



A-LEVEL

General Studies A

Unit 4 (GENA4) A2 Science and Society
Mark Scheme

2760
June 2016

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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.
- Mark schemes for individual questions worth more than just a few marks are usually based on **levels** (see further guidance below) 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.
- **Answers given in the mark scheme are not necessarily definitive. Other valid points must be credited, even if they do not appear in the mark scheme.**

Approximate distribution of marks across the questions and assessment objectives for this unit (**GENA4**)

Question Numbers		Q1	Q2	Q3	Q4	AO marks for Sec. A	AO marks for Sec. B	AO marks for A+B
Assessment Objectives	AO1	3	3	2	2	10	8	18
	AO2	5	4	4	5	18	7	25
	AO3	2	2	3	2	9	5	14
	AO4	2	2	2	2	8	5	13
Total marks per question		12	11	11	11	45	25	70

Levels of Response marking

1. It is essential the **whole response is read** and allocated the level it **best fits**.
2. Marking should be positive, rewarding achievement rather than penalising for failure or omissions. The award of marks must be directly related to the marking criteria.
3. Levels are tied to specific skills. Examiners should **refer to the stated assessment objectives** (see above) when there is any doubt as to the relevance of a student's response. When deciding upon a mark in a level examiners should bear in mind the relative weightings of AOs (see AO grid above). For example, in Sections B essays, more weight should be given to AOs 1 and 2 than to AOs 3 and 4.
4. Use your professional judgement to select the level that **best** describes a student's work; assign each of the responses to the most appropriate level according to **its overall quality**, then allocate a single mark within the level. Levels of response mark schemes enable examiners to reward valid, high-ability responses which do not conform exactly to the requirements of a particular level. Length of response should not be confused with quality: a short answer which shows a high level of conceptual ability, for example, must be recognised and credited at that level.
5. **Credit good specialist knowledge when it is applied appropriately to the question, but be aware that the subject is General Studies and responses should be addressed to the general reader. Relevant points that are well developed and substantiated should be well rewarded, as should be arguments that are supported with examples, and not just asserted.**
6. **Answers should be assessed at the level that is appropriate to the expected knowledge and skills of a post-16 General Studies student. Avoid applying greater demands to responses on topics that are more closely related to your own specialist knowledge.**

Assessment of Quality of Written Communication (QWC)

7. Quality of written communication will be assessed in all units where longer responses are required by means of **Assessment Objective 4**. If you are hesitating between two levels, however, QWC may help you to decide.

Determine a mark

8. Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.
9. You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.
10. Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.
11. An answer which contains nothing of relevance to the question must be awarded no marks.

Marking methods

All examiners **must** use the same marking methods. The following advice may seem obvious, but all examiners **must** follow it as closely as possible.

1. If you have any doubt about which mark to award, consult your Team Leader.
2. Refer constantly to the mark scheme throughout marking.
3. **Always** credit **accurate, relevant and appropriate** answers which are not given in the mark scheme.
4. Do **not** credit material irrelevant to the question, however impressive it might be.
5. If you are considering whether or not to award a mark, ask yourself... 'Is this student nearer those who have given a correct answer or those who have little idea?'
6. Read the guidance on the previous page about **Levels of Response marking**, and constantly refer to the **specific Level Descriptors** in the mark scheme.
7. **Use the full range of marks**. Don't hesitate to give full marks when the answer merits them (a maximum mark does not necessarily mean the 'perfect answer') or give no marks where there is nothing creditable.
8. No half marks or bonus marks can be given under any circumstances.
9. The key to good and fair marking is **consistency**. Once approved by your Team Leader, do **not** change your standard of marking.

Marking using QMS+ (red pen on script)

This unit will be marked on the actual script using a red pen. Scripts in your allocation will be posted to you from the school. The marks you award are recorded on the scripts and the marks for each question are entered into the QMS+ software.

1. Mark the full script in red pen.
2. **You must** annotate in the body of the response to acknowledge a creditworthy point.
3. At the end of the response **you must** indicate the level and mark and write a summative comment (see MMS).
NB. Schools/Colleges can request scripts back post results (via Access to Scripts); it is therefore **essential** that the annotation/comments are appropriate, relevant and relate to the mark scheme.
4. Enter the marks for each question in to the QMS+ software.
5. Your assessments will be monitored to ensure you are marking to a consistent standard.
6. Any blank pages in the answer book should be 'ticked' to indicate you have checked the whole booklet for a response.
7. Your administration and meeting deadlines will also be monitored.

