# Teacher Resource Bank

GCE General Studies A

Second Specimen Question Papers and Mark Schemes:

- GENA2

General Certificate of Education
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

# GENERAL STUDIES (SPECIFICATION A) GENA2
# Unit 2 AS Science and Society

**For this paper you must have:**
- a Source Booklet for Section A (enclosed)
- an objective test answer sheet for Section A
- a 4-page answer book for Section B.

You may use a calculator

Time allowed: 1 hour 30 minutes

## Instructions
- Use black ink or black ball-point pen.
- Write the information required on the front of your answer book for Section B. The *Examining Body* for this paper is AQA. The *Paper Reference* is GENA2.
- Answer Section A (Questions 1.1 to 1.30) using the answer sheet provided **and one** question from Section B (Question 2, 3 or 4) in your separate answer book.
- Do any rough work in your answer book.
- Hand in **both** your answer sheet **and** your answer book separately at the end of the examination.

## Information
- The maximum mark for this paper is 65.
- This paper consists of **two** sections.
  **Section A** contains 30 objective test questions based on the material in the separate Source Booklet. There is 1 mark for each question. You will not lose marks for wrong answers.
  **Section B** contains three alternative structured questions. Marks are shown after each question and total 35.

## SECTION A

Each of the 30 questions carries 1 mark.

Read the passage entitled **Democratic Difficulties** which is printed in the separate Source Booklet and answer **Questions 1.1** to **1.30** by choosing the answer represented by the letter **A**, **B**, **C** or **D** that you think best. Mark your responses on your objective test answer sheet.

**1.1** Which of the following pairs shows an r-strategist followed by a k-strategist (paragraphs 2 and 3)?

**A** panda, lion
**B** forget-me-not, bacterium
**C** dandelion, cow
**D** duck, herring

**1.2** Which of the following correctly describes properties of the two different strategies (paragraph 2)?

| | **r-strategy** | **k-strategy** |
|---|---|---|
| **A** | rear their young | have few offspring |
| **B** | large number of eggs | do not rear their young |
| **C** | do not rear their young | offspring quite mature |
| **D** | most mammals | most birds |

**1.3** What is the meaning of cold-blooded (paragraph 2)?

**A** colder than the environment
**B** temperature varies with the environment
**C** warmer than the environment
**D** always at the same temperature

**1.4** Which of the following is a fact rather than an opinion?

**1** If organisms do not reproduce they will become extinct after one generation.
**2** For a species to be more advanced it must operate a k-strategy reproductive style.

Answer

**A** if neither is a fact.
**B** if **1** alone is a fact.
**C** if **2** alone is a fact.
**D** if both are facts.

**1.5** Which of the following must be true when the carrying capacity of a human population is reached?

**1** the birth rate is equal to the death rate.
**2** environmental pressures prevent further growth.
**3** existing medical knowledge cannot reduce infant mortality.
**4** people are generally living longer

Answer

**A** if **1** and **2** only must be true.
**B** if **1** and **3** only must be true.
**C** if **2** and **4** only must be true.
**D** if **1**, **2** and **3** only must be true.

**1.6** The carrying capacity of an environment will remain stable **only** if

**A** the organisms have no predators.
**B** food production is unchanged.
**C** the organisms are not overcrowded.
**D** the environment does not change.

**1.7** The population growth illustrated in **Figure 1** can best be described as

**A** slow, fast, slow.
**B** fast, slow, fast.
**C** a steady increase.
**D** a steady population.

**Turn over for the next question**

**1.8** Which of the following provides the strongest confirmation that the world's population has not yet reached its carrying capacity (paragraph 6 and **Figure 2**)?

**A** The population is getting older.
**B** The birth rate is still high in some places.
**C** The birth rate is falling in some countries.
**D** The graph's curve has not begun to flatten.

**1.9** Referring to **Figure 2** and paragraph 6, approximately how many times greater is today's population than in the year zero?

**A** 5
**B** 20
**C** 50
**D** 100

**1.10** De Wit's 1967 estimate based on photosynthesis of the world's carrying capacity (**Figure 3**) is likely to be wrong because

**A** photosynthesis is dependent on rainfall.
**B** insects and animals eat plants.
**C** many plants cannot be eaten by humans.
**D** humans cannot survive on a plant diet.

**1.11** Looking at the estimates of the carrying capacity for the human population (**Figure 3**), which of the following is likely be the most accurate?

**A** Ravenstein in 1891
**B** Penck in 1925
**C** Hulett in 1970
**D** Kates in 1991

**1.12** The estimates of the world's carrying capacity by Revelle, Clark and Higgins were all larger than those of Ravenstein and Penck over half a century earlier (**Figure 3**). This is likely to be because

**1** food production increased more than was anticipated during the intervening time.
**2** the mathematical model used for the earlier predictions was wrong.
**3** people are living longer than had been expected.
**4** health care is better than would have been predicted.

