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**General Certificate of Education
June 2010**

GENERAL STUDIES

GENA4

Unit 4 A2 Science and Society

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 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 4 (A2 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 Section B more weight should be given to AOs 1 and 2 than to AOs 3 and 4.
- *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 the highest level.
- A response which bears no relevance to the question should be awarded no marks.

Distribution of marks across the questions and assessment objectives for this unit

Question Numbers		1	2	3	4	AO marks for Sec. A	AO marks for Sec. B	AO marks for A+B
Assessment Objectives	AO1	2	2	3	3	10	8	18
	AO2	6	4	4	4	18	7	25
	AO3	1	4	2	2	9	5	14
	AO4	2	2	2	2	8	5	13
Total marks per Question		11	12	11	11	45	25	70

GENERAL MARK SCHEME FOR SECTION A

Level of response	Mark range	Criteria and descriptors for Assessment Objectives 1 – 4
LEVEL 3	10–11– (12)	<p>Good response to question</p> <p>Good to comprehensive knowledge and understanding 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). 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	5 – 9	<p>Reasonable attempt to answer question</p> <p>Modest to quite good knowledge and understanding 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 conclusion. (AO3). Mostly clear and accurate communication and organisation (AO4).</p>
LEVEL 1	1 – 4	<p>Limited response to 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	No valid response or relevance to the question.

SUMMARY OF SOURCES

SOURCE A

Figure 1 Climate change and energy

Figure 1 shows the contribution of transport to greenhouse gas emissions in the UK and highlights the central political dilemma between building a transport network to support economic growth and the sort of measures necessary to protect the environment.

Figure 2 Greenhouse gas emissions: CO₂

Figure 2 indicates the extent to which transport and communications contribute to total GHG emissions, relative to the contribution of business, industry and residential end users. Whereas emissions attributable to business and residential users have declined between 1990 and 2006, the contribution of transport has risen by 12%.

Figure 3

UK Energy consumption by transport mode and fuel type 1997–2007

Figure 3(a) demonstrates the dominant role of road transport in terms of energy consumption but also demonstrates the growing significance of aviation.

UK average new car fuel consumption 1997–2007

Figure 3(b) suggests that, as new cars develop, they are more efficient in terms of fuel consumption.

Figure 4

Road traffic growth 1949–2006 (selected years)

Figure 4(a) indicates changing patterns of vehicle use since 1949 and underlines the huge growth in cars and light vans on the road.

Road traffic forecasts

Figure 4(b) Projected trends up to 2025 suggest that the previous growth of road traffic will continue in the first quarter of the 21st century.

Figure 5 Explosion in rail use ‘means growth of the network is urgent’

Despite the many media criticisms of rail transport quantitative evidence is overwhelming that, for whatever reasons, rail travel has grown very significantly in recent years, producing great pressure on the existing rail transport network.

Figure 6 Cars or planes?

The growth of cars as the preferred form of personal transport is well documented but there is now greater awareness, particularly since the rise of budget airlines, of the increase in air travel. This has led to growing concern about the contribution of planes to environmental pollution. There are many more cars but, proportionately, air travel can be environmentally more damaging.

SOURCE B Could climate goals survive Heathrow's third runway?

Opinion over whether a 3rd runway should be developed at Heathrow is divided. Supporters include groups likely to benefit through increased trade, business opportunities and jobs.

Political opinion is more divided although opposition from the green movement is unanimous on environmental grounds. Other politicians are concerned about the potential impact of a third runway on the UK's commitment to reduce greenhouse gas emissions.

Both sides can produce sound arguments for and against expansion. A professor of engineering quoted suggests that possible advances in technology may make threats to the environment less dramatic. A research scientist quoted casts doubt on the reliability of such claims.

SOURCE C £100 million road to electric motoring...police, post office and politicians step on the gas

Reports on a financial initiative by Gordon Brown's government to support a new generation of electric public service vehicles together with electric car test drive facilities being made available for members of the public to feed back information on their experience.

According to the writer, such vehicles would have a positive impact on climate change, cut fuel costs, reduce dependency on foreign oil, cut harmful emissions and create jobs.

