



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

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**General Certificate of Education**

**General Studies 5761**  
*Specification A*

**GENA2      AS Science and Society**

**Mark Scheme**

*2009 examination - June series*

**This mark scheme uses the [new numbering system](#) which is being introduced for examinations from June 2010**

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.

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

## 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
<b>Assessment Objectives</b>	<b>AO1</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>
	<b>AO2</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>8</b>
	<b>AO3</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>
	<b>AO4</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Total marks per question</b>		<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>

Level of response	Mark range	Criteria and descriptors for Assessment Objectives 1–4
LEVEL 3	13–17 (18)	<p><b>Good response to question</b>            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).</p>
LEVEL 2	7–12	<p><b>Reasonable attempt to answer question</b>            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).</p>
LEVEL 1	1–6	<p><b>Limited response to the question</b>            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).</p>
LEVEL 0	0	<p><b>No valid response or relevance to the question.</b></p>

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**02 Explain what methods can be used to make new and existing housing more environmentally sustainable.****(17 marks)**

Candidates may refer to the context of the question, in terms of the government's intention to meet targets for lower carbon emissions, and the aim to increase the number of new homes to increase the supply of housing, particularly affordable housing.

It is possible to use a greater range of sustainable systems in new houses, but some, at least, can be retrofitted to existing properties. Methods might include:

- houses with a compact shape to reduce surface area will be more energy-efficient; terraced houses have less external surface area
- in general, small windows reduce heat loss from a house; however, large south-facing windows, if properly fitted, gain more heat than they lose in the course of a year (passive solar gain)
- high thicknesses of insulation will retain heat, particularly if attention is paid to the joints between walls, floors and roof, and if the house is kept relatively airtight
- in a 'superinsulated' house, the retained heat from lighting, appliances and body heat can significantly reduce the amount of additional heating required
- double or triple glazing is a means of reducing heat transfer through windows – glazing units are hermetically sealed, with an air space between the panes, providing insulation
- low-emissivity glass has a coating on one side which has the effect of allowing solar radiation into a room, but inhibits the transmission of longer wavelength heat back out of the window
- solar panels placed on the roof of a house can be used to heat water for domestic use and heating, saving on additional water and space heating
- photovoltaic panels are a form of solar panel which converts solar energy into direct current electricity which can be stored in a battery or converted to alternating current for use in household appliances
- small scale wind turbines can be attached to a house to generate electricity; they can be connected to the electricity grid to enable surplus power to be used
- geothermal heat pumps can be used as a heat exchanger, warming a house by transferring the heat from the ground into the house; it can also reverse the process, cooling a property by transferring heat from the house to the ground
- the use of water can be significantly reduced by collecting rainwater and the use of 'grey' water for non-personal purposes (gardening, car cleaning, etc)
- although not strictly connected with housing structure, candidates may also mention the use of energy-efficient appliances and light bulbs

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

**03 Discuss the environmental, political and economic problems that are likely to arise in building new towns and altering existing properties in order to increase the number of 'sustainable homes'.**

**(18 marks)**

**Environmental problems** might include:

- green belt land is likely to be used for at least some of these new 'eco-towns', with consequent loss of amenity, landscape, farmland, etc
- there could be a loss of habitat for many animals and plants, perhaps including rare or endangered species
- if these new towns are built away from major centres of employment, they will lead to an increase in car usage and consequent pollution and carbon emissions, negating the purpose of the 'eco-towns'
- the towns may not be large enough to justify effective public transport provision, encouraging car use even more.

**Political problems** might include:

- resistance from existing residents of attractive rural areas to the urbanisation of their environment, the intrusion of large numbers of new residents, etc
- the planning process may take a long time and / or lead to the rejection of some or all of these proposed new towns
- there might be a change of government, leading to different priorities being established, and perhaps this set of proposals being scaled down or ended
- for existing premises, other residents may object to planning permission for external developments, such as wind turbines or solar panels, creating social disharmony.