Answer

**A** if **2** and **4** only are correct.
**B** if **1**, **2** and **3** only are correct.
**C** if **1**, **3** and **4** only are correct.
**D** if all are correct.

**1.13** If the population of a country increases as many people live longer

**A** a large fall in the birth rate would be of little concern.
**B** there could be significant changes in the structure of its society.
**C** a higher proportion of the population is likely to emigrate.
**D** a higher proportion will contribute towards the country's national income.

**1.14** Referring to **Figure 4**, which of the following statements is/are correct?

**1** A high birth rate and a high death rate can produce a low population.
**2** If the death rate falls then the population may rise.
**3** If the birth rate and the death rate both fall then the population must fall.
**4** A low birth rate and a low death rate can produce a high population.

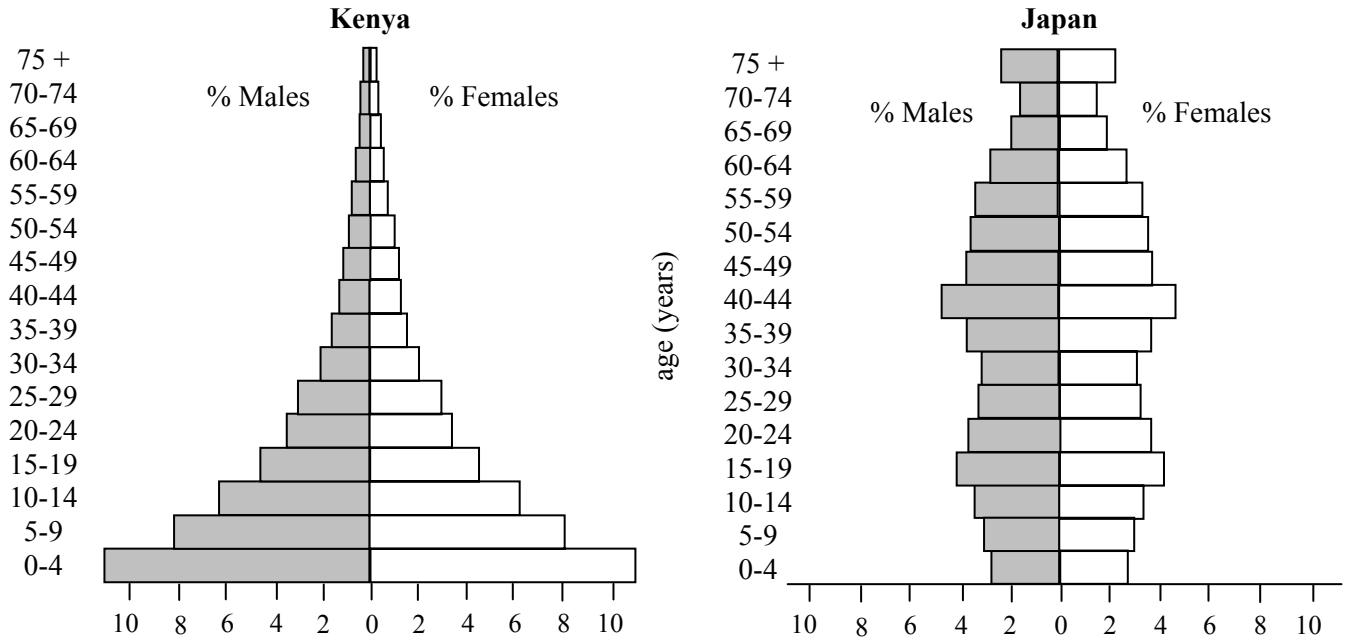
Answer

**A** if **2** and **3** only are correct.
**B** if **1**, **2**, and **3** only are correct.
**C** if **1**, **2** and **4** only are correct.
**D** if all are correct.

**Turn over for the next question**

**Questions 1.15 and 1.16**

Populations can be represented by population pyramids. The diagrams show the population pyramids for Kenya and Japan.




**1.15** Which of the following conclusions is implied by the population pyramids for Kenya and Japan?

**A** Kenya has high maternal mortality.
**B** Japan has high maternal mortality.
**C** Kenya has high child mortality.
**D** Japan has high child mortality.

**1.16** Which of the following statements must be true about demographic transition in Kenya and Japan?

**A** Neither has undergone a demographic transition.
**B** Both have undergone a demographic transition.
**C** Kenya has undergone a demographic transition but Japan has not.
**D** Japan has undergone a demographic transition but Kenya has not.