The author's optimism was, unsurprisingly, shared by environmental campaigners such as Anita Goldsmith of Greenpeace and Tony Bosworth of Friends of the Earth. No reference is made to critics of electric cars.

SOURCE D Are electric cars the answer to the growing environmental problems?

The writer opens by referring to a Chris Paine drama-documentary film called *Who Killed the Electric Car* which has revived the debate about whether more effort should be made to develop and promote environmentally-friendly electric-powered vehicles particularly as new prototypes are emerging.

Unlike Source C, Source D includes points both for and against electric cars but the writer doesn't seem to answer his own question, perhaps because the article is insufficiently analytical.

The nearest he gets to a conclusion is the use of a single argument pointing the reader to the extent that a supposedly pollution-free vehicle will still be indirectly responsible for pollution because of its dependence on a source of battery recharging.

SOURCE E Running out of road?

Written just over a fortnight before a referendum took place in Greater Manchester which, in its single question, would be a test of whether local residents would support a congestion charge for a number of vehicles entering the city at peak working times.

An affirmative vote, if it satisfied certain conditions, would trigger significant additional funding for the city to invest in improving public transport – particularly the bus and metro systems. A rejection of the plan would mean no congestion charges for individual motorists – at the cost of preventing additional government financial aid towards improving public transport.

The article gives the views of both 'Yes' and 'No' campaigners and indicates that public opinion appeared to be evenly divided (although this was manifestly not the case when the vote took place on 11 December and the proposal was overwhelmingly rejected in all 10 areas of Greater Manchester).

SOURCE F Has the congestion charge been effective in reducing London's traffic?

This is the withheld source on the London congestion charge and helps to supplement information provided in Source E on a proposed scheme in Manchester.

Poses four questions relating to the establishment and impact of the congestion charge in London.

Why are we asking this question now?

(Proposals by the then mayor to introduce higher charges for gas-guzzling vehicles.)

Has the scheme cut traffic and is there less congestion?

(In the short-term it did – opinion divided over longer term effects. Pattern of London transport has changed – fewer individual vehicles but more taxis, coaches etc.)

What is the revenue from the scheme used for?

(Transport for London administers the scheme and must ensure that any "profit" is invested in public transport improvements.)

Has business in London suffered?

(Difficult to isolate the effects of the charge on business. Not surprisingly, retailers have not supported the scheme.)

SECTION A

01 Using the data and other information in Source A on transport and environmental concerns, consider how far new technology and government policies can address these concerns.

(11 marks)

- There are six separate figures in Extract A, each providing data and comments which might be used to identify transport and environmental concerns. Level 1 answers may be very brief/narrow and/or have a tendency to re-write the data/comments descriptively.
- Level 2 answers are likely to cover most of the Figures in Extract A, perhaps with a combination of some descriptive writing and some analytical comment in the context of identifying transport and environmental concerns and considering how these might be addressed.
- Level 3 answers will use data and information from almost/all Figures in Source A with clear and relevant interpretation and analysis leading to a logically argued conclusion about how transport and environmental concerns might be addressed.

Indicative content (key concerns arising from the data and other information in Source A)

- Increase in transport-generated greenhouse gas emissions.
- How to balance an effective transport system and concern about the environment and quality of life.
- Marked increase in number of vehicles on the road and consuming non-renewable oil-based resources, leading to congestion.
- Significant rise in rail travel putting pressure on the rail network.
- Growth in air travel and its impact on the environment.

Indicative content (use of changing technology and making political policies effective)

- Further improvement of fuel consumption as new vehicles are developed.
- Development of more non-oil based fuel technologies for motor vehicles.
- Greater adherence to 'green' taxation policies relating to both motor vehicles and air travel.
- Higher priority given to link between transport and the environment, and environmental affairs generally.
- Future of congestion charges.
- More investment in railway rolling stock, lines and stations.
- Clearer policies in relation to future growth of air travel.

Conclusion

The problems are fairly clear: too many vehicles on the road; rapid growth in air travel; environmental concerns; railway pressure points leading to overcrowding etc. There appears to be more concern about harming the environment and global warming but restrictions on travellers are electorally unpopular especially if they involve increased charges/taxation. Although alternatives to petrol driven engines exist their development is small-scale and slow. There are no immediate solutions that don't involve a combination of substantial investment and personal sacrifice – neither of which will be attractive to travellers.