Levels mark scheme for SECTION A (for Questions 01 to 04)

Levels	Marks	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 a 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>
	0	No valid response or relevance to the question.

- | | |
|----------|----------|
| 0 | 1 |
|----------|----------|
- Using the data and information in **Source A (Figures 1–5) only**, assess the extent to which animal species are affected by the rising human population.

[12 marks]

Specification reference: 3.6.1 , 3.6.7

Refer to the ‘3 Levels mark scheme’ for Section A on page 6

Candidates should be able to achieve marks in the highest level by using a selection of relevant points, not necessarily the complete range.

In Question 01, only information contained in Source A should be credited.

In Source A, there are Figures 1 to 5.

Candidates need to address all aspects of the question in order to achieve a L3 score – candidates will need to discuss issues relating to the extent to which animal species are affected by the rising human population.

- **Level 1** answers may be very brief/narrow and/or have a tendency to re-write the data/information descriptively instead of using the data/information more analytically to build a realistic assessment of species survival. Candidates who only use one figure will not reach Level 2. At Level 1, candidates will only provide a superficial outline maybe repeating materials from the source.
- **Level 2** answers are likely to refer to at least half of the figures in Source A, with a combination of some descriptive writing and some analytical comment in the context of building a case of species survival.
- **Level 3** answers will use data/information from most of the figures in Source A with clear and relevant interpretation/analysis leading to a logically argued conclusion indicating the realistic chances of survival alongside rising population growth.

Indicative content**Figure 1**

The article refers to: –

- the influence of human rubbish near World Heritage sites
- 50% decline in wild animals over the last 40 years (Decimation is an emotive term used to describe human’s impact. Students may legitimately question the use of this word.)
- the decline is driven by human consumption
- the earth must be protected from development and deforestation
- a Living Planet Index (LPI) has been created to monitor the 45 000 known living vertebrates.

Figure 2

IUCN Red List data, the official guide to endangered animals, is provided. Explanations are provided defining the varying levels of ‘threatened’ species as well as those now extinct.

Data is provided in both a tabular and pie chart form.

Students should be expected to note that while there are some significant threats that for 56.7% there is little concern and that for another 15.2% we lack data and this is a limitation on our final judgement.

The tabular data and pie chart provide alternative views (one tabular and one pie chart).

Students may question the legitimacy, validity and reliability of the data but overall the data suggests that a significant minority of species are either extinct or under serious threat.

Figure 3

3.1 and 3.2 demonstrate anticipated population growth; and 3.3 the effect on species.

- 3.1** Anticipated population growth; with high growth we will see the earth's population double and with even medium fertility increase by around 2–2.5 billion people.
Low fertility; will see a decline in population but how likely is this trend and how reliable is the data?
- 3.2** This demonstrates the relationship between the developing and industrialised regions of the world.
Population growth up to 2050 is most significant in the developing world. The impact on extinction rates can therefore be predicted, especially since the probability (assumption) that fertility rates will be higher in the developing world.

Both figures use slightly different time scales and the reliability of these predictions may be legitimately questioned by the candidates.

- 3.3** This graph links human population growth with increasing extinction rates. It demonstrates a clear link between human population growth and animal extinctions.

Students may link this with the data in 3.1 (fertility rates) and 3.2 (regional growth rates). Based on this data it would seem that some animal species have little chance of surviving alongside humans.

3.1-3.3 Students may focus on source 3 and draw out conclusions from all 3 diagrams-this should be recognised.

Figure 4

A range of issues and facts is provided – students should use a selection and integrate within their analysis. They include

- definition of the meaning of extinction and how it is measured (Point 1)
- current projections on freshwater systems (P2) and on the rainforests (P3)
- impact on primate populations (P4)
- impact on reptile populations (P5) and amphibians (P7)
- human impact is however significant and is listed e.g. pollution, corrosion, climate change, etc (P5)
- some animals are becoming extinct before we are even aware of them (P6)
- bird populations are diminishing (P8)

Figure 5

This article reveals that there is in fact a mixed picture on the success of animal species ability to survive alongside humans within the UK and this would appear to mirror the mixed picture in Figure 2.