**1.17** Consider a country with a population of 20 million with a birth rate of 40 per 1000 per year and a death rate of 20 per 1000 per year (as illustrated near the centre of the time line in **Figure 4**). If other factors are not taken into account, in 10 years time the population will have increased by

**A** 400 000
**B** 4 000 000
**C** 8 000 000
**D** 12 000 000

**1.18** According to **Figure 5**, the highest recorded birth rate per thousand of the population in England and Wales since 1700 is

**A** 30
**B** 33
**C** 35
**D** 38

**1.19** India and China acted to lessen their birth rates believing that

**A** economic growth would increase if adults spent less time caring for children.
**B** mass unemployment was likely if the population continued to grow at its previous rate.
**C** a rapidly growing population always restricts a country's development.
**D** HIV would become widespread had they not done so.

**1.20** Assuming that 30% of the population of Zimbabwe are HIV positive, what is the probability that if two people are selected randomly and independently then just one of them will be HIV positive?

**A** 15%
**B** 21%
**C** 30%
**D** 42%

**1.21** If fertility rates are below replacement level in 75% of the world by 2050 (paragraph 10) it implies that

**A** the other 25% will be reproducing rapidly.
**B** population growth will slow.
**C** famine will increase.
**D** demand for clean water will reduce.

**1.22** Which of the following is an opinion rather than a fact (paragraph 10)?

**1** The world's population will continue to increase significantly in the next 50 years.
**2** The maximum length of life will not increase significantly in the next 50 years.

Answer

**A** if neither is an opinion.
**B** if **1** alone is an opinion.
**C** if **2** alone is an opinion.
**D** if both are opinions.

**1.23** Each of the following is a cause of death rates increasing **except**

**A** the number of AIDS cases in Africa continues to rise.
**B** some diseases are becoming resistant to existing antibiotics.
**C** new diseases are always evolving.
**D** people are living longer.

**1.24** The head of the United Nations Population Division has reduced the estimate of the world's population from 9.3 billion to

**A** 9.1 billion.
**B** 9.0 billion.
**C** 8.9 billion.
**D** 6.3 billion.

**1.25** How is the overall conclusion of the passage best summarised?

**A** Urgent measures to increase birth control should be adopted.
**B** The world's population may not grow as quickly as earlier predictions suggested.
**C** People will live longer and longer.
**D** The carrying capacity will soon be reached.

**Questions 1.26 to 1.30**

For each of **Questions 1.26** to **1.30** you are given an assertion followed by a reason. Consider the assertion and decide whether, on its own, it is a true statement. If it is, consider the reason and decide if it is a true statement. If, and only if, you decide that *both* the assertion and the reason are true, consider whether the reason is a valid or true explanation of the assertion. Choose your answer (**A** to **D**) as follows and indicate your choice on the answer sheet.

| **Directions summarised** | | | |
|---|---|---|---|
| | **Assertion** | **Reason** | **Argument** |
| **A** | True | True | Reason is **a correct** explanation of assertion |
| **B** | True | True | Reason is **not a correct** explanation of assertion |
| **C** | True | False | Not applicable |
| **D** | False | – | Not applicable |

| | **ASSERTION** | | **REASON** |
|---|---|---|---|
| **1.26** | Human reproductive style is described as following the k-strategy | because | a lot of energy is used in the rearing of offspring. |
| **1.27** | The fertilised eggs of aquatic animals (paragraph 2) will be suited to the even temperature of water | because | most r-strategy animals are cold blooded and cannot regulate their temperature. |
| **1.28** | According to paragraph 8, more young people going to university will increase the birth rate | because | they will be dependent on their parents for longer. |
| **1.29** | Serious epidemics could reduce the world population | because | the death rate could become greater than the birth rate. |
| **1.30** | The writer implies (paragraph 10) that the world's population will rise | because | a high proportion of people will survive AIDS. |

**END OF QUESTION 1**

**Turn over for Question 2**

## SECTION B

Answer **one Question** from **2**, **3** and **4**.

Wherever possible **use your own words** to show you understand the arguments.

You will be marked on your ability to use good English, to organise information clearly and to use specialist vocabulary where appropriate.

**EITHER**

**2**

Climate change is already happening, and managing its future impact requires a radical de-carbonisation of the economy and a move away from fossil fuels. UN research shows that most of the increase in average global temperature over the past few decades is due to greenhouse gas emissions. Without immediate action, there is a real risk that we will reach a tipping point beyond which uncontrollable climate change will occur.

The Stern Review in 2006 outlined the economic case for action. It estimated that if we do not act, the cost will be 5–20 per cent or more of global GDP each year; whereas, if we do act, the cost of reducing greenhouse gas emissions to avoid the worst impacts of climate change would be around one per cent of global GDP by 2050. The future security of energy supply is another pressing driver for reducing energy use.