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.

A candidate who uses only Figure 1 will be limited to the top of Level 1.

02 Using information from Source B and your own knowledge, consider how far the construction of a third runway at Heathrow is justified.

(12 marks)

- Candidates who write in a very brief, or mainly descriptive (and/or general) fashion about the construction of a third runway at Heathrow are likely to be placed in Level 1.
- Those who demonstrate some limited analytical and critical awareness of some of the arguments and counter-arguments relating to the construction of a third runway at Heathrow will reach Level 2. (Candidates relying entirely on Source B, or entirely on own knowledge, limited to Level 2.)
- Those who provide critical analysis over a wider range with a clear focus on a wider range of arguments and counter-arguments, leading to a conclusion relating to the construction of a third runway at Heathrow will be placed in Level 3.

Indicative content (Source B) in favour of third runway

- Third runway will lead to considerable expansion of the airport and its facilities.
- Good for business, extending links especially to expanding areas such as India and China.
- More jobs will be created.
- Engineering and technological improvements will reduce less desirable consequences of expansion.

Indicative content (Source B) against third runway

- Significant increase in flights will increase unwanted gas emissions, such as CO₂, which will damage the environment.
- This is incompatible with the government's policy to fight against climate change and meet its commitments to reduce greenhouse gas emissions.
- Engineering and technological developments difficult to quantify and may not improve aircraft design and technology as much as is claimed.

Own knowledge

- Inevitable and necessary given growing popularity of air travel and pressure on exiting facilities at Heathrow.
- Will increase Heathrow's capacity by 50%.
- Greater traffic congestion in the area.
- Noise for local residents.
- Demolition of nearby properties.
- Political divisions within Labour Party. Conservative opposition may lead to scrapping of runway if they come to power and can afford compensation.
- Issues associated with direct action taken by opponents.

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 Using evidence from Source C and D examine the likelihood of the increased development and use of electric vehicles in the UK.

(11 marks)

- Level 1 answers might write in brief and/or general terms about the development of electrically-powered vehicles.
- Level 2 answers are likely to contain some limited analysis and assessment of the possibilities of the larger-scale development of electrically-powered vehicles in the UK.
- More developed answers, at Level 3, are likely to demonstrate a clear and informed understanding of a range of factors relating to the possible development of electrically-powered vehicles on a larger scale in the UK, leading to a logically-argued conclusion.

Indicative content (Sources C & D)

- ✓ Financial support for their development by government. (C)
- ✓ Test-drive facilities for electric cars to be established at locations throughout GB. These will allow for public feed-back. (C)
- ✓ 'New generation' of electric public service vehicles to be introduced with government financial support. (C) / emergence of attractive recently developed vehicles such as Tesla Roadster and Audi-R-Zero. (D)
- ✓ More people might be inspired to use electric vehicles because of growing pressures to reduce carbon emissions. (C/D)
- ✓ Offer a quieter ride than conventionally-powered vehicles. (D)
- ✓ Less expensive maintenance than conventional vehicles. (D)
- X Powerful self-interested lobbying of the car industry. (C)
- X Sums promised by government for further research and development are relatively small in transport terms. (C)
- X Can cover only limited distances before needing a re-charge. (D)
- X Limited driving range between charging stations. (D)
- X Electric cars only transfer the point of pollution/will need electricity from renewable sources to be truly 'green'. (D)

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.

04 Using information from Sources E and F and your own knowledge, assess the strength of the case for the extension of congestion charging in British cities.

(11 marks)

- Level 1 answers are likely to rely more on narrative and a brief/generalised approach identifying only a few issues with limited use of sources.
- Level 2 answers will use one or both sources to identify and provide some limited analysis relating to congestion charges based on evidence from London and the failed vote in Manchester.
- Level 3 responses will do this in a more developed and evaluative way using both sources and offering a wider perspective based on evidence from London and the failed vote in Manchester.

