

GCE 2004
June Series



Mark Scheme

Science for Public Understanding *SPU1*

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.

Further copies of this Mark Scheme are available from:

Publications Department, Aldon House, 39, Heald Grove, Rusholme, Manchester, M14 4NA
Tel: 0161 953 1170

or

download from the AQA website: www.aqa.org.uk

Copyright © 2004 AQA and its licensors

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX. *Dr Michael Cresswell Director General*

Unit 1: Issues in the Life Sciences

Question 1

- (a) (i) • reduces number of people they are in **contact** with/close to /person to person contact
 • chance of being infected by someone incubating the disease reduced/one infected person could infect many in a crowd/air borne disease/coughing or sneezing
 • any virus picked up on hands less likely, to enter the body/to be transmitted to another
- allow 'bacteria' any 2 for 1
 no marks for repeat of question 'prevent spread' mark each 2
- (ii) • safe disposal of sewage
 • boil or treat water
 • do not use water from **contaminated** source/use only clean water
 • vaccinate any 2 for 1
 mark each 2
- (iii) **Yes**
 • no medicine/no vaccine/no natural resistance/no knowledge/only way to control
 • medical personnel put at risk by others' freedom
 • it worked
 • people spread disease to uninfected, areas/countries/could cause epidemic
 • worth some cost to individuals, for greater good any 2 for 1
 mark each 2
- (b) (i) • on first infection the immune system will produce **antibodies** (against the virus)/**white cells**
 • the immune system/white cells/antibodies can respond again more rapidly on reinfection/memory/recognition for 1 mark
 each 2
- (ii) • mutants will be less likely to be recognised by, immune system/antibody
 • surface protein changed by mutation
 • more likely to **survive and reproduce**/more likely to be passed on to others
- max 1 for answer on vaccination
 no marks for antibiotic resistance any 2 for 1
 mark each 2

Total 10 Marks

Question 2

- (a) (i) • genetic because environment would have changed over several generations
 • genetic because genes are **passed on** within a family
 mark for reason, not 'genetic' any 1 for 1 mark **1**
- (ii) • it takes many generations for genetic make-up of a population to change
 • only environmental factors can change rapidly
 • an example of an environmental change such as high fat diet or less exercise
 (example must be specific, not 'poor lifestyle' or 'poor diet') Any 2 for 1 mark each **2**
- (iii) • type 1 - least similarity between twins for 1 or 2 marks **2**
- (b) (i) • High BMI increases risk
 • non-linear, effect more pronounced at higher BMI for 1 mark each **2**
- (ii) • BMI 23, risk 11 - 13 BMI 37, risk 50
 • 4/5 fold increase in risk/increase by 40 - 37 cases **per 1000** per year/400% increase/4:1 risk increase
 check working is correct, if value 4 obtained by subtraction do not give mark for 1 mark each **2**
- (iii) **no doubts**
 • only last 2 points very uncertain
 • trend still present even if highest possible values chosen for low BMI
 • and lowest for high BMI
yes
 • because very small effect
 • **high BMI data** very unreliable
 • relationship less clear if extreme values used
 • overlap of error bars
 no marks for 'other risk factors' any 2 for 1 mark each **1**
- (c) (i) Heart disease/breast cancer for 1 mark **1**
- (ii) • information on risk/on diet/ban adverts/parental education
 • healthier/cheaper school meals/ban vending machines/ban junk food in schools
 • more exercise/exercise sport and exercise facilities more widely available/free
 • tax on fatty foods
 no marks for 'general lifestyle' any 2 for 1 mark each **2**