Source: adapted from *Report of Climate Change Commission*, Local Government Association, November 2007

(a) Explain the causes and consequences of climate change. (*17 marks*)

(b) Discuss the economic and political issues involved in reducing global carbon emissions. *(18 marks)*

**OR**

**3**

Never before has the threat of intrusion into people's privacy been such a risk. As technology develops within a globalised 24/7 culture, the power exists to build comprehensive insights into our daily lives, and more and more information is accumulated about us. According to one estimate, information about the average working adult is stored on some 700 databases.

The vast majority of information that is held on adults, and increasingly on children, serves a useful purpose and is well intentioned. But everyone recognises that there must be limits. What is the right balance between public protection and private life? How long, for example, should phone and internet traffic records be retained for use by police and intelligence services fighting against terrorism? Whose DNA should be held, and for how long, to help solve more crimes?

Source: adapted from *Information Commissioner's Office Annual Report 2006*

(a) Explain how government and businesses are able to gather information about individuals. *(17 marks)*

(b) Discuss the benefits and problems of large amounts of personal information being held by governments and businesses. *(18 marks)*

**Turn over for the next question**

**OR**

**4**

There were just over three million scientific procedures using animals in 2006. The exact figure was 3,012,032. The number of animals used is slightly less as some animals are used more than once. This does not happen often, and is strictly controlled.

The annual number of animal experiments has almost halved over the last 30 years. This is due to higher standards of animal welfare, scientific advances and stricter controls. There have been small rises in the last five years, so there now seems to be a gradual upwards trend following a few years when the numbers appeared to level off. While UK bioscience and medical research funding has increased in real terms by at least 50% since 1995, animal procedures have risen by just 11%.

Source: adapted from 'Animal Research Facts', Research Defence Society, www.rds-online.org.uk

(a) For what reasons do many scientists consider that animal experiments are essential research methods? *(17 marks)*

(b) Discuss moral, scientific and political issues that arise from the use of animals in scientific experiments. *(18 marks)*

**END OF QUESTIONS**

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**GENERAL STUDIES (SPECIFICATION A) GENA2**
**Unit 2 AS Science and Society**

# Source Booklet

Passage for use with **Questions 1.1** to **1.30**

## SOURCE FOR QUESTIONS 1.1 TO 1.30

Consider the following passage, including **Figures 1** to **5** and then answer **Questions 1.1** to **1.30**.

### Demographic Difficulties

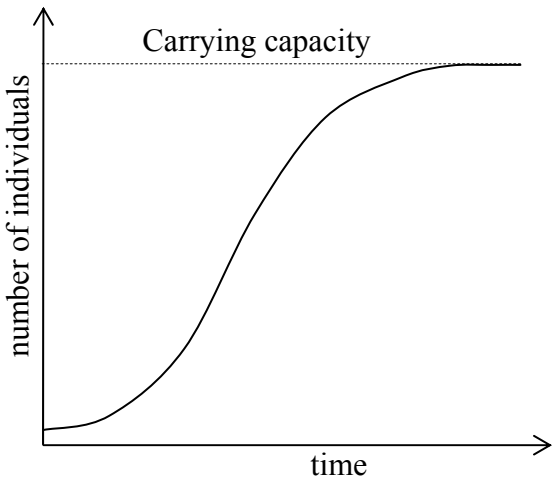
(1) The world's human population has been growing significantly during the last century, and at present is continuing to do so at a significant rate. This growth cannot continue indefinitely, however, and this passage considers some of the issues associated with the size of the world's population in the future.

(2) If organisms do not reproduce they will become extinct within one generation. For reproduction, all organisms use a proportion of the energy they have available to them. They may use this energy to produce large numbers of fertilised eggs, which are then left to develop on their own, or they may produce fewer offspring at a more mature stage, and use more energy to rear them. We describe these alternative reproductive styles as 'r-strategy'– where many offspring are produced, and 'k-strategy' – where the energy is used in rearing. R-strategists tend to be plants, or animals which are both aquatic and cold-blooded, since an aquatic environment will provide nutrients, support and a constant temperature.

(3) K-strategists vary in the number of offspring. For instance, ground-nesting birds often have larger numbers of offspring and at a more developed stage (i.e. able to run about and feed themselves on hatching) than do tree-nesting birds. Parent tree-nesters spend many hours providing food for their relatively undeveloped young.

(4) For all organisms, however, whether r-strategists or k-strategists, in a perfect and limitless environment population size increases exponentially, but in practice when populations reach a certain size environmental pressures prevent further growth. Births and deaths then balance and the population stabilises. The size of this stable population is known as the carrying capacity.