Indicative content

Source E (and beyond)

- This was a crucial exercise in local democracy with a relatively clear choice in a complex area of policy. A 'Yes' vote would bring a substantial sum for investment in Greater Manchester's public transport system. It would also bring a congestion charge at busy times in central Manchester. A 'No' vote would mean no congestion charge but no large-scale investment in public transport.
- The outcome of this local referendum could not have been clearer. Voters in all ten constituent parts of Greater Manchester voted overwhelmingly against change. (When a congestion charge was first imposed in London, there was no separate referendum on the policy.)
- Does this mean that any other city contemplating a congestion charge will hold a referendum? How far are those who turn out to vote motivated more by personal interest than by a wider notion of the public good?

Source F

- The congestion charge was undoubtedly a bold move by Ken Livingstone when he was first elected mayor of London in 2000.
- Prior to the introduction of the charge, London suffered from extreme peaks of congestion with a growing economic, social and environmental impact.
- Initially, at least, there was a significant impact on traffic volume.
- Surpluses generated have provided TfL with additional funding to invest in public transport.
- Initial reductions in traffic volume have not been maintained and, to some extent, the nature of traffic has mainly been re-distributed so that congestion remains.
- The charge is likely to be a deterrent for shoppers, thus damaging some central businesses.

Own knowledge

- Bold political gestures such as Ken Livingstone's need to be supported if combating climate change is ever to become a reality.
- Such schemes help to raise funds for re-investment in transport improvements.
- Politicians should listen more to the views of the people – as expressed in the Manchester referendum.
- Motorists are already heavily taxed.

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.

GENERAL MARK SCHEME FOR SECTION B

Each essay should be awarded a single mark out of 25. In awarding the mark examiners should bear in mind the overall assessment objectives for General Studies (see INTRODUCTION above) which the essay questions are intended to test in the following proportions:

AO1 – 8 marks

AO2 – 7 marks

AO3 – 5 marks

AO4 – 5 marks

Level of response	Mark range	Criteria and descriptors: knowledge, understanding, argument, evaluation, communication
LEVEL 4	20 – 25 (6)	Good to very good treatment of the question Wide ranging and secure knowledge of topic (AO1); good range of convincing and valid arguments and supporting illustrations, effective overall grasp and logically argued conclusion (AO2); good understanding and appreciation of material, nature of knowledge involved and related issues (AO3); coherent structure and accuracy of expression (AO4).
LEVEL 3	13 – 19 (7)	Fair to good response to the demands of the question Reasonable knowledge of topic (AO1); a range of arguments with some validity, appropriate illustrations with reasonable conclusions (AO2); some understanding and appreciation of material, nature of knowledge involved and related issues (AO3); mostly coherent structure and accuracy of expression (AO4).
LEVEL 2	6 – 12 (7)	Limited to modest response to the demands of the question Limited/modest knowledge of topic (AO1); restricted range of arguments and illustrations but some awareness and attempt at conclusion (AO2); little understanding and appreciation of material, nature of knowledge involved and related issues (AO3); weak structure and variable quality/accuracy of expression (AO4).
LEVEL 1	1 – 5 (5)	Inadequate attempt to deal with the question Very limited knowledge of topic (AO1); little or no justification or illustration, no overall grasp or coherence (AO2); inadequate understanding and appreciation of material, nature of knowledge involved and related issues (AO3); little or no structure/frequent errors of expression (AO4).
LEVEL 0	0	No valid response or relevance to the question

Section B questions are set in two related parts. Candidates need to answer both parts of the question well to gain access to a Level 4 mark. An unbalanced response with one part answered well and the other less well could only gain access to a maximum Level 3 mark.

If a candidate only answers one part of the question the maximum mark available will be 15.

SECTION B

05 'Rural life might be ideal for the retired and the elderly, but for young people it means isolation and boredom. For young people at least, city living offers many more opportunities and few disadvantages.'

To what extent do you agree or disagree with this statement?

Discuss the difficulties of adapting to a different environment and new style of life.

Indicative content (...agree or disagree...?)