Some species have adapted to humans with populations of Red Kites, Bitterns, Red Deer, Common Pipistrelle Bat, Otters and Danish Scurvy Grass performing well.

Some species have adapted well to humankind and have even thrived alongside humans.

Others less so, with serious falls in population of Water Voles, Turtledoves, Skylarks, Hedgehogs, etc.

The article suggests that conservation work can have an impact which suggests that animal species may survive.

The survey was completed by 25 organisations which again suggests that a concerted approach may help the survival chances of some animals.

Students should be able to draw firm conclusions – mainly negative – on the impact of humans and species chances of survival under this pressure. However, some species have seen their populations grow alongside humans and this should be noted at Level 3.

We would expect at Level 3 for candidates to question the relative provenance of the sources and conclude on their impact.

Candidates will be expected to use the data to portray the impact of humans on the environment, biodiversity and the survival chances of a whole host of species.

Any other valid points from Source A, not included in the indicative content, should be credited.

0 2 Using the evidence in **Source B and Source C only**, consider the conflicting human attitudes towards animals and our control over their life and existence.

[11 marks]

Specification reference: 3.6.1, 3.6.2

Refer to the ‘3 Levels mark scheme’ for Section A on page 6

To achieve Level 3 candidates will be expected to use both sources confidently, arriving at balanced responses.

Candidates should be able to achieve marks in the highest level by using a selection of relevant points from Sources B and C, not necessarily the complete range.

Candidates who only use one source or who provide superficial answers with gaps in analysis/understanding will be placed in the lower Levels, 1 and 2.

Answers will include discussion of the contrasting and contradictory attitudes that humans have towards animals.

On the one hand we have a baboon given media celebrity status and on the other the cull of badgers. Humanity seems to adopt a God-like status in relation to the animal world. Who lives and who perishes? The resources and energy spent on the survival chances of one animal should be contrasted with the similar resources planned to cull UK Badger populations in order to preserve cattle stocks. Of course, cattle are a commercial product as opposed to badger populations where there is no commercial gain. Nevertheless, the treatment of badgers raises strong emotions across the wider human population and comparisons could be made with the attitudes demonstrated towards the solitary baboon.

Both articles raise fundamental issues regarding human power and attitudes towards animals.

Indicative content (Source B)

Source B published by the Guardian:

- Source B informs us of the planned badger cull in England and Wales
- after initial attempts the focus has turned to the killing of badger cubs
- the rationale – the impact on commercial cattle and tuberculosis is raised
- some scientists and pressure groups are challenging both the effectiveness and morality of the present badger cull. Professor Woodroffe is an eminent academic and adds significant weight to the anti-cull analysis.
- others are stressing the absolute need to protect cattle populations (DEFRA and NFU)
- the article then explores both sides of the argument
- NFU talks refers to “maximum benefit” by following this approach
- Claire Bass from the Humane Society International calls this a moral outrage not supported by evidence or the statistics provided.

Indicative content (Source C)

Source C published by the Times:

By contrast this article focuses on an international story focusing on just one stranded animal in Africa.

- the baboon (Robinson Crusoe) has become a media celebrity and cause
- the article focuses on contradictory relationships between humans and the animal world (highlighted also above)
- reference is made to the mating pandas at Edinburgh Zoo
- the author notes our contradictory and sentimental attitude towards nature and how this is reflected in media reporting and the development of green policies.

Our “exploitation of nature on an industrial scale” is noted.

The issue of choice, related hard questions and reflection complete this article.

Both articles demonstrate humanity’s power over animals and our contradictory views and behaviours (both personally and collectively) towards animals. We mass produce and manufacture cattle for human consumption and cull another breed. At the same time the articles highlight the needs of a breeding panda couple and a stranded baboon.

Any other valid points from Sources B and C, not included in the indicative content, should be credited.

0 3

Using the information from **Source D and your own knowledge**, consider whether genetic cloning and other techniques are a realistic and desirable solution to species management.

[11 marks]

Specification reference: 3.6.9, 3.6.6, 3.6.1, 3.6.5

Refer to the ‘3 Levels mark scheme’ for Section A on page 6

Candidates should be able to achieve marks in the highest level by using a selection of relevant points from Source D and their own knowledge, not necessarily the complete range.