**Economic problems** might include:

- the cost of developing entire new towns will require massive investment from both the government and the private sector – this may be constrained by political concerns over public borrowing and taxation, and concerns over investment in an economic downturn
- it will take many years of use of renewable energy systems (e.g. small scale wind turbines) to compensate for the amount of energy used in producing them
- the costs of installation of renewable energy measures are so high that it could take many years for householders to recover the costs through lower bills
- the costs of adapting existing properties is high; many poorer, perhaps elderly, residents will not be able to afford major alterations
- if grants are to be given to adapt existing properties, who will be responsible – local councils, central government?

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

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**04 Explain the ways in which developments in science and technology have contributed to improving sporting achievement.****(17 marks)**

There is a wide range of possible examples that can be given in response to this question, some of which are identified below. Whatever examples candidates use, they should demonstrate clear links to sporting achievement.

**Training and preparation:**

- diet – the importance of different foods for particular requirements, for example, loading up on carbohydrates for energy; the use of dietary supplements, such as creatine, may be mentioned
- though not legal, some athletes use performance-enhancing drugs (e.g. steroids) to give them increased power, stamina, etc
- sports psychologists can assist athletes to cope with stress and to focus and motivate themselves for key challenges
- training techniques are used to minimise injuries; intensive physiotherapy and surgical techniques can now enable rapid recovery from many previously serious injuries
- computer analysis of videos of a sportsperson's action can highlight faults in technique which can then be improved

**Equipment:**

- athletics races are now run on all-weather synthetic tracks made of polyurethane, which improve performances over other track surfaces
- athletes, especially in sprint competitions, usually wear tight lycra clothing, which is claimed to reduce leg muscle vibration and to reduce wind resistance
- swimmers can wear full or partial bodysuits designed to reduce drag in the water
- many pieces of equipment (e.g. tennis racquets, golf clubs, racing cycles) use carbon fibre and metal alloys to reduce weight and increase strength

**Recording and regulating:**

- effective recording and regulation ensures that no individual or team can gain an unfair advantage in competition
- in athletics, starting pistols are electronically wired to the timing system; at the finish line, photocells and digital cameras are used to establish the placings
- distances in field events are measured by placing reflectors at the point of impact; a laser signal is then bounced off the reflector and back to the measuring device to assess the distance with high accuracy
- in some team sports (e.g. cricket, rugby) video referees are used to determine close decisions
- regular chemical testing is done in athletics for the detection of performance-enhancing drugs

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

**05 Consider the extent to which sporting activity and achievement can be beneficial for individuals and for society as a whole.**

**(18 marks)**

For the **individual**:

- sport can offer a sense of self-worth and achievement – though those who are not successful may develop a sense of failure
- sport instils a sense of discipline and self-control – though that is not always evident in the behaviour of some high profile professional sportspeople
- many sports encourage teamwork, which can serve individuals well in other walks of life
- strenuous exercise can help reduce stress and releases endorphins in the body, promoting a sense of well-being
- sport promotes a healthy lifestyle, with long-term health benefits – though some sports are inherently dangerous and can lead to serious injury
- sport can offer a lucrative career opportunity to a minority of participants – though the vast majority of sportspeople participate largely for the love of the game

For **society as a whole**:

- the sporting industry is a major business and wealth creator, employing a workforce of many thousands
- sport is a focus for local and national pride, from local leagues to international competitions; though it can also be the occasion of excessive rivalry, sectarianism and even violence
- racism is a feature of some sports, particularly among spectators; though sport has also been used to promote anti-racism campaigns (e.g. 'give racism the red card')
- sport can help create a healthy population, reducing healthcare costs in the long run
- sport is a means of keeping young people 'off the streets', acting as a diversionary activity, and empowering them to take up positive and creative opportunities later in life
- paralympic sports have been important in creating opportunities for people with disabilities, and have helped promote a positive image of disabled people in the wider community
- sport has been used in various political campaigns, with boycotts and demonstrations at sporting events – which might be seen as dysfunctional

