OCR
RECOGNISING ACHIEVEMENT

GCE

Mark Scheme for June 2011

Guidance for Examiners

Do not use ticks in Section B.
Use the following annotations. (In any one script you are not expected to use all of these.)

Yes	recognises a point worthy of credit
Dev	a developed point or development of a point
No	a content error
NAQ	not answering the question
eg	appropriate example
SP/G/Eng	spelling, grammar and language error; you are not expected to correct all of them
(…)	indicates a choice or a key phrase
Rubric	rubric infringement
D	description
R	reason
Rep	repetition, often of the question
Ev	evaluation

Stages to an essay mark

Read and annotate the candidate's response.

Consider its position within the level and a possible mark.

Write a one or more line comment reflecting the AO statements.

eg	AO1	good knowledge
		very limited knowledge and eg
	AO2	examples given
	AO3	personal experience relevant
		restricted personal experience
	AO4	clearly written
		inaccurate Spg

Enter the final mark in a circle.

Assessment Objective Weighting

	AO1	**AO2**	**AO3**	**AO4**
Marks	**8**	**10**	**6**	**6**

Generic Mark Scheme for Questions with 30 marks

Level 5

AO1	• select, use and integrate a very good range of relevant knowledge • show a good understanding of the concepts involved	
AO2	• interpret and analyse issues and problems well and evaluates them appropriately • use evidence to develop complex reasoned arguments and draw sound conclusions on the evidence	
AO3	• demonstrate very good awareness of the differences between types of knowledge • have a very good appreciation of the strengths and limitations of the different types of knowledge	**25–30**
AO4	• communicate complex ideas clearly and accurately, using specialist vocabulary where appropriate, in a concise, logical and relevant way • use a wide range of the rules of grammar, punctuation and spelling with accuracy and facility.	

Level 4

AO1	• select, use and integrate a good range of relevant knowledge • show an understanding of the concepts involved	
AO2	• interpret and analyse issues and problems well and evaluates them competently • use evidence to develop reasoned arguments and draw sound conclusions on the evidence	
AO3	• demonstrate good awareness of the differences between types of knowledge • have a good appreciation of the strengths and limitations of the different types of knowledge	**19–24**
AO4	• communicate ideas clearly and accurately, using specialist vocabulary where appropriate, in a concise, logical and relevant way • use a range of the rules of grammar, punctuation and spelling with accuracy and facility.	

Level 3

AO1	• select, use and integrate a range of relevant knowledge • show an adequate understanding of the concepts involved	
AO2	• undertake some interpretation and analysis of issues and problems and make a superficial evaluation • use evidence to develop arguments and draw conclusions	
AO3	• demonstrate awareness of the differences between types of knowledge • have an appreciation of the strengths and limitations of the different types of knowledge	**13–18**
AO4	• communicate clearly, using some specialist vocabulary with facility • use some of the rules of grammar, punctuation and spelling with facility.	

Level 2

AO1	• select, use and integrate a limited range of relevant knowledge • show a modest understanding of the concepts involved	
AO2	• demonstrate limited interpretation and analysis of issues and problems with limited evaluation • use evidence to develop limited arguments and draw limited conclusions	
AO3	• demonstrate limited awareness of the differences between types of knowledge • have a restricted appreciation of the strengths and limitations of the different types of knowledge	**7–12**
AO4	• communicate ideas with limited clarity, using some specialist vocabulary • use some rules of grammar, punctuation and spelling.	