Total 14 Marks

Question 3

- (a)
- nothing else available
 - placebo effect/belief/trust/traditional values/holistic
 - might give temporary relief of symptoms/natural recovery
 - diseases not clearly, diagnosed/understood
- any 2 for 1 mark each **2**
- do not allow ‘distrust of modern scientific medicine’
- (b) (i)
- one group given treatment being tested another group given previous treatment or no treatment (must have both groups named or implied)
 - **results/differences/comparisons** between groups noted
 - two groups treated identically in all other ways
- any 2 for 1 mark each **2**
- (ii)
- patients are allocated at random to either **treatment or control** group
- for 1 mark **1**
- (iii)
- to avoid bias in the way groups are chosen
 - example of bias
 - to eliminate the effect of other unknown variables which could influence result
 - example of possible variable
- any 2 for 1 mark each **2**
- I (i)
- artemisinin is at least as effective as quinine in, all forms/cerebral malaria
 - artemisinin better in mixed malaria
 - neither are totally effective in severe malaria
 - cerebral malaria has the highest death rate
- allow any correct deduction from table
- any 2 for 1 mark each **2**
- (ii)
- placebo is no treatment at all
 - unethical to not treat
 - important to know how it compares with standard treatment
 - to decide whether to replace
- any 2 for 1 mark each **2**
- (iii) **yes**
- need to, test effectiveness
 - risk of side effects/need to determine correct dosage
 - different ethnic groups may have different responses
- no**
- the Chinese had done trials
 - no reason to doubt Chinese science
 - drug-resistant malaria is a very serious problem
 - as long as there was no evidence of harm it should have been tried
 - should give patients the choice
- not just ‘would save lives’
- any 2 for 1 mark each **2**

Total 13 Marks

Question 4

- (a) (i) • increase in GM animals
• decline overall until 2001/increase since 2001/almost constant overall/2001 lowest number
• decline in non-GM any 2 for 1 mark each **2**
- (ii) • decline due to new technologies/more careful research design
• public protests/refine, replace reduce policy
• GM increase, as more genes identified/to discover gene function
• more techniques for GM any 2 for 1 mark each **2**
- (b) • normal (CF) gene obtained
• inserted into vector/virus/lipid coat/plasmid (ignore bacteria for this mark)
• vector sprayed/inserted into (lung) cells (do not allow bacteria)
• inserts in genome in (lung) cells
• normal (CF) gene functions
allow max 1 for any GM e.g. in bacteria to make medicine, like insulin any 3 for 1 mark each **3**
- (c) (i) • benefits to humans outweigh costs to animals
• long term human benefit/very large numbers of people will benefit
• important to minimise animal suffering
• human life more important than animal life
insist on ethical not technical here any 2 for 1 mark each **2**
- (ii) • should not use animals for our own ends/abuse of our power
• causing deliberate harm/suffering to animals wrong
• we should find other research tools
• animals rights/lack of consent any 2 for 1 mark each **2**
- (iii) • cost benefit position in support
• intrinsic animal rights
• alternatives to animals
• results invalid as animals different from humans
allow answers that are repeat of (i) or (ii) any 2 for 1 mark each **2**
- quality of written communication based on (c) (i), (ii) & (iii)
2 for spg, 2 for argument
>2spg penalise 1, >4spg penalise 2 for up to 4 marks **4**

Total 17 Marks

Question 5

- (a)
- it confirms the common origin of the finches/evidence that one **original species** can give rise to several others/DNA in new species similar to that it **evolved from**
 - small changes lead to different species
 - general explanation of mutation and speciation must deal with speciation for 2
- any 2 for 1 mark each **2**
- (b)
- **variation** in beaks before drought (variation can be implied by a sense of continuum e.g. larger or smaller beaks)
 - birds with larger beaks more able to get food/smaller beaked birds less able to get food
 - survivors' offspring would inherit large beaks
- any 2 for 1 mark each **2**
- (c)
- no theory is ever completely certain knowledge
 - predictions based on completely new ways of testing theory (such as DNA) are valuable confirmation (**not proof**)
 - long timescale needed to test theory

 - Although theory widely accepted there are many details which are not certain
 - yields information on the origin of a species
 - yields information on evolutionary relationships/human evolution
 - allows deductions on earlier species/ separations of species

 - some groups still doubt the theory
 - the more evidence that is available the weaker the doubters' case
- not 'allows us to predict the future'
- any 2 for 1 mark each **2**

Total 6 Marks**Paper Total 60 Marks**