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General Certificate of Education (A-level)
January 2012

General Studies A GENA2

(Specification 2760)

Unit 2: Science and Society (AS)

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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.

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Unit 2 Section A

(GENA2 AS Science and Society)

This component is an objective test for which the following list indicates the correct answers used in marking the candidates' responses.

1.1	**B**	**1.16**	**D**
1.2	**D**	**1.17**	**C**
1.3	**B**	**1.18**	**A**
1.4	**C**	**1.19**	**B**
1.5	**A**	**1.20**	**B**
1.6	**C**	**1.21**	**C**
1.7	**A**	**1.22**	**C**
1.8	**B**	**1.23**	**C**
1.9	**D**	**1.24**	**D**
1.10	**C**	**1.25**	**A**
1.11	**D**	**1.26**	**D**
1.12	**D**	**1.27**	**A**
1.13	**B**	**1.28**	**C**
1.14	**C**	**1.29**	**A**
1.15	**D**	**1.30**	**A**

Unit 2 Section B (AS Science and Society)

INTRODUCTION

The nationally agreed assessment objectives in the QCA Subject Criteria for General Studies are:

AO1 Demonstrate relevant knowledge and understanding applied to a range of issues, using skills from different disciplines.

AO2 Marshal evidence and draw conclusions: select, interpret, evaluate and integrate information, data, concepts and opinions.

AO3 Demonstrate understanding of different types of knowledge appreciating their strengths and limitations.

AO4 Communicate clearly and accurately in a concise, logical and relevant way.

- The mark scheme will allocate a number or distribution of marks for some, or all, of the above objectives for each question according to the nature of the question and what it is intended to test.
- In most cases mark schemes for individual questions are based on *levels* which indicate different qualities that might be anticipated in the candidates; responses. The levels take into account a candidate's knowledge, understanding, arguments, evaluation and communication skills as appropriate.
- Examiners are required to assign each of the candidates' responses to the most appropriate level according to **its overall quality**, then allocate a single mark within the level. When deciding upon a mark in a level examiners should bear in mind the relative weightings of AOs (see below). For example, the most weight should be given to AO1, then AO4, then AO2 and finally AO3.
- *Indicative content* is provided as a guide for examiners. It is not intended to be exhaustive and other valid points must be credited. Candidates do not have to cover all points mentioned to reach Level 3.
- A response which bears no relevance to the question should be awarded no marks.

Distribution of marks across questions and assessment objectives for Unit 2, Section B

Question Numbers		Q2 & Q3	Q4 & Q5	Q6 & Q7	Total marks for Section B
Assessment Objectives	AO1	12	12	12	12
	AO2	8	8	8	8
	AO3	5	5	5	5
	AO4	10	10	10	10
Total marks per question		35	35	35	35

Level of response	Mark range	Criteria and descriptors for Assessment Objectives 1-4
LEVEL 3	13–17 (18)	**Good response to question** Good to comprehensive knowledge, understanding and approach demonstrating overall grasp of the range and nature of issues (AO1). Capacity to interpret evidence and sustained ability to present relevant arguments, analysis and exemplification, focusing on the main points of the question (AO2). Shows some understanding of different types of knowledge, with some appreciation of their limitations in seeking to reach a reasoned and logical conclusion (AO3). Ability to communicate clearly and accurately in a fluent and organised manner (AO4).
LEVEL 2	7–12	**Reasonable attempt to answer question** Modest to quite good knowledge, understanding and approach demonstrating some grasp of the nature of some key issues (AO1). Moderate range of arguments, analysis and exemplification covering some of the main points of the question (AO2). Limited understanding of different types of knowledge but some ability to work towards or achieve a reasoned conclusion (AO3). Mostly clear and accurate communication and organisation (AO4).
LEVEL 1	1–6	**Limited response to the question** Restricted / narrow knowledge and understanding of key issues (AO1). Simple, perhaps mostly unexplained points – or very narrow range – with limited interpretation or analysis and exemplification (AO2). Lacking in understanding of different types of knowledge with little or no evidence of ability to work towards a conclusion (AO3). Variable levels of communication and organisation (AO4).
LEVEL 0	0	**No valid response or relevance to the question.**

02 Examine health, environmental and other reasons for the increase in the number of older people in Britain's population.