- **Level 1** answers may be very brief/narrow and/or have little development with no own knowledge. Students may simply paraphrase the articles and offer little additionally.
- **Level 2** answers are likely to show some understanding of the issues around genetic cloning and other techniques. They may provide some own knowledge but it may lack depth or development. Alternatively they may refer to just one aspect of the question (are the techniques realistic and desirable but not both as required)....
- **Level 3** answers will effectively use the case material and are likely bring in some of their own ideas with clear and relevant interpretation/analysis leading to a logically-argued conclusion around the realistic nature and desirability of genetic cloning and other techniques.

No OK: Maximum score 8

Indicative Content (P) = Paragraph (OK) = Own Knowledge

Source D highlights a range of current scientific developments around DNA and gene science (and the related scientific and moral implications). Although in their infancy the speed of developments is breath-taking and considerable. (See <https://www.genome.gov/25020028>)

Paragraph 1 sets the tone – it is a blog but the science which underpins this is well established and used in a number of contexts (own knowledge (OK) opportunities)

Genetic cloning, gene therapy, DNA experimentation and reverse engineering are in different stages of development but the rate of development in medical sciences has been significant. Knowledge of a genome has expanded significantly over the last 25 years.

The article itself recognises, in the opening paragraph, that this is emerging and developing science which has captured the public’s imagination and raised new moral debates. (P1 and P2).

Areas for discussion include:

- the significance of DNA and Gene therapy (opportunities for OK)
- de- extinction – breeding back (P1 and P6)
- cloning techniques are already in use; most famously with Dolly the Sheep (OK example), P3 and P4
- gene therapy is already used to eradicate hereditary illness and to nominate characteristics in babies (P4 and OK – gene identification for cystic fibrosis)
- embryo techniques and developments (P4 and OK)
- development of reverse engineering – at the moment this science is in its infancy but the capacity to manipulate DNA already exists (P5)
- ‘breeding back’ is recognised as a possibility but would take significant time (how realistic? how

- desirable?)
- conservation policy may be further damaged if we simply believe that we can replace animals in the future using the technology (OK)
 - scientific opinion is split on how these developments should proceed; there are no right answers here but ethical and religious beliefs may be briefly discussed in relation to the desirability of these processes (P3 and OK)
 - students may use 'Jurassic World' (new film in June 2015) as an example of the potential and risks attached to genetic engineering. Although science fantasy it does draw on scientific developments and some credit may be drawn. Comparisons with Mary Shelley's 'Frankenstein' could be interesting (P7, P9 and OK).

Own knowledge can be used throughout this question. Gene therapy is taught in both GCSE and A Level specifications – some students may be able to demonstrate considerable knowledge of the techniques. It is currently being developed to address brain cancer, Parkinson's and the elimination of hereditary diseases such as eye disorders.

Students will have considered both the scientific and moral dilemmas attached to gene therapy and manipulation. **Links to conservation need be made.** Students may conclude that the medical technology may eventually be a solution for conservation issues but the desirability is limited when there are more pressing uses for the technology.

Students will find a tension between the realism and desirability aspect of this question. The techniques are becoming more commonplace and even commercial, but whether we should proceed is open to debate and a question of ethics.

Any other valid points from Source D or own knowledge, not included in the indicative content, should be credited.

0 4

Using the information from **Source E and Source F only**, discuss whether zoos are essential for conservation or simply exploit animals for human entertainment.

[11 marks]

Specification reference: 3.6.2, 3.6.10, 3.6.3

Refer to the '3 Levels mark scheme' for Section A on page 6

Candidates need to develop a balanced and rounded response which may well acknowledge the potential disadvantages of zoos but also their wider role in conservation.

Level 3 answers will arrive at balanced outcomes which consider both the essential conservation role and the more negative perspectives on the efficacy of zoos.

- *Those who demonstrate the capacity to use Source E and Source F to provide a more detailed discussion of the factors influencing the role of zoos, leading to a conclusion, will reach Level 3.*
- *Those who demonstrate the capacity to use both Source E and Source F to provide some discussion of factors about the role of zoos are likely to be placed in Level 2.*
- *Candidates who use either Source E, or Source F (or both), to write in a very brief, or mainly descriptive, and/or general fashion about the role of zoos are likely to be placed in Level 1.*

Candidates should be able to achieve marks in the highest level by using a selection of relevant points from Sources E and F, not necessarily the complete range.

