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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Human Biology 5413
Specification A

BYA3 Pathogens and Disease

Mark Scheme

2005 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.

BYA3

Question 1

(a) (i) where mitosis/division/growing/ occurs; 1
(*reject growing cells)*

(ii) to distinguish chromosomes/chromosomes not visible without stain; 1

(iii) to let light through/thin layer; 1

(b) (i) 74 + 18/982;
= 9.4% / 9%; 2
(allow 1 mark for identifying prophase & metaphase i.e. 92 or correct method using wrong figures)

(ii) genetic differences/different types of garlic;
time of day; chance;
age of root tip;
water availability;
temperature;
nutrient availability; 2 max
(environmental factors = 1 but cannot be awarded in addition to a named environmental factor

Total 7

Question 2

(a) add antibodies/enzyme;
wash to remove unbound antibodies;
add (colourless) solution; 3
(mark correct responses sequentially)

(b) antibodies specific/shape only fits one antigen;
other antigens different shape;
would not bind to antibodies; 2 max

Total 5

Question 3

(a) (*Salmonella*) produces toxins;
released when bacteria die;
takes time for enough bacteria to die/for bacteria to multiply; 2 max

(b) (i) bacteria in raw meat;
bacteria/exudates from raw meat cannot fall on cooked food; 2

(ii) bacteria may (get into cloth) and be transferred elsewhere/
bacteria grow/multiply (in moisture/food solution) on cloth; 1

Total 5

Question 4

(a) antibiotic has diffused/spread/moved into agar;
killed/inhibited bacteria; 2

(b) largest clear area/inhibition zone/killed the most bacteria; 1

(c) (i) translation cannot occur;
blocks/binds to codon/triplet of bases on mRNA;
anticodon/tRNA will not fit/base-pair;
amino acid not delivered/joined; 2 max

(ii) disrupts cell wall/prevents cell wall synthesis;
stops DNA replication; 2

Total 7

Question 5

(a) nucleotide**;** 1

(b) (i) 21.4, 21.4; 28.6; 2

(ii) amounts of A and T /C and G/complementary bases different;
therefore no base-pairing; 2 max

(iii) both contain phosphate;
pentose/5C sugar;
both have nucleotides/are polymers;
both have purines/pyrimidines/bases/A/C/G; 2 max

Total 7

Question 6

(a) (i) lives/feeds in/on another organism;
causes harm/detriment (to host); 2

(ii) constantly changes antigens;
so antibodies no longer effective/fit/work/recognise them;

OR

'hides' in red blood cells/liver;
so antigens cannot be detected (by immune system); 2

(b) single-stranded piece of DNA/nucleotides;
fits/complementary to (*Plasmodium*) gene/piece of DNA; 2

(c) have not had time to build up immunity/weaker immune system;
(there are other possibilities e.g. have fewer rbcs than adult so parasites affect larger percentage of rbcs) 1

Total 7

Question 7

(a) enzyme;
makes DNA;
single-stranded(DNA);
using RNA template/starting with RNA/complementary to RNA; 2 max

(b) (i) incorporated into DNA (during replication);
resulting DNA will not replicate/undergo transcription; 2

(ii) idea of attacking virus at different stages in life-cycle/reduces chance of virus developing resistance/need drugs to control side-effects/many different strains of virus/virus changes surface antigens; 1

(c) HIV destroys/damages T-cells;
(more vulnerable to TB with) impaired immunity/immune response; 2

Total 7

Question 8

(a) 1. fatty material/foam cells/cholesterol in artery wall/under endothelium;
2. creates turbulence/damage to lining of artery;
3. formation of plaques/atherosclerosis/narrows lumen of artery;
4. (turbulence) increases risk of blood clot;
5. blood clot breaks off;
6. (blood clot) lodges in coronary artery;
7. reduces blood supply to heart muscle;
8. reduces oxygen supply;
9. results in death of heart muscle; 6 max

(b) (i) equal chance of being assigned to either group; 1

(ii) to compare with warfarin to see if it has any effect; 1

(iii) $14/255 \times 100 = 5.5\%$
$37/253 \times 100 = 14.6\%$;
$14.6 - 5.5 = 9.1(\%)/9.13(\%)$; 2

(c) (i) (Trend): as heparin concentration increases, clotting time increases;
(Pattern): reference to change after 0.2 arbitrary units; 2

(ii) blood clot from transfused blood could cause thrombosis/stroke/embolism/heart attack/myocardial infarction; 1

(iii) calcium ions needed to convert prothrombin to thrombin/fibrinogen to fibrin;
less thrombin /fibrin formed; 2

Total 15

Question 9

(a) (i) protein/immunoglobulin;
specific to antigen;
idea of 'fit'/complementary shape; 2 max

(ii) 1. virus contains antigen;
2. virus engulfed by phagocyte/macrophage;
3. presents antigen to B-cell;
4. memory cells/B-cell becomes activated;
5. (divides to) form clones;
6. by mitosis;
7. plasma cells produce antibodies;
8. antibodies specific to antigen;
9. correct reference to T-cells/ cytokines;
6 max

(b) 1. antibody gene located using gene probe;
2. cut using restriction enzyme;
3. at specific base pairs;
4. leaving sticky ends/unpaired bases;
5. cut maize/DNA /vector using same restriction enzyme;
6. join using DNA ligase;
7. introduce vector into maize/crop/recombinant DNA into maize; 4 max

(c) passive;
person is not making own antibodies/antibodies not replaced;
memory cells not produced; 2 max

(d) fewer ethical difficulties/
less risk of infection; 1

Total 15