- It is probably very unwise to over-generalise or to use stereotypes when dealing with rural life. Younger people's reactions might depend on what they are used to.
- Many people have a dream of rural life, escaping from the 'rat race' and leading a less-stressful existence in 'chocolate box' surroundings.
- Plenty of people enjoy life in rural surroundings – and it is not necessarily the case that such people are necessarily the retired and the elderly. There are fewer pressures and some people like the opportunities to get involved with local organisations.
- Much may depend on the financial circumstances of rural dwellers. Seemingly 'sought after' areas like Cornwall have some of the worst poverty in the UK.
- Communications are important. Broadband has transformed life in many respects but the absence of a car can be a considerable handicap. Public transport may be very limited or non-existent.
- In some areas the preponderance of 'second homes' has contributed to the demise of rural schools, pubs, shops and post offices. In other areas there might still be more of a community feel.
- Some people may find it necessary to leave a village, whether they wish to or not, because of the shortage of affordable housing to buy or rent.
- On the surface, city life may have many attractions for younger people seeking a more varied social and cultural life.
- City life also has its downsides e.g. traffic and crime, whereas the countryside may offer opportunities for outdoor activities.

Indicative content for (Discuss the difficulties...)

- Challenge and excitement may be counter-balanced by fear or uncertainty.
- Older people may become more conservative and less willing to experience change.
- Moving can be an expensive process, particularly for families.
- Accommodation can be a major issue especially in a sluggish housing market.
- Family ties and friendships may have to be broken. Moving might result in dislocation and loneliness.
- Cultural differences might arise depending on the distance involved in the move and the change in surroundings.
- The experience of moving to study at university might be cited – something that many young people might view with mixed feelings.
- Boredom in rural areas can lead to anti-social behaviour.

Conclusion

Much will depend on the personal experiences and outlook of the writer. Typically, young people might well look with a sense of anticipation at what they consider to be the attractions of city life. Alternatively they might feel that the drawbacks may at least be equal to the supposed advantages.

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 'The problem with many contemporary advances in science and technology is that the changes they create produce anxiety and insecurity and often lead to unemployment.'

Using specific examples, consider how far contemporary advances in science and technology produce change that is threatening to the individual and society.

Discuss the possible consequences of unemployment for the individual and family life.

Indicative content (Consider how far contemporary changes...)

- Much will depend on the specific examples chosen. The case can be argued both ways and reference to 'contemporary' in the question should lead to examples from the last thirty years.
- It can be argued that new ideas and developments are exciting and challenging. Life does not stand still and innovation is often welcome and stimulating.
- New ideas and developments can present different opportunities.
- Conversely, jobs can be threatened if older techniques are replaced/mechanised. Much may depend on the outlook of the individual, degree of adaptability and their age / personal circumstances.
- The number of new jobs that can be created is not infinite. Increasingly, those who lose out will be those with the least educational qualifications and limited skills. Change may be particularly threatening for people in these categories. They may feel alienated and this could contribute to crime or mental illness.
- New opportunities might not be evenly distributed geographically.
- There are many causes of unemployment.

Indicative content (Discuss the possible consequences of unemployment...)

- Younger people may have limited knowledge/experience of unemployment given the relatively low unemployment rates of the period from 1997–2007.
- The situation changed during 2008 and into 2009 with the disappearance of High Street names such as Woolworths (which employed 27 000 people) and savage cuts even among the workforce of the highly efficient and productive workforce in the Nissan plant at Sunderland.
- The most immediate impact is on an individual/family income. Despite tabloid reports to the contrary, state benefits offer only a minimum income guarantee so the unemployed are likely to suffer a sharp decline in living standards. Those without savings can soon get into debt.
- Some of those unable to find alternative employment – the less skilled, older workers and those living in parts of the country with limited employment opportunities – may lose their home if they cannot keep up mortgage payments.
- Great strain may be put on relationships when families experience the effects of unemployment.
- The psychological effects of unemployment – the bewilderment and depression – are well documented.

Conclusion

Change is going to happen and it will be enthusiastically embraced by some and resisted by others. Change is likely to mean learning new skills and modifying existing lifestyles – to a greater or lesser degree. In a competitive, global economy no country can afford to standstill or it will be overtaken by a more efficient competitor. There is much in the slogan ‘adapt or die’ – whether we like it or not.