Level 1
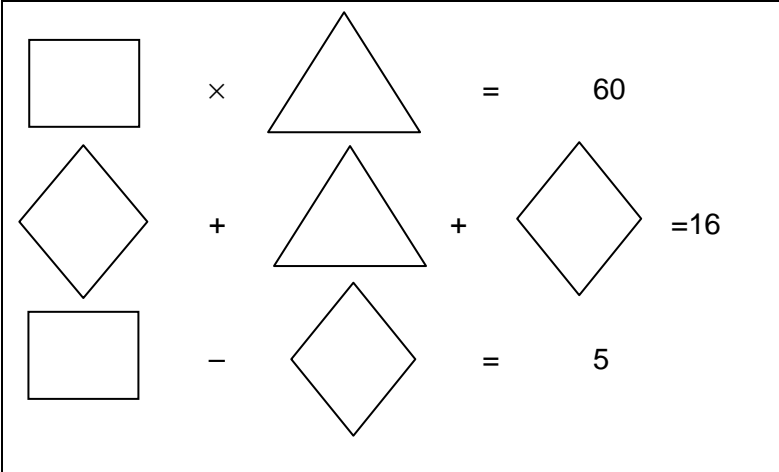
AO1	• select, use and integrate some knowledge which may not be accurate • show a restricted understanding of the concepts involved	
AO2	• demonstrate poor interpretation and analysis of issues, problems and evaluation • recognise arguments and conclusions	
AO3	• demonstrate very limited awareness of the differences between types of knowledge • have a very restricted appreciation of the strengths and limitations of the different types of knowledge	**0–6**
AO4	• communicate with little clarity using occasional specialist terms • use poor grammar and punctuation, and inaccurate spelling.	

Section A

Answer **all** the questions in this section.

1			**A student was asked to submit a first draft for an investigation into the attitudes of people in the UK to further expenditure on space exploration.**	
			First draft (submitted by the student) **Title:** An investigation into the attitudes of people in the UK to further expenditure on space exploration. **Outline:** I intend to use a questionnaire and ask people about their attitudes to further space exploration. I will collect data and draw conclusions based upon the replies I receive.	
			The tutor wrote the following comments on this first draft: • this is a promising start with potential • you will need a representative sample for your questionnaire • at the moment the term 'attitudes of people' is rather broad • do you intend to use open or closed questions in the questionnaire? • once your data is collected how will you analyse it in order to reach conclusions? • the issue of expenditure appears to have been lost in your first outline.	
	(a)		**Why does the tutor suggest that the student should use a 'representative sample'?**	**[3]**
			• representative samples of populations are taken with a view to • gaining an approximate value for the population as a whole • it is impossible to survey everybody • samples may be random or stratified • in view of the scale of this investigation the student may wish to refine the term 'population' to a particular group defined by gender, age or location. Allow **1 mark** per point made or **2 marks** for a developed point. (up to a max. of 2 marks) **1 mark** for AO4 to be shown **(+1)** inside the margin.	
	(b)		**How could the student refine the term 'attitudes of people'?**	**[3]**
			• attitudes can be defined as the degree of an individual's like or dislike for an item. Attitude*s* are generally positive or negative • attitudes tend to be judgemental and sometimes emotional • attitudes may be measured through such devices as the semantic differential, interviews and group discussions • a refinement would be to ask if subjects 'agree or disagree'. This could be refined to a ranking scale compared to other options or by offering pairs from which a subject has to select one eg space exploration or expenditure on motorways. Allow **1 mark** per point made or **2 marks** for a developed point.(up to a max. of 2 marks) **1 mark** for AO4 to be shown **(+1)** inside the margin.	

	(c)		**Explain the difference between 'open' and 'closed' questions.**	**[3]**
			There are two types of question: open and closed.	
			• closed questions are those where the respondent is given a number of alternative answers to choose from	
			• open questions allow the respondent to answer more fully and freely in their own way and often leave a space of several lines for this purpose.	
			1 mark for each. **1 mark** for AO4 to be shown **(+1)** inside the margin.	
	(d)		**Why does the tutor comment about the issue of expenditure?**	**[3]**
			• the word expenditure is clearly in the title and yet is absent from the student response • the expenditure was to be additional to that already spent • the student will need to make clear to respondents what expenditure is proposed.	
			1 mark for inclusion in title but exclusion from draft. **1 mark** for comment on additional expenditure. **1 mark** for AO4 to be shown **(+1**) inside the margin.	
	(e)		**Write a revised draft of this proposal [use about 100 words].**	**[6]**
			Draft to include: • definition of target population • definition of attitudes • definition of further expenditure (amount or for what) • attention to data collection (eg questionnaire) • analysis of data • presentation of data • commentary and conclusion • any other key design point. Allow **1 mark** for each point. (Max. 4) If there is no further development on the tutor's comment (Max 2 +1 AO4 mark). **2 marks** for AO4 to be shown (**+2**) inside the margin AO4 marks as follows: **0 marks** if the meaning is not clear. **1 mark** if the meaning is partially clear but the text contains frequent errors of SPG. **2 marks** if the meaning is clear and the text contains very few errors of SPG.	

