

GCE 2004  
*June Series*



# Mark Scheme

## Biology/Human Biology A *BYA3*

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**BYA3****Question 1**

- (a) (i) C → B → E → F → A → D 2  
*Mark links: 5 correct = 2, 4 correct = 1, <4 correct = 0*
- (ii) nucleus; 1
- (iii) A, D, F; (*ignore E if evident*) 1
- (b) (i) Isoleucine; 1
- (ii) TGG; 1

Total 6 marks

**Question 2**

- (a) (i) cannot predict/do not know in-between values; 1
- (ii) allows comparison(between people)/different people have different blood volumes/  
to give a standardised unit; 1
- (b) damage to cells (which release amylase);  
of pancreas; 2

Total 4 marks

**Question 3**

- (a) (i) droplets/ref. coughing/sneezing;  
which are breathed in/taken in through gas exchange system/nose/lungs;  
OR  
milk;  
drunk/taken into digestive system; 2
- (b) 2500 x 20.066;  
= 50165; 2  
*allow 1 mark if correct working shown*
- (c) (i) people cannot be treated effectively/fewer people treated/people infective for longer; 1
- (ii) AIDS patients have weaker immune systems/B-lymphocytes/helper T cells not present; 1

Total 7 marks

**Question 4**

- (a) Chromosomes attach to equator/middle of cell/spindle;  
Prophase;  
Anaphase;  
DNA replication/synthesis / chromosome copying/duplication;  
Telophase; 5
- (b) (i) Meiosis; 1
- (ii) 32; 1

Total 7 marks

**Question 5**

- (a) lives/feeds on host;  
causes harm/detriment (to host); 2
- (b) (i) male and female do not have to find each other/not separated;  
makes fertilisation more likely/more fertilised eggs/offspring produced;  
increases chance of finding new host/completing life cycle; max 2
- (ii) changes antigens/coats itself in host molecules/cells; 1
- (c) maintains blood flow (to parasite)/keeps host alive;  
parasite maintains its supply of nutrients/continues reproducing; max 2

Total 7 marks

**Question 6**

- (a) (i) Sticky ends/description;  
Reference to complementary base-pairing 2
- (ii) Ligase; 1
- (b) Carrier;  
DNA/gene; (*context of foreign DNA*)  
Into cell/other organism/host; max 2
- (a) Act as marker gene;  
Allows detection of cells containing plasmid/DNA;  
Reference to growing bacteria on antibiotic; max 2

Total 7 marks

**Question 7**

- (a) (i) protein / glycoprotein / glycolipid / polysaccharide / molecule;  
on surface / membrane (of cell);  
causes immune response / description / triggers antibody production; max 2
- (ii) reference to hybrid cell from tumour / cancer and B-lymphocyte / hybridoma;  
antibodies all the same / from one type of plasma cell;  
specific to / complementary to / fits only one antigen; max 2
- (b) (i) antibodies specific / only binds to PSA;  
PSA only associated with prostate cancer / not with other diseases; 2
- (ii) antibody with enzyme only attaches if PSA present / washed away if no PSA;  
no colour change without enzyme; 2

Total 8 marks

**Question 8**

- (a) 1 (DNA altered by) mutation;  
2 (mutation) changes base sequence;  
3 of gene controlling cell growth / oncogene / that monitors cell division;  
4 of tumour suppressor gene;  
5 change protein structure / non-functional protein / protein not formed;  
6 (tumour suppressor genes) produce proteins that inhibit cell division;  
7 mitosis;  
8 uncontrolled / rapid / abnormal (cell division);  
9 malignant tumour; max 6
- (b) cancer cells die / break open;  
releasing DNA; 2
- (c) normal DNA and changed DNA have different sequences;  
DNA only binds to complementary sequence; 2
- (d) fewer abnormal / cancerous cells / smaller tumours;  
less cell damage;  
less spread / fewer locations to treat; max 2
- (e) mRNA base sequence has changed;  
gene / DNA structure is different / has mutated;  
cancer gene active / tumour suppressor gene inactive; 3

Total 15 marks

**Question 9**

- (a) 1 fatty substance / foam cells / cholesterol in artery wall / under endothelium;  
2 atheroma creates turbulence / damage to lining of artery;  
3 formation of plaques / atherosclerosis / narrows lumen of artery;  
4 (turbulence) increases risk of blood clot / embolus;  
5 blood clot / thrombus breaks off;  
6 (blood clot) lodges in coronary artery;  
7 reduced blood supply to heart muscle;  
8 reduced oxygen supply;  
9 leads to death of heart muscle; max 6
- (b) (i) average number of admissions on ordinary day;  
when no football match being played;  
similar time of year / conditions; max 2
- (ii) large / significant difference for three days;  
then small difference; 2
- (c) increases heart rate;  
raises blood pressure / causes hypertension;  
blood supply to heart / oxygen use by heart increased;  
atheroma restricts blood / oxygen supply to heart muscle; max 2
- (d) reduces heart rate;  
beta-blocker fits receptor sites;  
on walls of heart / blood vessel;  
(receptor sites for) adrenaline / noradrenaline / stops adrenaline /  
noradrenaline binding; max 3

Total 15 marks