The effects of unemployment are well documented particularly during the depression of the mid 1920s and 30s and the industrial and economic re-shaping associated with Thatcherism in the 1980s. Very few economic pundits would be bold enough to predict how much unemployment will grow in 2009–2010 and the reactions of those who have experienced a 10-year boon between 1997–2007. With the UK economy officially ‘in recession’ in early 2009, some predictions suggest that unemployment will be over 3 million by 2010.

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 'There has been considerable debate in recent years about the origins of life on Earth. Disagreement is particularly marked between supporters of the theory of evolution and those who believe in creationism or intelligent design.'

Examine the main differences between evolution and creationism.

Discuss the case for teaching creationism or intelligent design as part of the science curriculum.

Indicative content (differences between evolution and creationism)

- Many scientists see evolution as a fact rather than a theory. For them, it provides the cornerstone of all modern biology.
- Scientists who support evolution point to the major scientific studies of Charles Darwin and, in particular, the publication of *On the Origin of Species by Means of Natural Selection* in 1859.
- Evolutionists supported Darwin's idea of natural selection, based on genetic characteristics and 'the survival of the fittest' which went against any form of divine plan which caused considerable controversy.
- If evolution is a fact it runs completely counter to creationist theory which is based principally on interpretations of the Old Testament Book of Genesis. One definition of creationism is 'a doctrine or theory holding that matter, the various forms of life, and the world were created by God out of nothing and usually in the way described in Genesis.'
- At its most basic, creationism is the belief that the universe was created by a deity. After that, there are different interpretations among creationists (e.g. New Earth creationists and Old Earth creationists).
- Neo-creationists have introduced intelligent design – a more refined version of creationism.
- The creationist movement is particularly strong in the USA's southern states where it is well organised and funded. Support in the UK is less common but increasing.

Indicative content (Discuss the justification...)

- There is no universally accepted definition of science but helpful guidelines include 'the systematic study of the structure and behaviour of the physical and natural world through observation and experiment'.
- The debate often centres not on whether creationism should be taught in schools but whether it should be taught as part of the *scientific* curriculum.
- Many secularists and scientists believe that creationism is a religious belief rather than an aspect of science that can be tested.
- In 2007, Professor Michael Reiss, Head of Science at London's Institute of Education, said that some teachers avoid the subject altogether because they are fearful of entering the debate. He also estimated that 10% of people in the UK believed in creation stories.
- Reiss (a CofE priest as well as a scientist) argued that, because of the growing numbers of students supporting creationism, there was some value in comparing creationist with evolutionary ideas if only to demonstrate how science, unlike religious beliefs, can be tested – the difference between scientific theory and a belief.
- Although adamant that creationism is not a science, Harry Stopes-Roe, Vice President of the British Humanist Association argues that when religions make factual claims they should be given scientific investigation.
- Others argue that the teaching of creationism should be confined to Religious Studies lessons.

- Various US court decisions have featured in the evolution v creationism debate. A landmark case (Edwards v Aquillard) took place in 1987 when the US Supreme Court held that the state of Louisiana's 'Creationism Act' was unconstitutional.
- A similar ruling against intelligent design was made in 2005 following the US district court case of Kitzmiller v Dover Area School District. The judgement ruled that efforts of supporters of intelligent design to have their beliefs included in the science curriculum represented an effort to circumvent the establishment clause of the US Constitution, which demands the separation of the Church and State.
- The UK does not have a written constitution. The most recent guidelines for teachers from The Department for Children, Schools and Families (DfCSF) state that 'creationism and intelligent design are not scientific theories nor testable scientific fact – and have no place in the science curriculum but we advise science teachers that when questions about creationism come up in lessons, it provides an opportunity to explain or explore what makes a scientific theory.'
- According to Professor Reiss in 2008, 'creationism has no scientific validity but this does not stop some people believing that it does'. After considerable criticism, not least from militant atheists such as Richard Dawkins, Reiss stepped down from his post as education secretary of the Royal Society.

