

GCE 2005

January Series



Mark Scheme

Biology Specification A

BYA3 Pathogens and Disease

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Dr Michael Cresswell Director General

BYA3**Question 1**

- (a) (i) Prophase; 1
- (ii) Chromosomes/chromatids moved apart;
- (iii) *A wide range of processes occurs during interphase. This list is by no means exhaustive, but we would expect to see answers such as:*
- Increase in volume of cell/volume of cytoplasm / increase in mass / cell bigger;
 increase in number of organelles;
 synthesis of protein/named protein;
 DNA replication / increase / chromosomes copied;
 ATP synthesis / respiration; max 2
- (b) Divide real length of bar (in mm)/10 by 0.02; 1
- (c) $12/200 \times 24$ / single error in otherwise correct method;
 1.44 hours (1 hour 26 min); 2

Total 7 marks

Question 2

- (a) (i) Reverse transcriptase; 1
- (ii) Idea that mRNA is present in large amounts in cell making the protein / mRNA has been edited / does not contain introns / mRNA codes for single protein; 1
- (b) (Ligase) splices / joins two pieces of DNA / “sticky ends”; 1
- (c) (i) To remove microorganisms / make air sterile / produce aseptic conditions; which could compete for nutrients / make unwanted products / be pathogenic; 2
- (ii) Maintains/controls temperature; 1

Total 6 marks

Question 3

- (a) Endonuclease / restriction enzyme; 1
- (b) DNA made of base pairs;
Each base pair is same length / occupies same distance along backbone; 2
- (c) (i) Second blank box from left labelled 6; 1
- (ii) Distance moved depends on length / number of base pairs /
second longest fragment / second shortest distance identified; 1
- (d) 5; 1

Total 6 marks

Question 4

- (a) (i) Snail; 1
- (ii) Passes out in urine or faeces and bores into snail; 1
- (iii) Snail/parasite in water;
Skin exposed / people spending time in water; 2

(b)

	<i>Schistosoma</i> parasite	Malaria parasite
Way in which the parasite enters the human body	Bores through skin	By mosquito bite
Part of the human body where the parasite is mainly found	In blood (vessels); NOT blood <u>cells</u>	In liver / red blood cells;

(1 mark for each column)

2

Total 6 marks

Question 5

- (a) Calcium;
Prothrombin + thrombin;
Fibrinogen + fibrin; 3
- (b) (i) Antibodies/immunoglobulins; 1
- (ii) Memory (B)-cells (formed in previous attack already) present;
(When bacteria recognised, they) divide rapidly to form plasma cells;
(These) produce antibodies (more) quickly / in greater numbers
(than first time); max 2

Total 6 marks

Question 6

- (a) (i) Fatty substances/foam cells in artery wall/under endothelium; 1
- (ii) Narrows artery;
Turbulence / uneven flow;
Damage to endothelium;
Thromboplastins released; max 2
- (b) (i) Correct area shaded (i.e. part supplied by vessels); 1
- (ii) Area deprived of oxygen; *Accept glucose* 1
- (c) Muscle in artery walls becomes thicker;
Aneurysm / ballooning of artery walls may occur;
Damage to endothelium (so foam cells enter); max 2

Total 7 marks

Question 7

- (a) To prevent contamination of apparatus with other microorganisms/bacteria;
To prevent personal contact with bacteria;
To prevent release of bacteria into air; max 2
- (b) (i) Diffuses slowly; 1
- (ii) Disruption of cell wall;
Interference with protein synthesis;
Interference with DNA replication; max 2
- (iii) B;
Produces inhibition zone greater than the minimum diameter; 2

Total 7 marks

Question 8

- (a) Publicity about vaccination / better health education / risks of ‘flu epidemics;
(Accept: now free on NHS (though only since 2000) / better awareness / more commonly available) 1
- (b) (i) 1990: 26% of 7.4million = 1.92million and
2000: 64% of 7.8 million = 4.99million;
increase = 3.07 million; 2
(Correct reading of all 4 figures from graph = 1)
(Correct answer but no ‘millions’ = 1)
(Correct method resulting from wrong graph reading = 1)
- (ii) Over 50% of population being vaccinated;
But only from 2000 onwards; 2
(Principle of more people being vaccinated each year = 1)
- (iii) Different strain/type of virus each year / virus mutates;
With different antigens;
Influenza antibodies / memory cells (rapidly) destroyed /
need replacing; max 2
- (c) (Protein coat) carries antigens;
Stimulates B-cells / production of antibodies;
Production of memory cells; max 2
- (d) 1. (Unprotected) sexual intercourse;
2. Blood transfusions;
3. Contaminated / shared needles;
4. Placenta;
5. Breast milk; max 3
(If none of above present, idea of exchange of body fluids = 1)
6. Destroys / infects helper T cells;
7. Viral RNA inserted into cell;
8. Reference to reverse transcriptase;
9. Cell makes viral protein / new viruses;
10. Immunosuppression leads to disease;
11. Specific effect, e.g. opportunistic infections/Kaposi’s sarcoma/TB; max 4

Overall part (d) = max 6

Total 15 marks

Question 9

- (a) Protein made of (chain of) amino acids;
Each amino acid has its own base code/code;
Triplet codes; max 2
- (b) UCA = 2 marks;;
TCA – 1 mark; 2
- (c) CCG;
GGG GGG; 2
- (d) (i) Changes base sequence;
Of later triplets / amino acid codes; 2
- (ii) S-phase/interphase; 1
- (e) 1. mRNA leaves (nucleus) through nuclear pore;
2. To ribosome;
3. tRNA molecules bring amino acids (to ribosome);
4. Specific tRNA molecule to specific amino acid;
5. Anticodon of tRNA corresponds / complementary to codon on mRNA;
6. Peptide bonds form between amino acids;
7. tRNA returns to cytoplasm / used again idea;
8. Ribosome moves along mRNA; max 6

Total 15 marks