



General Certificate of Education

General Studies 1761

Specification A

GENA2 AS Science and Society

Mark Scheme

2009 examination - January series

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.

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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	A	1.16	D
1.2	D	1.17	A
1.3	B	1.18	C
1.4	C	1.19	D
1.5	A	1.20	B
1.6	D	1.21	B
1.7	A	1.22	B
1.8	C	1.23	B
1.9	D	1.24	D
1.10	C	1.25	B
1.11	B	1.26	B
1.12	D	1.27	A
1.13	B	1.28	C
1.14	B	1.29	C
1.15	A	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, in questions 2 – 4 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	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)	<p>Good response to question</p> <p>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 limitation 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>Reasonable attempt to answer question</p> <p>Modest to quite good knowledge and understanding 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>Limited response to the question</p> <p>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>No valid response or relevance to the question.</p>

- 2 (a) Explain why the use of water transport might improve a company's 'environmental standing'.

(17 marks)

When deciding on their transport requirements, companies might consider the **environmental concerns and pressures** that are facing society and the economy:

- it is generally accepted that a significant cause of climate change is large-scale carbon dioxide emissions from industry and transport; aircraft and road transport in particular are significant contributors to CO₂ emissions
- congestion in and around major towns and cities is a major concern for residents and businesses; road transport, especially large lorries used to supply businesses, are a principal cause of congestion
- air and noise pollution is a concern in many urban environments; again, large transport vehicles are a main contributor to local pollution

In deciding on their specific requirements, companies might consider the **environmental advantages** water-based transport has over other forms of freight transport:

- water freight produces much less CO₂ (22 grams per tonne-kilometre) than road transport (59 grams) and even than rail (28 grams)
- overall, water transport is claimed to be four times less carbon intensive than road transport
- water transport also has much lower nitrogen oxide emissions
- water transport can reduce congestion significantly by taking goods off the roads – a single barge can carry as much as 15-20 lorries
- long-distance transport of goods by sea is much more environmentally acceptable than taking goods by air
- water vehicles are much quieter in operation than aircraft, lorries and trains

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.

- 2 (b) Discuss the social and economic issues affecting the transport of freight by road, rail and air.**

(18 marks)

Social issues:

- air freight can bring unusual and exotic products and out-of-season foods to UK consumers all year round; on the other hand, it can be disruptive for people living in proximity to airports
- rail freight is effective in keeping large loads off the roads, reducing congestion and noise for local residents
- road transport ensures quick delivery of goods, and is effective in getting fresh food products to consumers; on the other hand, it generates noise, pollution, causes accidents and its infrastructure results in the loss of land and amenity

Economic issues:

- air freight opens up new markets for developing countries in products such as food and flowers; airports in the UK are a focus for economic development
- air freighted goods have a high cost per unit; airport infrastructure costs are very high; dependence on air freighted goods may distort the economies of developing countries
- rail freight is particularly effective in transporting bulky and non-perishable goods
- rail transport lacks door-to-door flexibility, can be expensive for small items, requires high infrastructure costs which are subsidised by the taxpayer
- road transport can move goods quickly and relatively cheaply and it can deliver direct to an individual's door
- the high cost of road infrastructure and maintenance is paid for by public expenditure, though it benefits private transport companies

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.

- 3 (a) Explain why the operation of mobile phone systems has given rise to concerns about their use**

(17 marks)

Mobile phone operation:

- mobile phones are used for mobile communication, with a standard voice function and, depending on the handset, a variety of other functions, including text messaging, email, internet access and the taking and transmission of photos and video
- mobile phone handsets communicate with cellular base stations through electromagnetic waves in the microwave range
- base stations have relatively low power transmitters which broadcast their presence
- when turned on, a mobile phone handset transmits unique identifiers to the base station with the strongest signal
- base stations (usually located on masts or on high buildings) relay communications between the handset and other sets of the same network or sets of other networks or landline phones via the public telephone system

Concerns:

- because of the microwave radiation, mobile phones have a heating effect on the body (obviously the area around the ear)
- there are claims that excessive use of mobile phones is linked to brain tumours and other cancers
- there are claims that base stations have a negative health impact on those living close by or spending much of their time nearby (e.g. children in schools) – for example, fatigue, headaches, etc
- however, large numbers of studies have found no evidence of adverse health links (see passage)
- other concerns include possible interference of mobile phones with equipment in aircraft and hospitals – though some airlines are installing equipment to allow mobile phone use
- the use of mobile phones while driving is considered to be dangerous because it distracts the driver's attention; it is illegal in the UK
- there is a concern that mobile phones have been used to bully vulnerable young people

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.