**Figure 1: Pattern of population growth**



(5) Human beings operate a k-strategy, and human infants have a long period of dependency on their parents. The natural gap between offspring is in the region of two years, which implies that each woman is capable of producing in the region of fifteen living offspring. Very few women, however, ever used to reach that maximum and even fewer do so now. In primitive societies the population grows only slowly because of high infant mortality and high maternal mortality, both of which result in the mean number of living offspring per woman falling well short of the maximum. However, even small improvements in public health can cause a rapid population rise as fewer infants and mothers die.

(6) Globally, the human population does not yet seem to have reached its carrying capacity. Estimations of the world's carrying capacity have varied from 1 billion to 1000 billion. Currently the world population is approximately 6300 million and it is estimated that this will rise to about 9 billion by 2050.

**Figure 2: World Population over the last 4000 years**

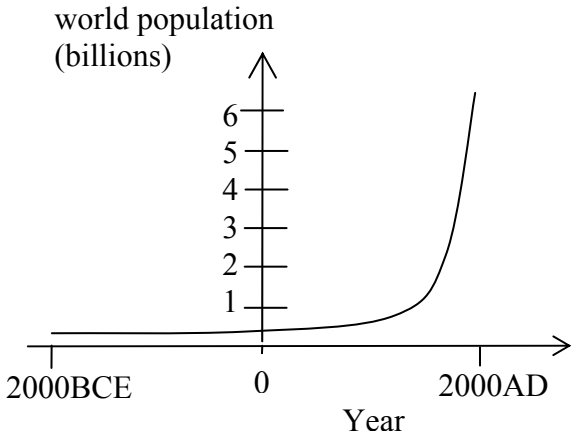
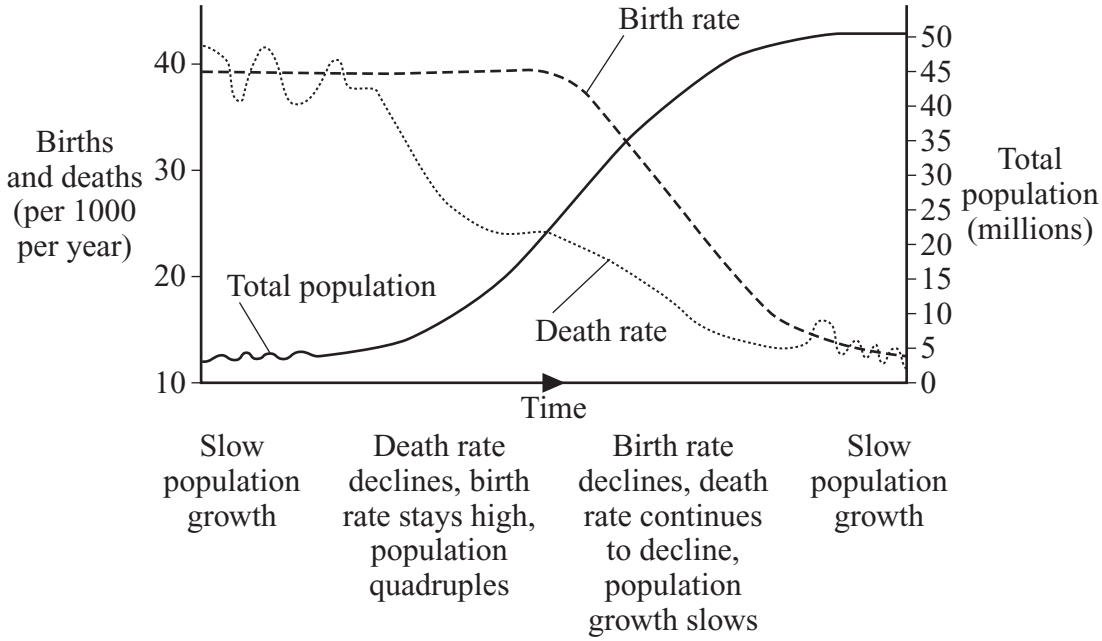



**Figure 3: Estimated world Carrying Capacity**

| **Predictions for the world's future carrying capacity** | | | |
|---|---|---|---|
| **Author** | **Year** | **Predicted carrying capacity (billion)** | **Basis of prediction** |
| Ravenstein | 1891 | 6 | Food production |
| Penck | 1925 | 8–16 | Food production |
| De Wit | 1967 | 1000 | Photosynthesis |
| Hulett | 1970 | 1 | Food production |
| Revelle | 1976 | 40 | Food production |
| Clark | 1977 | 28–157 | Food production |
| Higgins et al | 1983 | 33 | Food production |
| Kates et al | 1991 | 2.9–5.9 | Food production |