Source E: Indicative Content

This article, very much a personal perspective from the author, promotes the value and need for zoos as an essential component of any conservation strategy:

- the author indicates his own expertise and experiences of working with zoos (P1-P3)
- he recognises that not all are good but:
 - conservation in nature is not always practical or possible (Masai Mara example suggests the scale of any conservation project outside of zoos) (P4)
 - 'conservation – reservoir and return' argument is outlined (P6)
 - zoos prevent extinction of some animals (P6)
 - zoos provide a boost to wild populations (P6)
 - education – popular access and awareness raising for the general public (better than stuffed exhibits in museums) (P7)
 - education programmes provided by zoos for key workers in the wild – improving conservation in the wild (P7)
 - research – enables humanity to study and then restore and repair ecosystems (P8)
 - essential to prevent global threats from becoming a reality (P9).

Source F: Indicative Content

This article challenges the very existence of zoos. It is produced by a pressure group that views zoos as a form of entertainment for exploitative purposes (making money).

Answers may challenge the legitimacy and reliability of the author and source. Candidates may be sceptical about the provenance/ accuracy of the article from this Animal Rights pressure group.

The article comments on:

- restrictive environments and animal deprivation (P1-3)
- conservation should happen in natural habitats (P2)
- zoos are effectively supporting the degradation of the environments (P2-3)
- zoos only focus on the neediest of animal causes and do not effectively prepare animals for reintegration (P3)
- education is limited and visitors often see bored animal in restrictive environments (P4-5)
- the effectiveness and reliability of research is questioned. Research and data are skewed and do not focus on the wider conservation issues (P6)
- some assertions about the care of adult animals are made (including the selling off of animals to labs) (P7)
- issues about abuse and neglect are raised (P8).

The article provides a range of challenging ideas around the validity of zoos. Students may accept and use some of these ideas. The key to the answer will be how well the candidates analyse and synthesise the two articles to provide a credible response.

Any other valid points from Sources E and F, not included in the indicative content, should be credited.

Levels mark scheme for SECTION B (for Questions 05 to 08)

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 which the essay questions are intended to test in the following proportions:-

AO1 – 8 marks AO2 – 7 marks AO3 – 5 marks AO4 – 5 marks

Section B questions are set in two 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 very well and the other answered significantly less well could only gain access to a maximum Level 3 mark.

Levels	Marks	Criteria and descriptors: knowledge, understanding, argument, evaluation, communication.
Level 4	20 – 25	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	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	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	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).
	0	No valid response or relevance to the question.

0	5
---	---

The World Health Organisation (WHO) has recently condemned the international manufacture of foods and drinks containing excess fat, sugar and salt, suggesting that it is creating a health crisis of obesity, diabetes and other illnesses.

Consider the health risks of a diet consisting of excess fat, sugar and salt.

Discuss whether governments are doing enough to control the manufacture and sale of these products, or whether the solution lies in improved health education.

[25 marks]

Specification reference: 3.6.2, 3.6.8

Refer to the '4 Levels mark scheme' for Section B on page 16

Candidates should be able to reach marks in the highest level with a selection of relevant points, not necessarily the complete range.

The range and quality of responses will determine the level at which a response is awarded. Level 4 responses are likely to include balanced, well-argued and illustrated responses whilst Level 1 will be superficial and one sided.

Students can be awarded high marks if they provide a good summary across the three health risks or may be by focusing on a narrower range of risks in more detail.

Indicative content:

Consider the health risks of a diet consisting of excess fat, sugar and salt.

In a recent Public Health England report 'Evidence shows diet and obesity related diseases including cardiovascular disease and some cancers cost the NHS alone at least 11 billion pounds per year, and are major contributors to health inequality, with the most deprived being most at risk.'

Health issues around sugar include:

- diabetes
- oral health and tooth decay
- obesity and heart disease (and links with self-esteem and depression)
- impact on immune system
- liver related illnesses
- links with eating disorders and alcoholism may be made.

