



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

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GCE

Biology/ Human Biology A

Unit BYA3

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Unit 3: Pathogens and Disease

Question 1

- | | | |
|-----|---|---------------|
| (a) | DNA has deoxyribose, RNA has ribose;
DNA has thymine, RNA has uracil;
DNA double-stranded, RNA single-stranded; | 3 |
| (b) | (i) Attachment of amino acid; | 1 |
| | (ii) Allows binding/ joining/ attaching to mRNA;
Codon/ complementary base sequence; | 2 |
| (c) | (i) Each base is part of only one codon/ tRNA 'reads' three bases, then the next three; | 1 |
| | (ii) Some amino acids are coded for by more than one codon/ base sequence; | 1 |
| | | Total 8 marks |

Question 2

- | | | |
|-----|--|---------------|
| (a) | (i) B; | 1 |
| | (ii) C; | 1 |
| (b) | Amount of DNA halved;
(At start of mitosis) DNA has replicated;
Chromatids/ chromosomes separate;
At anaphase;
Role of spindle; | max 3 |
| (c) | (i) Stage B would take longer/ would not occur/ graph would be flat/ not so steep; | 1 |
| | (ii) No DNA synthesis so cells don't divide/ reduced DNA synthesis so cells divide more slowly/ cytarabine inhibits cell division;
Stops/ slows formation of new cancer cells/ stops/ reduces spread of cancer; | 2 |
| | | Total 8 marks |

Question 3

- | | | |
|-----|---|---------------|
| (a) | Plaque/ fatty material/ cholesterol/ foam cells/ lipoprotein build up;
<u>In</u> artery/ blood vessel wall; | 2 |
| (b) | Weakens <u>artery</u> wall;
So that it swells/ bursts; | 2 |
| (c) | Slows/ prevents conversion of fibrinogen to fibrin/ fibrin formation;
Less chance of a blood clot/ thrombus being formed/ slows blood clot formation;
Which may block coronary artery/ artery supplying heart muscle; | 3 |
| | | Total 7 marks |

Question 4

- (a) Show that bacterium is not present in any animal without the disease;
Isolate bacterium (from infected animal) and grow in (pure) culture;
When cultured bacterium introduced to healthy animals, the disease should develop;
Re-isolate bacterium; max 3
- (b) Ethical difficulties of using healthy humans/ apes in tests;
Ethical problems of injecting HIV which has no cure;
Difficult to grow in culture;
Long time delay between infection and AIDS symptoms; max 2

Total 5 marks

Question 5

- (a) Halves chromosome number/ produces haploid state;
[Accept: 'introduces variation'] 1
- (b) (i) Enables parasite to find new host/ act as vector; 1
(ii) Increases chances of parasite being passed on; 1
- (c) Does not need to move to find food;
Does not need to move to find a new host; 2
- (d) Immune system in blood/ parasite inside cells;
Difficult for antibody to reach antigen/ host antigens on cell surface; 2

Total 7 marks

Question 6

- (a) Similar in shape to noradrenaline/ adrenaline;
Fit in (sympathetic) receptor sites;
On cardiac muscle/heart;
Prevent stimulation of cardiac muscle; max 3
- (b) (40-80mg)
Higher doses produce no/ very little reduction in blood pressure;
Risk of side-effects/ toxicity with higher doses;
Saves wasting money on extra drug; max 2

Total 5 marks

Question 7

- (a) (i) Pancreatic duct blocked/ damaged;
So enzymes can't pass into gut/ leak into blood;
[Accept: early activation of trypsin; so enters blood not gut] 2
- (ii) Blood clotting proteins/ named protein digested;
Cell/ tissue damage leads to release of thromboplastin; max 1
- (b) Cells of heart/ heart tissue damaged in myocardial infarction;
Enzyme leaks out into blood; 2

Total 5 marks

Question 8

- (a) (i) Use of restriction enzyme;
'Cuts' between (specific) bases; 2
- (ii) Plasmid/ virus/ microinjection/ tungsten bullets; 1
- (b) Disease caused by toxin;
Only part of toxin made which won't cause disease; 2
- (c) 1 DNA unwinds/ hydrogen bonds break;
2 to allow assembly of mRNA;
3 Using (m)RNA nucleotides;
4 Via RNA polymerase;
5 Complementary sequence/ or equivalent;
6 mRNA joins to ribosome;
7 tRNA carries a specific amino acid;
8 Codon-anticodon relationship/ or explained/ defined;
9 Peptide bonds form between amino acids; max 6
- (d) (i) Leukotoxin acts as antigen;
Activates B-lymphocyte;
Forms clone of plasma cells;
Release (specific) antibodies into blood; max 2
- (ii) (Leukotoxin gives rise to) memory cells;
Produces plasma cells if antigen encountered a second time;
Rapid production of (specific) antibodies; max 2

Total 15 marks

Question 9

- (a) Enables comparison to be made;
Since increase in incidence with age/ older people have had more exposure to cigarettes; 2
- (b) No/ incorrect response with some attempt at calculation based on 556 and 428 as numerators; = 1 mark
No/ incorrect response with correct calculation; = 2 marks
Correct response (non-smokers have greater risk than smokers) with calculation of $556/7316 \times 100 = 7.6\%$ and $428/4651 \times 100 = 9.2\%$ for smokers and non-smokers respectively; = 3 marks 3
- (c) (i) (Relative risk of) lung cancer decreases the longer it is since giving up smoking;
(Relative risk of) lung cancer increases with the number of cigarettes smoked per day; 2
- (ii) 1 Mass of abnormal cells;
2 Idea of spread/ metastasis;
3 Altered DNA/ biochemical differences;
4 Rapid rate of cell division/ uncontrolled cell division;
5 Cigarette smoke contains carcinogens/ mutagens/ cancer-causing chemicals;
6 Causes changes in DNA;
7 Of genes that control cell division;
8 Reference to oncogenes;
9 Reference to tumour suppresser genes; max 6

Total 15 marks