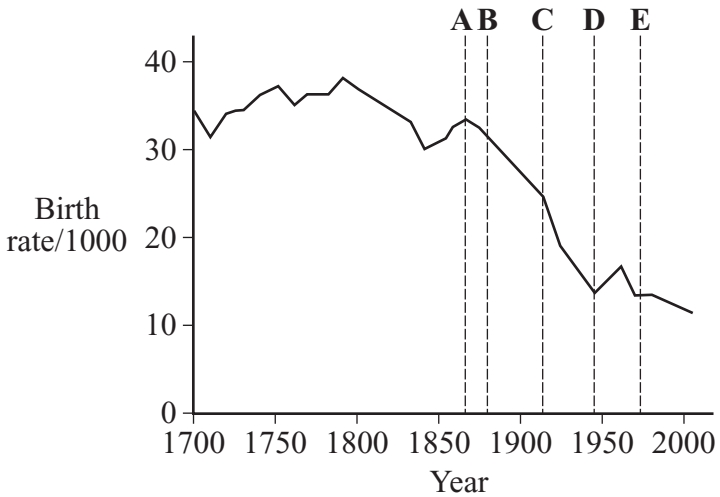
(7) This 'global picture' masks huge variations in population patterns across the world. In many developed countries (including the UK) birth rates are now below replacement levels. Populations are still growing only because people are living longer – they have undergone a demographic transition. This ageing of the population in developed countries has been referred to as a 'demographic time bomb'.

**Figure 4: An example of demographic transition**




(8) Elsewhere, in societies dependent on subsistence agriculture, children are able to contribute to the family welfare from a very young age, and to provide a net gain to the family from the age of puberty. In developed countries, however, the period of dependency of children has been artificially extended. Prolonging the period of dependency increases the demand on k-strategy reproducers and the biological response is to have fewer offspring. This implies that any action that increases the period of dependency, for instance raising the school-leaving age, will result in a lowered birth rate, and that this effect will occur before the later-leaving students themselves reach reproductive age.

**Figure 5: Birth rate in England and Wales since 1700**




**KEY**

A 1870: First Education Act
B 1880: School leaving age 11
C 1918: School leaving age 14
D 1944: School leaving age 15
E 1973: School leaving age 16

(9) Consequently, in recent years most of the world's population growth has come from the less economically developed regions, particularly from China, Africa and the Indian sub-continent. While China has responded with the 'one child' policy and India has used many strategies to encourage the use of birth control, in much of Africa little or nothing has been done.

(10) Is it likely that the world population will increase by almost 50% in the next 50 years? The greying of the population in developed countries will reach its natural halt long before 2050 – all the evidence seems to indicate that while many more people will reach very old age (90+), the maximum length of life is unlikely to be greatly extended. Demographic predictions assume that there is no increase in death rates and that the determinant of population size is the birth rate. However, across sub-Saharan Africa the AIDS epidemic is raging unchecked; in Zimbabwe it is estimated that 30% of the population is HIV positive. Many lethal diseases are developing resistance to the drugs used to treat them, and there is always the possibility of the evolution of a new and untreatable disease. The head of the United Nation's Population Division reduced his 2002 estimate of 9.3 billion by 400 million in March 2003, and it may yet need to be further reduced. He also stated that "fertility rates will be below replacement level in three quarters of the world by 2050".

**END OF SOURCE**

ACKNOWLEGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Figure 1: WT PHILLIPS and TJ CHILTON, *A Level Biology*, Oxford University Press, 1994
Figure 2: KEVIN BYRNE, *Environmental Science*, Nelson, 1997
Figure 3: Environmental Challenges in Farm Management (ECIFM) Website
Figure 4: amended from MICHAEL WITHERICK, *Environment and People*, Stanley Thornes, 1995

ASSESSMENT and QUALIFICATIONS ALLIANCE

## General Certificate of Education

# General Studies

*Specification A*

## GENA2

## Unit 2 AS Science and Society

# Second Specimen Mark Scheme

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams



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*Dr Michael Cresswell Director General*

**GENERAL STUDIES A (AS)**

**SPECIMEN UNIT**

**UNIT 2 : SECTION A**

**List of keys**

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

**Unit 2 Section B (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 AO marks Section B |
|---|---|---|---|---|---|
| Assessment Objective | 1 | 12 | 12 | 12 | 12 |
| | 2 | 8 | 8 | 8 | 8 |
| | 3 | 5 | 5 | 5 | 5 |
| | 4 | 10 | 10 | 10 | 10 |
| Total marks per Question | | 35 | 35 | 35 | 35 |

**GENERAL MARK SCHEME**

| Level of response | Mark Range | Criteria and descriptors for Assessment Objectives 1-4 |
|---|---|---|
| LEVEL 3 | 13-17(18) | **Good response to question**<br>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). |
| LEVEL 2 | 7-12 | **Reasonable attempt to answer question**<br>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). |
| LEVEL 1 | 1-6 | **Limited response to the question**<br>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** |