3 (b) Discuss the obligations of scientists, politicians and others in taking a 'precautionary approach' to new technological developments.

(18 marks)

The **precautionary approach** is based on the precautionary principle. There are two forms of the principle:

- the **strict** form – if there is a possibility of significant harm, then no action at all should be taken unless or until it can be shown that there is no risk of harm
- the **active** form – if there is a possibility of significant harm, any actions should be limited to a level at which no adverse effects can be predicted, or the best available technology should be used to minimise the risk to a more acceptable level

The **obligations** of scientists, politicians and others might include:

- **scientists** have an obligation to identify any adverse consequences of their work, to seek to minimise those consequence and to enable their work to be peer-reviewed
- **politicians** have an obligation to take decisions which balance the benefits of any new technology with the economic, social and safety costs to citizens
- **others** who have obligations include the following:
 - **companies**, which should not put their profits above the safety of customers and the wider population
 - the **media**, which needs to be accurate and responsible in its commentary on new developments
 - it can be argued that **individual citizens** have an obligation to take a precautionary approach in their own actions

In addition to the use of mobile phones, **areas in which the precautionary approach might apply** include:

- actions with an impact on climate change
- deforestation
- actions affecting biodiversity
- nuclear power
- genetic modification of crops
- new medicines

There have been **criticisms** of the precautionary approach:

- preventing the introduction of a new technology or technique because of possible negative consequences may prevent strongly positive outcomes of that action being achieved
- many technological and medical advances of the 19th and 20th centuries may have been stopped by a strict interpretation of the principle
- because powerful interests are often involved, decisions may be taken on political or economic rather than scientific grounds

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.

4 (a) Explain the kinds of ‘individual behaviour’ that are necessary to maintain good health.

(17 marks)

Individual behaviour to maintain good health should include an appropriate diet, adequate exercise and other lifestyle choices.

Diet

- a healthy diet will include:
 - sufficient calories to maintain activity, but not so many as to lead to the build-up of fat in the body
 - fats, including monounsaturated and polyunsaturated fats and omega oils
 - carbohydrates
 - essential amino acids
 - vitamins and minerals
- these can be found in the following food groups:
 - grains (found in bread, cereals, rice, pasta, etc)
 - vegetables
 - fruit
 - oils
 - milk and dairy products
 - meats and beans
- dietary guidelines suggest consuming five different fruit and/or vegetables a day, and limiting the consumption of red meats

Exercise

- physical activity is important for maintaining physical fitness and can contribute to maintaining a healthy weight, muscle strength, joint mobility and strengthening the immune system
 - aerobic exercise – e.g. running, walking, cycling – is important for building up cardiovascular endurance
 - anaerobic exercise – e.g. weight training – is designed to increase short-term muscle strength
- it is recommended that individuals should take 30 minutes moderate to vigorous exercise a day

Lifestyle

- a healthy lifestyle should avoid:
 - excessive use of refined salts and sugars in food
 - saturated fats, often found in ‘fast foods’ and processed foods
 - tobacco
 - non-medical use of drugs
 - excessive consumption of alcohol
 - unsafe sex

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.

4 (b) Discuss ways in which the ‘causes of health inequalities’ might be tackled.**(18 marks)**

The passage identifies a number of factors which influence health, as well as wider determinants of health. It suggests that tackling health inequalities is about tackling the unequal distribution of these determinants.

- **individual behaviour** might be changed by
 - more and better education on diet, exercise and lifestyle
 - regulations to control/limit less healthy ingredients in foods
 - regulation of fast food outlets / access to alcohol
- **access to health services** might be improved by
 - more emphasis on primary care
 - increased role for community-based health facilities
 - improved education on preventative healthcare
 - arguably, more ‘choice’ in the NHS
- **income** inequalities might be addressed by
 - redistribution of income via taxation and benefits
 - higher minimum wage
- **employment** issues might be tackled by
 - an economic policy which emphasises high-value, high wage jobs
 - getting more people out of long-term unemployment into jobs
 - improved health and safety at work
- **housing** might be improved by
 - demolition of inadequate housing
 - replacement with more ‘affordable’ housing
 - bringing all houses up to ‘decency standard’
- the **environment** might be improved by
 - further measures to control pollution from motor vehicles and aircraft
 - further measures to control pollution from industry

On the other hand, it could be argued that interventionist policies are not the best or most appropriate way of tackling health inequalities:

- health is a matter for personal responsibility and individual choice
- a free-market approach to income, employment, housing and the environment could, in the long run, lead to improved standards of living and improved health

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.