(17 marks)

Candidates may explain something of the **demographic context** of the question. The children born in the 'baby boom' years, when the birth rate was relatively high, are now reaching old age. This coincides with more recent declines in the birth rate, resulting in a smaller proportion of the population being of working age.

Health improvements include:

- successful campaigns to reduce smoking
- screening programmes for major cancers – e.g. breast, bowel cancers
- flu vaccination for older people
- advances in medical technology and techniques – e.g. radio and chemotherapy, organ transplantation – can keep patients alive much longer than previously.

Environmental changes include:

- there is less smoke pollution and other forms of pollution from industrial processes
- general housing conditions are much improved, with fewer people living in damp and overcrowded conditions
- the decline of heavy industry, mining, etc has led to reduced risk from substances such as asbestos and coal dust, a decline in industrial accidents and fewer chronic industrial diseases
- improved health and safety practices have also reduced deaths in the workplace.

Other reasons may include:

- there is greater awareness of the importance of diet and exercise
- greater affluence has meant that people generally have better diets, shorter working hours, longer and better holidays, etc, helping to prolong their lives
- welfare state provisions have improved quality and length of life of people with disabilities
- social care provision for older people is widely available and of good quality.
- lower birth rate and reduced family size affects the age distribution of the population.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 17 marks)

- identifies and explains a substantial range of reasons for the increased number of older people in the population
- OR identifies a more modest range of reasons, but explains them in greater detail
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- identifies and explains a modest range of reasons for the increased number of older people in the population
- OR identifies a more limited range of reasons, but explains them in some detail
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- identifies and explains a very limited range of reasons for the increased number of older people in the population
- OR identifies a modest range of reasons, but with little or no explanation
- shows little evidence of analysis and evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

03 Consider the social, economic and political consequences of the UK's ageing population.

(18 marks)

Social consequences include:

- effects on family life – children may become carers to elderly parents well into their own middle/old age
- costs of long-term care for older relatives may be a burden to families
- younger children can have access to experiences and wisdom of older relatives
- the older generation may support the working generation with childcare, etc
- older people may become 'segregated' from others in separate housing schemes
- younger people may plan their futures (education, career, children) in expectation of longer life.

Political consequences include:

- politicians need to take notice of the 'grey vote' in their decision making
- issues related to increased demand for healthcare for the elderly
- issues related to the provision of personal care for the elderly (care homes, etc)
- issues of concessionary provision for the elderly – free travel, leisure facilities, TV licences, etc.

Economic consequences include:

- the 'grey pound' is the money that older people have available for spending that they are likely to spend on products and services most appropriate to their needs
- there is an expanding market for companies offering products and services to older people – including leisure and tourism, housing (retirement villages), etc
- the ongoing cost of providing state pensions for older people with a long life span is an increasing burden for taxpayers
- many employers in the private and public sector claim to be having difficulties in providing occupational pensions, particularly 'final salary' pensions
- the costs associated with increased social and healthcare provision
- the age of retirement and pension entitlement is being increased.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 18 marks)

- considers a substantial range of social, political and economic consequences of the ageing population in the UK
- OR considers a more modest range of consequences, but discusses them in greater depth
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- considers a modest range of social, political and economic consequences of the ageing population in the UK
- OR considers a more limited range of consequences, but discusses them in greater depth
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- considers a very limited range of consequences of the ageing population in the UK
- OR considers a modest range of reasons, but with little or no depth or development
- shows little evidence of analysis and evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

04 Explain the effects of alcohol on the human body and its impact on an individual's health.

(17 marks)

Alcohol is an organic compound. The type of alcohol found in alcoholic drinks is ethanol. Once swallowed, it is absorbed into the bloodstream through the stomach. Cell membranes are highly permeable to alcohol, so once it is in the bloodstream it can diffuse into virtually every tissue in the body, with particular effects on the brain and liver.

Its effects on the human body include:

- initial euphoria, reduced inhibitions, increased sociability
- increased lethargy, reduced comprehension, delayed reactions, loss of balance
- confusion, impaired speech, dizziness, vomiting
- loss of coordination, loss of consciousness, reduced heart rate, urinary incontinence
- unconsciousness, respiratory depression, decreased heart rate, death.

