Mark scheme
June 2002

GCE

Biology A / Human Biology

Unit BYA3

Question 1

(a)   Organism that lives in / on another organism / host and which
       is living / causing it harm;   **1**

(b)   Human / named location in human
       (Fresh) water *reject 'marine'*
       Snail
       Human / named location in human
       All 4 correct = 2 marks
       Any 3 correct = 1 mark   **2**

(c)   Any 3 of:
       'Suckers' (*or reasonable description in context*) for attachment / so not dislodged
       (from blood vessel);
       Absence of locomotory organelles in <u>adult</u> since remain in blood
       vessel / other valid explanation;
       (Digestive) enzymes to rupture blood vessel / burrow through skin;
       Large number of eggs to increase chance of finding secondary
       host / snail / complete lifecycle;
       Ciliated cercariae to swim through water;
       Large number of cercariae to increase chance of finding
       main host / human;
       Surface proteins / resistant layer to prevent attack by
       host / prevent digestion;
       Use of intermediate host to complete life cycle;   **3 max**

                                                        Total 6 marks

Question 2

(a)   (i)   **A** / identified (e.g. 7):
              has ½ mass of DNA in B / ¼ mass of DNA in C / would have ½
              chromosome number of B / contains least DNA / has 23 chromosomes; **1**
              Reject haploid

       (ii)   14 (arbitrary units);
              Diploid number of chromosomes re-established;
              Gametes are haploid (*or concept explained*) / each gamete will contain
              7 units;   **2 max**

(b)   Separation of chromatid pairs / chromatids within a pair / chromosomes;
       Reject 'homologous chromosomes'   **1**

                                                        Total 4 marks

Question 3

(a)		Bacterium (always found) in diseased organism and not in healthy organism;	
		Bacterium (can be) cultivated / cultured / isolated;	
		(Pure) cultures of the bacterium must cause the same disease / symptoms when introduced into (susceptible) other organisms;	
		Can be re-isolated (from the other experimentally infected animals);	**4**
(b)		Spread by droplet infection / breathed in / airborne;	**1**
(c)	(i)	Numbers falling <u>before vaccination</u> introduced;	**1**
	(ii)	Better housing conditions / other social reason e.g. diet;	
		Better awareness of disease / improved medical care;	
		Fewer susceptible people / more immune;	
		Availability of antibiotics post circa 1940; (*reject before*)	**1 max**
		Reject 'hygiene'	
(d)		HIV affects <u>cells</u> of immunological system / white blood <u>cells</u> / lack of functional white blood <u>cells</u> / eq (means a person is more susceptible);	**1**
		Reject 'affects immune system'	

Total 8 marks

Question 4

(a)	(i)	A disease-causing organism / bacterium;	**1**
	(ii)	Weakened organism;	**1**
(a)		(At 95% level) most people are immune;	
		5% / few vulnerable / susceptible individuals (remain in population); *Reject 'not immune'*	
		Little chance of <u>contact</u> (with affected person);	**2 max**
(c)	(i)	Number of <u>births</u> each year varies / changes seen more easily / allow valid comparisons to be made / provides an indication of likelihood of outbreak of disease;	**1**
	(ii)	3600;	**1**
(d)		Antibodies not produced by body;	
		No memory cells;	
		Short-term / not lifelong;	
		<u>Antibodies</u> (*or context established*) donated by mother / across placenta / in milk;	**2 max**

Total 8 marks

Question 5

(a)   (i)   Enzymes and (colourless) dye; *ignore wrong names of enzymes*   **1**

(ii)   Glucose oxidase;
Peroxidase; *accept 'peroxide reductase'*   **2**

(iii)   Enzymes are specific / glucose oxidase only reacts with glucose /
Peroxidase only reacts with hydrogen peroxide
        OR
A $\rightarrow$ H_2O_2 and B $\rightarrow$ colour change;   **1**

(b)   No glucose <u>in urine</u> / person not diabetic / concentration
normal in blood   **1**

(c)   Enzyme-based method is quantitative / more sensitive /
specific to glucose / ora;   **1**

Total 6 marks

Question 6

(a)   Lower blood pressure / less turbulence (in veins);   **1**
Reject 'no pressure'.