2	(a)		Calculate the value of <u>each</u> of the following. What do you notice about <u>each</u> total calculated?	
		(i)	$12^2 + 33^2$	**[2]**
			144 + 1089 = 1233 Answer contains number 12 and 33 from the question. **1 mark** for correct answer and **1 mark** for correct comment. Examiners may allow **1 mark** for an appropriate comment on an incorrect total eg an answer of 1234 is incorrect but could gain **1 mark** for noting the numbers are in sequence.	
		(ii)	$8^2 - 4^2$	**[2]**
			64 − 16 = 48 Answer contains the numbers from the question but in reverse order. **1 mark** for correct answer and **1 mark** for correct comment. Examiners may allow **1 mark** for an appropriate comment on an incorrect total eg an answer of 80 is incorrect but could gain **1 mark** for noting the numbers are all divisible by 8.	
	(b)		In the three equations shown in Fig. 1 each shape represents a number between 5 and 10.	
			Fig. 1	
			Find the three numbers, between 5 and 10, that are represented by the shapes in the three equations shown. Show clearly how you came to your answer.	**[5]**
			A typical approach by a candidate might be one of the following: • trial and error – choosing numbers and testing them in the equations • considering the factors of 60 which are between 5 and 10 for the first equation, then continuing to check the other 2 equations • use of simultaneous equations. It is likely, that if candidates choose the algebraic approach they may label their 3 variables as x (rectangle), y (triangle) and z (diamond) as this is the order in which the shapes appear in the diagram. Rectangle = x Triangle = y Diamond = z Equation 1 x y = 60 Equation 2 2z + y = 16 rearranged to y = 16 - 2z Equation 3 x − z = 5 rearranged to x = 5 + z	

			Both of the rearranged equations (2 and 3) substituted into equation 1 to give $(16 - 2z)(5 + z) = 60$ Multiplied out to give $z^2 - 3z - 10 = 0$ Factorised to give $(z + 2)(z - 5) = 0$ An answer of $z = -2$ is impossible Answer of $z = 5$ Substitution into the other equations to give $x = 10$ and $y = 6$	
			If all three are correct and clearly stated an examiner may award **5 marks.** If **less than three** correct then **1 mark** for **each correct** answer and **up to 2 marks** for working out.	
	(c)		**Advertisements and retail stores often promote the offer 'Buy one get one free'. Outline <u>two</u> ways in which customers should be suspicious of this offer.** Areas of suspicion include: • price may have been increased temporarily • suggests that more is better • free product may be of lower quality • may be old stock sold at new stock price • value greatly overstated • emotive use of the word 'FREE' • item may simply be "50% off" or 'half price', • buyer must buy something first, the 'free' item is not truly gratis • cheapest item in the bundle is the one that is 'free.' **1 mark** for each point or **2 marks** for a developed point. Maximum 3.	**[3]**
				Section A Total **[30]**

Section B

Answer **one** question from this section. Answers should be in continuous prose.

3			**Explain how, by considering different time scales (eg short term, medium term and long term), different solutions might be proposed to the same scientific problem.**	**[30]**
			Assessment Objective Balance	

	AO1	AO2	AO3	AO4
Marks	8	10	6	6

This question involves:
- selection of a scientific problem
- selection of at least two time scales to offer different solutions to the same problem.

Recommended annotation

Intro. for introduction
SP for scientific problem
T1, T2 and T3 for identified time scales
S1, S2 and S3 for different solutions at the appropriate time scale
Dev for development
Conc for conclusion.

Indicative content

Scientific problems where time scale could have had an influence:
- global warming
- traffic congestion
- air pollution
- population growth.