Energy drinks have attracted a lot of publicity and can be damaging to health unless the excess energy is 'burnt off' by leading an active life style.

Obesity has a significant impact on longevity and is a major factor in premature deaths.

Students may link excess fat and sugar (obesity) with a lack of exercise and sedentary life styles. Poor diet and a lack of exercise can become a vicious circle.

Fats can cause obesity (an obvious but valid point).

Students may distinguish between saturated (these are very unhealthy) and unsaturated fats. Some level of fats is important for a person's health.

Likewise, candidates may discuss the dangers of (chemically) processed fats and the impact on health.

Fats can increase cholesterol levels resulting in heart attack, narrowed arteries and angina.

Health issues around excess salt:

- increased blood pressure (hypertension) is the major factor which causes heart failure, strokes and heart attacks, the leading causes of death and disability in the UK
- there is also increasing evidence of a link between high salt intake and stomach cancer, osteoporosis, obesity, kidney stones, kidney disease and vascular dementia and water retention
- salt can also worsen the symptoms of asthma.

<http://www.actiononsalt.org.uk/less/Health/>

Discuss whether governments are doing enough to control the manufacture and sale of these products, or whether the solution lies in improved health education.

- governments (both UK and EU) have introduced Codes of Conduct and clearer labelling of foods and drinks
- education programmes (Healthy Schools) and Public Health campaigns have raised issues around cholesterol testing and diabetes
- Public Health England have been promoting the '5 a day' campaign
- encouraging the Department for Health to work with the food and drinks industry.

Candidates may consider the role of manufacturers. Sugar and salt helps create tasty foods and drinks. Any product alteration may affect profits. Manufacturers are working on 5 strategies:

- education
- portion size
- reformulation
- lower calorie options
- healthy options.

Should governments encourage or impose sugar and salt research/replacements?

- candidates may legitimately argue that governments have no right to intervene in the dietary choices of its citizens
- a counter argument is that it is one of the responsibilities of governments to protect their citizens from danger, including dangers from the manufacture of food with poor health consequences
- a further argument may be that access to informed choice is limited and that commercial and retail enterprises deliberately look to sell products high in fat, salt and sugar because they are often 'best sellers'.

The question asks candidates to consider whether legislation, or in fact education, is the best means for changing our consumption habits.

- focus on children
- focus on buying habits and the role of Indirect taxes such as VAT (currently at 20%)
- education will provide greater information and awareness but whether people will actually follow advice and education is debatable

- some have suggested that the State penalise people for their dietary choices through increased taxes and or punitive health payments.

There is no quick fix but candidates should consider the balance between private choice and the role of governments and the extent to which it can influence diet, etc.

Possible comparison with current government action – and results – against tobacco products may be made?

Any other valid points, not included in the indicative content, should be credited.

0 6

'The 3D printer is awesome and without doubt the most significant invention of the last 30 years. Its capability to reproduce any product means that it has endless uses in every aspect of our lives.'

Consider the potential uses and abuses of 3D printing and the extent to which it could transform our lives.

Identify another significant scientific/technological innovation for personal and/or commercial use made during the last 30 years. Explain the reasons for your choice.

[25 marks]

Specification reference: 3.6.5, 3.6.8, 3.6.10

Refer to the '4 Levels mark scheme' for Section B on page 16

The range and quality of responses will determine the level at which a response is awarded. Level 4 responses are likely to include balanced, well-argued and illustrated responses whilst Level 1 will be superficial and one sided.

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

Indicative Content:

Consider the potential uses and abuses of 3D printing and the extent to which it could transform our lives.

To achieve level 4 students will need to consider both abuse and uses as well as considering the potential impact to transform our future lives.

3D printers are also known as additive manufacturing. They can create and manufacture any 3D object by machine. They can create/recreate any object cheaply – size is not an issue.

3D Printers were first invented in the 1980s, and later developed into rapid tooling and rapid manufacturing technologies to provide unlimited opportunities to create, recreate and mimic almost any real-life product.

As with all new technology, it's easy to get carried away with the benefits of 3D printing. It opens up a world of countless opportunities for all industries, and stands to reduce transportation costs, environmental impacts, waste, and reliance on corporations by opening up to the world the potential to make any object.

Prevalent in many schools and FabLabs used in education.