Conclusion

Perhaps it is dangerous to compartmentalise and label knowledge as 'science' or 'religion'. The main fear of opponents of creationism is that teaching it within the science curriculum gives creationism the validity of science. Creationists claim that there is scientific evidence to support their theory.

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.

08 'Despite birth control programmes, population growth in many Less Economically Developed Countries continues largely unchecked resulting in continuing poverty and putting greater pressures on aid organisations and governments.'

Explain why it has proved difficult to slow down population growth in some parts of the world.

Discuss the consequences of continued rapid population growth in developing countries

Indicative content (Explain why it has proved difficult...)

- The world's current annual population growth is about 1.14% but most European countries have low growth rates (often <1%) whereas many Asian and African countries have significantly higher growth rates.
- Nearly all world population growth is now concentrated in the world's poorer countries (characterised by high birth rates, high maternal mortality and low life expectancies).
- The demographic divide – inequality in the population and health profiles of rich and poor countries – is widening. In 2008, world population was 6.7 billion (double the 1960 figure): 1.2 billion in regions classified by the UN as more developed and 5.5 billion in less developed regions.
- Global population is projected to rise to 9.3 billion by 2050. Such projections can only be reduced by conscious efforts to limit growth through sex education/birth control or 'family size limit' policies such as those pursued by China (which has created a serious gender imbalance).
- The sheer scale of population growth in the least developed countries makes population growth difficult to tackle. To stop world population growth, fertility worldwide would have to fall to 1.57 children per woman. In countries like Afghanistan and the Democratic Republic of Congo the figure is currently closer to 5.
- In 1994, the UN made a commitment to better sex education and birth control advice but millions of unwanted pregnancies still occur in developing countries and, in some, abortion is banned.
- Birth control and sex education programmes need to be comprehensive, embracing sexuality, health, family planning and contraception, hygiene, child bearing.
- India has one of the oldest family planning programmes, starting in the 1950s. Since then population growth has slowed but not by as much as supporters of birth control anticipated.
- There is opposition in some Catholic and Muslim countries to greater emphasis on birth control and its teaching. It is argued that all children are a gift from God and it is very difficult to change established attitudes and beliefs.
- Money is often an issue. Richer donor countries rarely spend what they promise on birth control and sex education. In 2008, the World Bank called for better and expanded sex education in developing countries.
- Countries with high rates of population growth often have large numbers of poorly educated people, some of whom take their beliefs from local cultures and superstitions. Having a large family might provide support in old age.

Indicative content (Discuss the consequences of...)

- In less developed countries, it is estimated that at least 20% of the population is undernourished. Reports from the UN and the World Bank suggest that over 3 billion people in the world live in abject poverty with 1/3rd of them continuing to suffer from severe malnutrition and starvation.

- Increased population increases the need for food, infrastructure and services – expenses that most high-growth countries find it difficult to meet.
- Family support structure especially in sub-Saharan Africa and governments, even where stable, struggle to provide their people with basics such as food, clothing and shelter.
- Large families are often seen as a means of support in old age but are a serious hindrance to economic expansion.
- Europe's share of world population growth fell significantly between 1950–1995 from 21.7% to 12.8% – and is projected to shrink to about 6.8% in 2050.
- The European population is also an ageing one and countries will need to devote a higher proportion of their spending on meeting the needs of their own elderly – perhaps with implications for financial support to other countries.
- Great advances have been made in technology with significant improvements in agricultural output through improved use of seeds, fertiliser, irrigation and machinery.
- The contribution of GM crops has considerable potential but uncertainty still surrounds its more widespread use.
- Rapidly growing populations are particularly vulnerable in times of natural disaster, the impact of global warming or disruption in times of internal conflict.
- In a period of global recession, developed countries may find it more and more difficult to offer financial support to developing nations.

Conclusion

There are many difficulties – political, economic, moral and religious in slowing down population growth in developing countries. As more developed countries grapple with the problem of an ageing population, developing countries have a lower life expectancy and a higher proportion of young people.

If population growth continues as predicted, and particularly if it is combined with the extremes of weather frequently associated with global warming, the consequences of increased flooding, drought, disease, population movement, political instability and aid will loom large by 2050 or earlier yet there are few signs that the barriers to limiting population growth will diminish.

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.