(b)   (Collagen in) damaged blood vessel wall / platelets;
(Activates) thrombokinase / thromboplastin;
In presence of calcium (ions) / plasma enzymes / factor 8;
Prothrombin converted to thrombin;
(Thrombin causes) conversion of fibrinogen into fibrin;   **4 max**
Latter two must be in correct sequence for both marks.

(c)   (i)   (Greater blood) turbulence;   **1**

(ii)   Arrow at point of branch or just below in coronary <u>artery</u>;   **1**
Reject 'above branch'.

Total 7 marks

Question 7

(a)   *Penicillium* / fungus produces / secretes antibiotic / penicillin;
       Penicillin (*reject Penicillium)* / antibiotic will kill / inhibit the growth
       of bacteria / other microorganisms;   **2**

(b)   Reduce rate of (population) growth / slow division of bacteria /
       cells / reduced metabolism;
       So nutrient supplies not exhausted / toxins not accumulating;   **2**

(c)   (mRNA) cannot be translated / translation cannot occur;
       Peptide bonds are not formed / amino acids cannot join /
       polypeptide not formed;
       No codon-anticodon binding;   **2 max**

                                                                      Total 6 marks

Question 8

(a) Identify those at risk from <u>developing</u> cancer;
So as to avoid relevant environmental factors / enable early diagnosis;
Identify risk in families; **2 max**

(b) *Mutation of suppressor gene – up to 4 marks*

1. Mutation is a change in the DNA / sense strand;
2. Base sequence altered / e.g.;
3. Suppressor gene produces wrong instructions / has different code;
4. (Therefore) different amino acid sequence;
5. Different protein structure / non-functional protein;

Malignant tumour – up to 2 marks

6. Cell division by mitosis;
7. Tumour cells growth abnormal / continuous / uncontrolled / rapid;
8. Tumour cells spread / invade other tissues / form secondary tumours / metastasis;
9. Via blood / lymph system; **6 max**

(c) (i) Most lung cancer occurs in smokers / non-smokers also develop lung cancer;
Smoking increases the risk of lung cancer;
Smoking is an environmental factor for lung cancer;
Smokers' risk more than 4x that of non-smokers / correct ref to figures;
(But) only a small proportion of smokers develop lung cancer;
Smokers more likely to develop other lung disease than cancer; **3 max**

(ii) Do not know size of sample / might be small sample in study;
Genetic differences / predisposition;
Could be different age at which started to smoke;
Could be different number of cigarettes smoked per day;
Could be different tar levels in cigarettes smoked;
Could be different sexes in sample;
Other valid; **2 max**

(d) All exposed to same environmental conditions / factors / no regional variations;
Same level of pollution / example; *reject less pollution*
Similar diet / example;
Same water supply;
Easier to screen whole population;
Easier to follow family history / people related;
Identify genetic differences in those affected (since everything else the same) / less genetic diversity; **2 max**

Total 15 marks

Question 9

(a)		Carrier of foreign DNA / gene;	**1**

(b)   (i)   *Pst* I;   **1**

      (ii)   (Loss of) marker gene;
            Genetic code / base sequence / DNA altered;
            (So) gene no longer functional;   **2 max**

      (iii)   Separate DNA strands to expose sense strand / probe only a
            single strand;
            Probe contains a complementary base sequence to gene;
            Attaches to complementary sequence if gene present;
            Presence / location indicated by radioactivity / fluorescence;   **3 max**

(c)   So cells cannot conjugate / link;
            To stop transfer of DNA;
            To reduce risk of other organisms in environment getting altered genes; **2 max**

(d)   1. DNA is double stranded / double helix;
            2. Unwinds / separates / hydrogen bonds break;
            3. Two strands / sense / antisense strands exposed / act as templates;
            4. DNA nucleotides in nucleoplasm / link together / form polynucleotide;
            5. Complementary base pairing / described;
            6. Role of DNA polymerase;
            7. Two identical copies of DNA made;
            8. Each contains one of original strands / semi-conservative;   **6 max**

Total 15 marks