**Question 1 is an objective test section marked separately by AQA.**

**Question 2**

**2(a) Explain the causes and consequences of climate change.** ***(17 marks)***

**Causes**:

- the greenhouse effect is a natural process by which heat is retained in the atmosphere by greenhouse gases, such as carbon dioxide, water vapour and methane, creating a climate which allows life on Earth to exist in its present forms.
- although there are many influences on climate change, it is widely accepted that human activity, particularly since the beginning of the industrial age, has led to an increase in the amount of these gases in the atmosphere, creating an enhanced greenhouse effect which is having an impact on the Earth's climate.
- the sources of anthropogenic greenhouse gases include:
  - combustion of fossil fuels in power-stations and manufacturing industry produces significant $CO_2$ emissions
  - use of fossil fuels to power transport produces $CO_2$ and (in the case of aircraft) water vapour
  - deforestation by burning (which also has the effect of limiting the reduction of $CO_2$ by photosynthesis)
  - agricultural practises (e.g. rice cultivation, ruminant animals) lead to the production of methane
  - fertiliser use leads to the release of nitrous oxide.

**Consequences**:

- average global temperatures have risen by 0.75$^{o}$C over the last 100 years; estimates of increases over the next 100 years range from 1.1$^{o}$C to 6.4$^{o}$C
- sea-levels are expected to rise (increased water temperature)
- increase in extreme weather events, including flooding and droughts
- melting of glaciers and polar ice caps
- impact on biodiversity – extinction of some species, expansion of others
- effect on agriculture – both positive and negative
- increase in the range of disease vectors, leading for example to the spread of malaria
- an indirect consequence may well by large-scale movements of population, from areas badly affected by climate change to more temperate areas.

Any other valid points should be credited.

**2(b) Discuss the economic and political issues involved in reducing global carbon emissions.**

It is widely accepted that reducing carbon (and other) emissions is necessary to limit the impact of global warming and climate change.

**Economic issues**

- the economic consequences of reducing emissions could include
  - the slowing (or reversal) of economic growth in major economies such as USA
  - the slowing of growth in emerging economies such as China, India and Brazil
  - increased economic conflict between nations
  - high costs of re-engineering manufacturing industry, vehicles, aircraft, etc
  - countries dependent on the production of fossil fuels could suffer reduced income
  - high costs of alternative fuels (nuclear, renewables).

- on the other hand, there could be positive opportunities for economic growth:
  - technological innovation in new vehicle design
  - development of renewable energy.

- the economic consequences of <u>not</u> reducing emissions could include:
  - disruption and costs of damage to infrastructure by extreme weather
  - costs of healthcare to cope with disease
  - loss of food production as a result of desertification, droughts, floods
  - control of and adjustment to large-scale population movements.

**Political issues**

- international political issues might include:
  - difficulty in reaching international consensus on reducing emissions – e.g. Kyoto Protocol (1997) and the UN Conference in Bali (December 2007)
  - the attempt by the US to protect its current pre-eminence by resisting targets for reduction of carbon emissions
  - concerns about the political stability of the main oil-producing regions
  - the demands of developing nations to be able to 'catch-up' with more advanced economies.

- domestic political issues might include:
  - decisions on whether to construct more nuclear power stations
  - decisions on type and location of wind farms, tidal barrages, etc
  - need to improve public transport infrastructure
  - policies to encourage the use of public transport
  - decisions on whether to discourage the use of air travel
  - policies to influence individual behaviour – e.g. on recycling, consumer decisions, etc.

Any other valid points should be credited.

**Question 3**

**3(a) Explain how government agencies and businesses are able to gather information about individuals.** ***(17 marks)***

Information is held by government agencies and businesses on computer databases. These are collections of records or data stored in a computer system so that information may be accessed and cross-referenced with other databases.

- there are a number of government databases holding information, provided by the individual concerned, on taxation, national insurance, pensions and other welfare benefits
- biometric recognition systems are increasingly used, currently on passports and in the future on national identity cards; they are also used by commercial organisations for security purposes
- government agencies hold a variety of types of record – for example, of employees, NHS patients, those convicted of criminal offences, etc
- the national DNA database holds profiles of 3.5 million people in the UK (5.2% of the population), mainly of people convicted of criminal offences, but also of those arrested but not charged or convicted; the information is used to help identify offenders and secure convictions
- credit reference agencies compile databases containing financial information on individuals which is used to determine access to loans and other financial services
- number plate recognition cameras are used to enforce speed limits and the London congestion charge, by linking to the DVLA database
- CCTV cameras record to tape or digitally; they are used in town centres, shops, car parks, residential and play areas, on roads and motorways, stations, airports, in buses and taxis, etc for the purpose of identifying possible offences and for use in any subsequent legal proceedings
- store loyalty cards contain personal details on magnetic stripes which enable stores to gather information on purchases by cardholders to be used for future marketing purposes
- cash machines (ATMs) record the account being accessed via an electronic chip on the card, the user by a PIN number and the time and location; in some locations, security cameras record images of the user
- mobile phone records can show who was called and when, and the location of the caller based on proximity to particular cell base stations

Any other valid points should be credited.