There have been claims that modest amounts of alcohol provide benefits in relation to protection from coronary heart disease – though these have perhaps been exaggerated by the drinks industry.

Short term effects on an individual's health may include:

- feeling unwell during and after drinking alcohol (hangovers)
- injury as a result of alcohol-related violence, including domestic violence
- injury as a result of alcohol-related accidents, in the home and as a result of drink driving
- health consequences of unsafe sex practices, such as sexually transmitted infections (STIs).

The impact of heavy and/or long term alcohol use on an individual's health may include:

- increased risk of liver disease (cirrhosis), type 2 diabetes, some cancers
- increased risk of coronary heart disease and stroke
- increased risk of mental health disorders, depression, memory loss, a higher incidence of suicide among alcoholics
- slowing of brain development among adolescent drinkers
- foetal alcohol syndrome amongst babies born to mothers who are heavy alcohol users.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 17 marks)

- identifies and explains a substantial range of effects of alcohol
- OR identifies a more modest range of effects, but explains them in greater detail
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- identifies and explains a modest range of effects of alcohol
- OR identifies a more limited range of effects of alcohol, but explains them in some detail
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- identifies and explains a very limited range of effects of alcohol
- OR identifies a modest range of effects of alcohol, but with little or no explanation
- shows little evidence of analysis or evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

05 Discuss social and economic issues that arise when considering ways of reducing the harm caused by alcohol.

(18 marks)

Alcohol consumption is currently regulated by in a variety of ways, including:

- licensing of premises and individuals permitted to sell alcohol
- restrictions on the hours during which shops and other licensed premises may sell alcohol
- an age limit of 18 for those permitted to consume alcohol
- taxation of alcohol products is (partly) intended to dampen demand for alcohol products
- there are restrictions on the content of alcohol advertising.

Additional forms of regulation might include:

- a complete ban on alcohol advertising
- further increases in prices, through higher taxation and/or a 'minimum unit price'
- a higher age limit (e.g. 21, as in the US)
- a ban on alcohol consumption in public places
- a reduction in licensing hours, away from the maximum 24 hours.

Social issues that might be considered include:

- the apparent British culture of 'binge' drinking, in contrast to more relaxed European cultural attitudes
- many town and city centres have become 'no-go' zones at night for many people because of the prevalence of drinking and drink-related violence in these areas
- the threat (real or imagined) of anti-social behaviour and violence from groups of under-age drinkers in residential areas
- does society have a responsibility to control or influence the behaviour of individuals which harms them and others?
- would further regulation be an example of the 'nanny state'?

Economic issues that might be considered include:

- the cost to industry and the economy of the amount of productive work lost through the effects of alcohol misuse
- the cost to the taxpayer of police, health and local authority time dealing with the consequences of alcohol misuse
- the drinks industry is a major employer and exporter – restrictions could have a negative economic effect
- restrictions could also impact negatively on local shops and supermarkets which sell alcohol
- should individuals with (self-induced) alcohol related illnesses be denied expensive treatments and/or be required to pay for the treatments themselves?

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 18 marks)

- discusses a substantial range of measures and social, economic and ethical issues
- OR discussion is more narrowly focused, but has greater depth
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- discusses a modest range of measures and social, economic and ethical issues
- OR discussion is narrowly focused, but has some depth
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- discusses a very limited range of measures and social, economic and ethical issues
- OR discusses a modest range of issues, but with little or no depth or development
- shows little evidence of analysis and evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

06 Examine the uses and risks of radiation in medicine and other forms of industry.

(17 marks)

Radiation at the short wavelength end of the electromagnetic spectrum consists of high frequency ultraviolet, X rays and gamma rays. Nuclear radiation is the product of the radioactive decay of unstable elements, emitted as either alpha particles, beta particles or gamma rays.

Uses of radiation include:

- medical imaging and diagnosis – e.g. X rays, CT scans
- radiation is used to kill cancer cells in radiotherapy
- smoke detectors use alpha radiation
- X rays of people and luggage are used for security purposes at airports and elsewhere
- radiation can be used as a sterilising agent – for example, surgical instruments
- radiation can be used to preserve food, by killing bacteria, viruses and micro-organisms in food products
- radiocarbon dating is used to determine the age of materials
- non-destructive testing and imaging in industry
- nuclear power generation to produce electricity for the national grid or to power nuclear submarines
- military uses, including nuclear weapons and radiation tipped weapons.