3D printers have been used in war zones to make spare parts for armoured vehicles.

Also used to produce cars, bridges, buildings in China and to mould ear pieces – their potential is huge. See for some interesting designs <http://www.hongkiat.com/blog/3d-printings/>

However, 3D printers are still potentially hazardous, wasteful machines, and their societal, political, economic, and environmental impacts have not yet been studied extensively.

Significant issues around forgeries exist, including guns (currently illegal in America – where guns are legal).

They are still expensive, can be slow (relatively) and consume large amounts of energy, are reliant on plastics and produce related pollution/waste.

Potential commercial issues around piracy and trademarks exist.

The technology has been created and cannot be un-invented so issues around use and control will become more significant. The potential to transform our lives is great but there are significant risks and challenges too.

Identify another significant scientific/technological innovation for personal and/or commercial use made during the last 30 years. Explain the reasons for your choice.

Students will need to explain their innovation within a personal or commercial setting.

There is no preferred innovation and students who select carefully and then explain/justify their selection are likely to score highly, rather than glib and superficial selections. Nevertheless there will be scope for some interesting and even novel responses and these should be rewarded.

Innovation is the process of adapting and bringing to market an existing product or idea. It takes a new idea or invention and makes it ready for the market.

Students have a lot of freedom to select their preferred innovation. Student will need to justify and explain their selection. It is the quality of this explanation and justification that is crucial when determining the level of response.

The last 30 years (approximately mid 1980s) have witnessed a revolution in science and technology including:

Mobile phone and tablet technology, Internet, broadband, WWW (browser and html), PC/laptop computers, E-mail, social networking via the Internet, Digital photography/videography, Office software (spreadsheets, word processors), open source software and services (eg, Linux, Wikipedia), GPS systems, online shopping/ecommerce/auctions (eg, eBay), DNA testing and sequencing/Human genome mapping, microprocessors, fiber optics, non-invasive laser/robotic surgery (laparoscopy), solar energy (photovoltaic cells), large scale wind-turbines, Graphic User Interface (GUI), genetically modified plants, biofuels, bar codes and scanners, anti-retroviral treatment for AIDS.

Any other valid points, not included in the indicative content, should be credited.

0	7
---	---

Water is an abundant, valuable resource, found over most of the Earth's surface and used in all human activities. However, its distribution and demand remains a problem with significant consequences for public health and even life.

Consider the conflicting demands for water in the modern world.

How can we ensure a better supply and distribution of usable water for the world's population, and what might be preventing this from happening already?

[25 marks]

Specification reference: 3.6.1, 3.6.3, 3.6.10

Refer to the '4 Levels mark scheme' for Section B on page 16

The range and quality of responses will determine the level at which a response is awarded. Level 4 responses are likely to include balanced, well-argued and illustrated responses whilst Level 1 will be superficial and one sided.

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

Indicative content:

Consider the conflicting demands for water in the modern world.

Water is one of the most vital natural resources for all life on Earth and fundamental for human populations. The availability and quality of water has always played an important part in determining where people can live but also the quality of life. Even though, there always has been plenty of fresh water on Earth, water has not always been available when and where it is needed, nor is it always of suitable quality for all uses.

Water must be considered as a finite economic resource that has restrictions on its availability and usability.

Read more: <http://www.waterencyclopedia.com/Tw-Z/Uses-of-Water.html#ixzz3PRPPZUz4>

Water is an invaluable source used in a wide range of human activities – the demand, linked to human population growth, has ensured that shortages remain a problem.

Agricultural processes use approximately 70% of all available water.

This is often linked to geographical imbalances and political issues. The control of water has caused conflicts. Conflict is inevitable with these conflicting needs and over history has seen local wars, etc. In China, for example, the growth of huge dams has flooded some habitable areas in order to provide water for the larger cities and industrial areas.

There are potential regional conflicts over access to water resources, e.g. the Middle East.

Water is used in a wide range of commercial, domestic and industrial settings:

- drink and food preparation
- agricultural process – land irrigation and animal husbandry
- industrial processes (Chemical, Manufacturing and Food Production)
- power generation – hydro and nuclear

- transport
- pollution (e.g. sewage farms)
- medical including public health issues (control and prevention of disease)
- sport and recreation, eg management of modern golf courses.