**3(b) Discuss the benefits and problems of large amounts of personal information being held by governments and businesses.** ***(18 marks)***

**Benefits**:

- accurate databases of information are necessary for equitable and efficient operation of the taxation and benefit systems
- vehicle and motorist databases are necessary for the safe operation of the private transport system
- speed and congestion charge cameras are used to ensure the safe and efficient functioning of the road system
- a number of systems are valuable in the prevention and detection of crime (criminal records, DNA database, CCTV, etc)
- biometric passports and (potentially) ID cards are said to be necessary for enhanced security and protection against terrorism
- commercial records can be used for better marketing and improved services for consumers

**Problems**:

- many of these technologies can be seen as an intrusion into personal privacy
- the cost to government of such large databases is very high, and they are not always effective for the purposes for which they were created
- the proliferation of information held digitally has led to rapid growth in crimes of identity theft
- details on databases, both public and private, can be sold to commercial organisations, leading to unwanted marketing pressure on individuals
- information on databases, particularly financial information, may be inaccurate but still be used to the detriment of individuals who are unaware of the inaccuracies
- some minorities may be (or appear to be) targeted – for example, black males are much more likely to be on the DNA database than white males
- there have been a number of cases in which large amounts of data on individuals has been lost, increasing the possibility of fraud and identity theft

Any other valid points should be credited.

**Question 4**

**4(a) For what reasons do many scientists consider that animal experiments are essential research methods?** ***(17 marks)***

Animal experiments fall into three main (and overlapping) categories:

- basic or pure research
- applied research, studying diseases and developing medicines
- toxicological testing of chemicals (safety testing)

Some of the reasons that scientists consider animal experiments are essential for research include:

- animals are useful surrogates for humans in the study of living systems, including cells, tissue and organs
- testing on animals can be used to determine whether a particular drug should be tested on humans
- animals have shorter life and reproductive spans, meaning that several generations can be studied in a relatively short time
- laboratory animals are bred specifically for animal testing purposes, meaning that they will be free of diseases and other factors which might undermine the accuracy of an experiment
- many of the greatest medical advances have been the result of animal experiments – for example:
  - anaesthetics
  - organ transplants
  - vaccines
- current areas of research using animals include:
  - AIDS
  - cancers
  - cystic fibrosis
- there have been significant advances in veterinary science as a result of animal testing

Any other valid points should be credited.

**4(b) Discuss moral, scientific and political issues that arise from the use of animals in scientific experiments.** ***(18 marks)***

**Moral issues** include:

On the one hand

- the view that human beings are unique amongst animals, and are therefore morally entitled to use them for their own purposes
- it is, however, accepted that, while they may be in some sense superior to animals, humans have a moral duty not to inflict unnecessary harm on animals without good cause
- it is morally right that we should seek to develop medical and veterinary science for the relief of suffering, both human and animal
- it would be unethical to test substances or drugs with potentially adverse side-effects on humans without first testing them on animals
- controlled experiments usually require confinement in a laboratory – human beings could not be confined in this way

On the other hand

- there is a different moral view that animals have rights that are equivalent to those of humans, and should therefore be treated similarly to humans
- animals are sentient beings who can experience physical and emotional pain
- animals are incapable of giving reasoned consent to testing
- any potential benefits to human beings have to be set against the harm to animals – the suffering of animals is excessive in relation to any benefits gained

**Scientific issues** include:

- it is accepted by scientists who use animals in this way that they should seek to
  - reduce the numbers used
  - refine their techniques to minimise suffering
  - replace the use of animals wherever possible with other methods of testing
- There is a view that scientific testing is bad science because:
  - animal diseases are not directly comparable to human diseases
  - drugs may have different effects on animals compared to humans
  - the stress of animal testing undermines the validity of the results
- it is argued that scientists can use alternative research methods which do not involve animal testing, for example
  - computer simulations
  - use of cell culture techniques

**Political issues** include:

- governments have accepted that this is an issue requiring regulation, and animal testing in the UK is tightly controlled by legal requirements and restrictions
- despite the legal framework, opponents claim that inspection regimes are not sufficiently strong to prevent abuse
- animal testing has been the focus of pressure group activity and protest actions, sometimes involving violence against people and property

Any other valid points should be credited.