Risks of radiation include:

- ionising radiation can cause damage to cells, which may divide uncontrollably and form a cancerous tumour
- exposure of reproductive organs to ionising radiation can lead to defects in subsequent generations
- long term exposure to radiation can cause radiation sickness and often death, because more cells die than the body can replace
- individuals may be exposed to radiation on long-haul flights, or through their working environment – e.g. in mines, hospitals or nuclear power stations
- radiation may leak into the environment as a result of a catastrophic accident – e.g. Chernobyl – or as a result of small scale leaks over a long period.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 17 marks)

- identifies and explains a substantial range of uses and risks of radiation
- OR identifies a more modest range of uses and/or risks, but explains them in greater detail
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- identifies and explains a modest range of uses and/or risks of radiation
- OR identifies a more limited range of uses and/or risks, but explains them in some detail
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- identifies and explains a very limited range of uses and/or risks of radiation
- OR identifies a modest range of uses and/or risks, but with little or no explanation
- shows little evidence of analysis or evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

07 Discuss arguments for and against building more nuclear power stations as part of Britain's future energy policy.

(18 marks)

The **need for a future energy policy** – the UK (and the world) needs to reduce its reliance on fossil fuels because the greenhouse gas emissions from them are associated with global warming; the production and use of fossil fuels are associated with pollution, oil spills, etc; and fossil fuel resources are finite and will deplete in the course of the 21st century.

Arguments **for nuclear power** as an energy source:

- nuclear power generation is non-greenhouse gas producing
- nuclear power is a mature technology which works well and is essentially safe
- nuclear power generates energy 24/7, and is not subject to weather patterns
- nuclear power would give the UK direct control over its energy which would no longer be dependent on supplies from politically unstable areas
- other countries (e.g. France) successfully generate the majority of their energy from nuclear power stations
- compared to fossil fuel extraction, nuclear power generation has fewer accidents and far fewer power stations.

Arguments **against nuclear power** as an energy source:

- the potentially damaging consequences of a nuclear accident
- the problem of disposal / storage of radioactive waste
- the capital cost of building and (eventually) de-commissioning nuclear power stations
- greenhouse gas emissions are produced in the building of power stations and in the mining and transportation of uranium
- the link to nuclear weapon production
- danger of terrorist use of nuclear materials
- risk of terrorist attack on nuclear power station, or on vehicles transporting fuel or waste
- in parts of the world susceptible to tectonic activity, nuclear power stations may be vulnerable to natural disasters such as earthquakes or tsunamis – e.g. Fukushima 2011.

Other alternative energy sources, which are renewable, are available – they include wind, solar, tidal, wave and hydro-electric power. They are all likely to be part of the mix in any future energy policy for the UK. They are unlikely, however, to be the complete answer because of limitations of geography and climate in relation to HEP, wind and solar power, and issues of technical viability and capital cost in relation to tidal and wave power.

Candidates should be able to achieve marks in the highest level with a selection of relevant points, not necessarily the complete range. Other valid points, not included here, should be credited.

*As a **guide**, the characteristics of answers at different levels are likely to be as follows:*

A **Level 3 answer** (13 – 18 marks)

- discusses a substantial range of issues relating to nuclear power and energy policy
- OR discussion is more narrowly focused, but has greater depth
- shows clear evidence of analysis and evaluation, leading towards a reasoned conclusion
- is well organised and fluently communicated.

A **Level 2 answer** (7 – 12 marks)

- discusses a modest range of issues relating to nuclear power and energy policy
- OR discussion is narrowly focused, but has some depth
- shows some evidence of analysis and evaluation, leading towards a conclusion
- has some organisation and is reasonably communicated.

A **Level 1 answer** (1 – 6 marks)

- discusses a very limited range of issues relating to nuclear power and energy policy
- OR discusses a modest range of reasons, but with little or no depth or development
- shows little evidence of analysis and evaluation, with little in the way of a conclusion
- has variable levels of organisation and communication.

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