Candidates will be expected to develop a number of themes with L4 responses developing balanced and well-integrated outcomes.

How can we ensure a better supply and distribution of usable water for the world's population, and what might be preventing this from happening already?

Investment in water supply infrastructure is often left to governments.

Role of charities may be considered (and the misuse of charity money).

An improved supply may come from the private sector led by the profit motive.

Groundwater supplies of water have been heavily exploited with significant impact on the environment. (Deforestation, super-dams destroying valleys (China), etc.)

Desalination plants (approximately 97% of the earth's water can be found in our Oceans and seas.) Therefore, logically the answer belongs here. The cost of desalination has been prohibitive but it may be the only long term sustainable process.

Improved recycling and water management systems would help. What is preventing this? A range of possible factors exist including:

- unprecedented demand
- political will and choices
- cost (can science provide solutions? will business find this profitable?)
- will governments get votes out of this?

Failure to resolve wider conflicts can prevent resolution of these distribution issues and leave high levels of demand unsatisfied, with human consequences.

Better supply and distribution has been a long term problem and is not easily resolved. Candidates may well make this point.

Any other valid points, not included in the indicative content, should be credited.

0 8

Personal debt in the UK – including student loans, credit cards and mortgages – now stands at £1.43 trillion. This is an average of £54 000 per UK household and has been described as a ‘ticking time bomb’.

Consider the benefits and dangers of high levels of personal debt.

How can we improve financial self-management and encourage people to adopt more responsible borrowing in the future?

[25 marks]

Specification reference: 3.6.2, 3.6.3, 3.6.9

Refer to the ‘4 Levels mark scheme’ for Section B on page 16

The range and quality of responses will determine the level at which a response is awarded. Level 4 responses are likely to include balanced, well-argued and illustrated responses whilst level 1 will be superficial and one sided.

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

Indicative Content:

Consider the benefits and dangers of high levels of personal debt.

Credit is the process of borrowing money with interest repayable (a reward for the lender). This has been an area of controversy with some Payday loan companies charging APR (Annual Percentage Rates) in excess of 1000%. In times of economic boom and growth this may seem a realistic option. However, in times of recession and austerity excess credit can become a significant problem on a personal, family and societal level.

Benefits of personal debt include:

- accessing expensive goods such as cars - this benefits both the person (who may even need a car to get to work) and the economy
- credit can be accessed for long term arrangements such as a mortgage. For many people accessing the current housing market would be impossible without this credit facility
- convenience (credit is a quick and, if done responsibly, an effective way of making a payment for a good or service)
- credit card purchases are protected by law
- student loans enable students to access Higher Education
- planned borrowing can be cheaper than high credit cards and pay day loans
- credit enables people to live independently and avoid borrowing from friends and family.

But, personal debt when not controlled and/or beyond the means of the borrower’s income can result in:

- significant debt and hardship
- loss of home
- insolvency and credit rate issues
- mental health problems and even suicide
- poverty
- family breakdown.

How can we improve financial self-management and encourage people to adopt more responsible borrowing in the future?

Definition of financial self-management: the ability to understand how money works in the world: how someone manages to earn or make it, how that person manages it, how he/she invests it (turn it into more) and how that person donates it to help others.

http://en.wikipedia.org/wiki/Financial_literacy

Financial self-management can be improved and supported via

- teaching in schools and colleges (Functional Skills, PSE and Enterprise education)
- adult education
- Gamblers Anonymous offer support and help
- ensuring that credit agencies follow the Codes of Practice implemented by Credit Services Association
- public education.

Government legislation has imposed maximum credit rates for payday loans companies.

Responsibility rests on the providers of credit to behave responsibly. However, there is a contradiction here (profit motive and responsible credit do not necessarily go hand in hand) and governments may need to go further to ensure that vulnerable people are protected. Nevertheless, a credit fuelled recovery can be beneficial for governments and this can create a tension when governments act to further control the issue of credit.

Whether we can encourage more responsible lending is difficult to assess – we live in a consumer based society where tastes and fashions change quickly. We are encouraged by retail and the media to spend today and pay tomorrow.

Responsible lending can be taught in schools but many would argue that greater work is needed with adults/parents.

Any other valid points, not included in the indicative content, should be credited.