma/ B cells make specific antibodies; 4 max

Total 15

Question 9

- (a) (i) So drug given is the only variable / no other variables; 2
Other factors may affect survival rate / results;
- (ii) To avoid bias/ idea of psychological effect/expectations affecting results; 1
- (b) 3 / 2.88;; 2
Allow one mark for principle of multiplying percentage who die by 288 to find actual number.
- (c) (i) Allows comparison; 2
Children have different levels of infection when admitted;
- (ii) Graph shows more rapid response; 2
Lower incidence of neurological problems;
- (d) 1. Rapid reproduction rate;
2. Ensures some are passed on / increases chance of finding new host;
3. 'Hides' inside liver/red blood cells;
4. Avoids host immune system;
5. Changes surface antigens;
6. Part of life-cycle in mosquito /mosquito carries it to new host;
7. No need for locomotory structures as transported in blood;
8. No need to move to find food;
9. Host cells have same water potential as *Plasmodium* / no need to regulate water content; 6 max

Total 15