Examiners should accept other scientific problems as well as those listed above including ones taken from the physical and social sciences.

Role of different time scales

Global warming:
- short term solutions include greener policies such as recycling
- medium term redesign of the internal combustion engine
- long term adoption by many nations of greener policies.

Traffic congestion:
- short term solutions include restrictions, removal of parking spaces
- medium term include road pricing
- long term include better provision of public transport.

Examiner tolerance
Examiners may be tolerant in their interpretation of time scale and flexible in the candidates' interpretations of the words 'scientific problem'.

There are many more problems than those listed above.

Level descriptors
These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'borderline' should be awarded the lowest marks in the level.

Level 5	These candidates will show a very good grasp of the import of the question with its focus on time scale. They will show very good understanding that with at least two time scales different solutions could be found to the same scientific problem. Their answers will be very clear and written with accuracy and fluency.	**25–30**
Level 4	These candidates will show a good grasp of the import of the question with its focus on time scale. They will show good understanding that with at least two time scales different solutions could be found to the same scientific problem. Their answers will be clear with few limitations to their spelling.	**19–24**
Level 3	These candidates will show an adequate grasp of the import of the question with its focus on time scale. They will show adequate understanding that with at least two time scales different solutions could be found to the same scientific problem. Their answers will be clear with some limitations to their spelling.	**13–18**
Level 2	These candidates will show a limited grasp of the import of the question with its focus on time scale. They will show modest understanding that with at least two time scales different solutions could be found to the same scientific problem. Their answers will not be clear with insecurity in their spelling.	**7–12**
Level 1	These candidates will show a very limited grasp of the import of the question with its focus on time scale. They will show restricted understanding that with at least two time scales different solutions could be found to the same scientific problem. Their answers will lack clarity using poor grammar, punctuation and inaccurate spelling.	**0–6**

The question refers to different time scales. Exceptionally candidates answering using only **one** time scale can be awarded marks up to the top of Level 3. If an examiner is uncertain about scoring an answer they should consult their Team Leader.

4			**What is meant by the term 'genetic engineering'?** **Describe <u>two</u> successful outcomes of genetic engineering. Explain <u>one</u> concern that people have about genetic engineering.**	**[30]**

Assessment Objectives Balance

	AO1	AO2	AO3	AO4
Marks	8	10	6	6

This question involves:
- explanation of the term genetic engineering
- description of two successes made possible by genetic engineering
- explanation of one concern people have.

Recommended annotation

Intro. for introduction
GE for definition of genetic engineering
S1 and S2 for successes of GE
C for concern about genetic engineering
Dev for development
eg for examples
Conc for conclusion.

Indicative content

Definition of genetic engineering

Genetic engineering involves direct manipulation of an <u>organism</u>'s <u>genes</u>.
It uses the techniques of <u>molecular cloning</u> and <u>transformation</u> to alter the structure and characteristics of genes directly.
The definition may be successfully expressed through examples but does need to include genes.

Successes of genetic engineering include:
- improving crop technology to grow foods that resist insect pests, bacterial or fungal infection, resist herbicides to improve yield, have longer freshness than otherwise, or have superior nutritional value
- the manufacture of synthetic human insulin through the use of modified bacteria
- production of human growth hormone
- production of vaccine for Hepatitis B
- the manufacture of erythropoietin to regulate red blood cell production in hamster ovary cells
- the production of new types of experimental mice such as the oncomouse (cancer mouse) for research.

Concerns about genetic engineering include:
- GM food concerns in Europe contrast to the US where GM crops are more widely grown and the introduction of these products has been less controversial. Safety is a major issue in this controversy eg adverse health effects. A lack of long term data leaves this area as one of controversy
- effects of GM crops on the ecosystem eg reduced biodiversity, risks of horizontal gene transfer changing wild plants

			• ethical issues relating to human genetic engineering eg testing on animals including primates. Testing on human embryos and the rights of the unborn. Do parents have rights to change their unborn children and free them from preventable disease? Dangers of different access for the wealthy (Designer children).	