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

**06 Explain the scientific principles involved in transplanting human organs.**

**(17 marks)**

- an organ transplant is the removal of a whole or partial organ from one body to another; the purpose is to replace a damaged or failing organ with a working one
- organs that can be transplanted are the heart, the lungs, kidneys, liver, pancreas and small intestine
- other tissue that can be transplanted includes bones, skin, corneas and heart valves
- organ donors can be living or deceased:
  - living donors can donate skin (which is renewable), single kidneys (where the remaining organ can take on the workload of both), and can donate part of other organs, such as their liver, small bowel and pancreas (which can regenerate or take on the workload of the rest of the organ)
  - deceased donors can donate any organ, subject to its condition; death must be confirmed by a doctor separate from the transplant team
- some of the more common reasons for organ transplants include:
  - heart failure or severe coronary artery disease
  - kidney failure (which can be temporarily supported by dialysis)
  - cystic fibrosis, which in some cases requires a double lung transplant
  - liver failure, caused by alcoholism or long-term untreated hepatitis C or hepatitis B
- organs are matched to recipients by blood group and tissue type for compatibility; the best matched transplants result in the best outcomes
- antibodies in the body will reject transplanted organs from other incompatible individuals; immunosuppressant drugs are used to inhibit or prevent activity of the immune system
- although racial origin is not in itself a cause of incompatibility, patients from the same ethnic group are more likely to be a close match; successful transplants are carried out between people from different ethnic groups wherever the matching criteria are met

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

**07 Discuss economic, medical and ethical issues involved in deciding who receives transplants and other scarce health care resources in the NHS.**

**(18 marks)**

**Economic issues**

- health care on the NHS is free at the point of use – which means that treatment is rationed by decisions on economic priorities taken by politicians and managers, and medical decisions taken by doctors, rather than by ability to pay
- the variation in availability of treatment which results from the decisions of different NHS organisations is sometimes said to constitute a ‘postcode lottery’
- the costs of transplants are high, but in some cases (e.g. kidney disease) the cost of transplants and after-care is less than continued treatment by dialysis; the high cost of new drugs (e.g. Herceptin, used in the treatment of breast cancer) means that it is not available for all those with the disease

**Medical issues**

- donation is voluntary by each individual who may carry a donor card, or by agreement with family members after death; the current system requires a person to ‘opt in’ to donation; there is discussion of a system of ‘presumed consent’ in which an individual must ‘opt-out’ if they do not wish their organs to be considered for donation
- there are over 3000 transplants every year in the UK, but more than 1000 people die each year waiting for a transplant. It is estimated that 1200 additional transplants could take place if there were a system of presumed consent
- patients from Asian and Afro-Caribbean backgrounds are more at risk from kidney disease but donation rates from those communities are relatively low, reducing the chances of a successful match being found
- the National Institute for Health and Clinical Excellence (NICE) issues guidance on the use of medicines, treatments and procedures within the NHS; this can be controversial if new drugs are not recommended because of their high cost in relation to efficacy
- there might be concerns about the certification of death for non-living donors – the usual practice is to determine brain-stem death, though in some cases non-heartbeat donation is acceptable
- there can be concerns about the safety of transplants and other treatments, for example in relation to the transmission of HIV or hepatitis

**Ethical issues**

- there is an ethical debate about presumed consent and whether individuals should be able to opt in to donation, or be required to opt out if they so wish
- there can be difficult choices relating to the choice of recipients for transplants or for other expensive or restricted treatments, based on
  - age – should elderly patients with a limited lifespan receive scarce resources?
  - economic importance – should the importance of an individual in the economy have a bearing on their treatment?
  - family – should a parent of several children be treated more favourably than someone with no family responsibilities?

- lifestyle – should patients with an unhealthy or risky lifestyle, for example those who are obese or who smoke and/or drink excessively, be eligible to receive donated organs when there may be other, potentially more successful recipients waiting for an organ?
- some people with particular religious views may refuse to be considered for transplants or to accept blood transfusions or other forms of treatment.

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