	Examiner tolerance Examiners may be tolerant in their interpretation of the definition of genetic engineering.	

Level descriptors

These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'borderline' should be awarded the lowest marks in the level.

Level 5	These candidates will show a very good understanding of the term 'genetic engineering. They will provide very good descriptions of two successes of genetic engineering. Their explanation of one concern will be very well developed. Their answers will be very clear and written with accuracy and fluency.	**25–30**
Level 4	These candidates will show good understanding of the term 'genetic engineering'. They will provide good descriptions of two successes of genetic engineering. Their explanation of one concern will be developed. Their answers will be clear with few limitations to their spelling.	**19–24**
Level 3	These candidates will show relevant knowledge of two successes of genetic engineering. Their explanation of one concern will be adequate. These two parts, success or concern, will tend to be unbalanced. Their answers will be clear with some limitations to their spelling.	**13–18**
Level 2	These candidates will provide limited knowledge of two successes of genetic engineering. Their explanation of one concern will show modest understanding. One of the two parts, success or concern, will be only a partial or token answer. Their answers will not be clear with insecurity in their spelling.	**7–12**
Level 1	These candidates will provide very limited knowledge of two successes of genetic engineering. Their explanation of one concern will show restricted understanding .One of the two parts, success or concern, will tend to be fragmentary. Their answers will lack clarity using poor grammar, punctuation and inaccurate spelling.	**0–6**

The question is in two main parts (successes and concerns). Exceptionally candidates answering only **one** part of the question can be awarded marks up to the top of Level 3. If an examiner is uncertain about scoring an answer they should consult their Team Leader.

5			**Scientists have contributed to developments related to birth rates. Describe two advantages and two disadvantages of these developments.**	**[30]**

Assessment Objectives Balance

	AO1	AO2	AO3	AO4
Marks	8	10	6	6

This question involves:
- recognition of the developments in birth rates from the work of scientists
- describing two advantages of the developments recognised
- describing two disadvantages of the developments described.

Recommended annotation

A1, A2, A3… for advantages of developments in birth rates
D1, D2, D3… for disadvantages of developments in birth rates
Dev for development
eg for examples
Conc. for conclusion.

Indicative content

Birth rates

Advantages from the work of scientists include:
- contraception has enabled planned parenthood
- lower infant mortality
- determination of parenthood, paternity testing
- termination in cases of danger
- IVF to enable pregnancy in difficult case
- total population control (eg China)
- demographics.

Disadvantages from the work of scientists include:
- side effects of new drug treatments
- multiple births
- reduced birth rates threaten size of working population
- higher dependency rates, more successful births
- safety measures suggest more hospital births with consequent fall in community involvement and risk of disease
- fewer children threaten viability of schools and colleges
- access to expensive treatments.

Some outcomes may appear as advantages and disadvantages. This is acceptable.

Level descriptors
These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'borderline' should be awarded the lowest marks in the level.

Level 5	These candidates will offer two very good accounts of advantages and two very good accounts of disadvantages. The development of each will be very good. Their answers will be very clear and written with accuracy and fluency.	**25–30**
Level 4	These candidates will offer two good accounts of advantages and two good accounts of disadvantages. The development of each will be good. Their answers will be clear with few limitations to their SPG.	**19–24**
Level 3	The candidates will show some relevant knowledge through description of two advantages and two disadvantages. Their answers may be unbalanced with greater attention to advantages or disadvantages. Their answers will be clear with some limitations to their SPG.	**13–18**
Level 2	The candidates will show limited understanding of advantages and disadvantages. One of these will be presented in modest terms. Their answers will not be clear with insecurity in their SPG.	**7–12**
Level 1	The candidates will show very limited understanding of the advantages and disadvantages. The response in one of the two will be fragmentary. Their answers will lack clarity using poor grammar, punctuation and inaccurate spelling.	**0–6**

The question is in two main parts (advantages and disadvantages). Exceptionally candidates answering only **one** part of the question can be awarded marks up to the top of Level 3. If an examiner is uncertain about scoring an answer they should consult their Team Leader.