
THINKING SKILLS

9694/43

Paper 4 Applied Reasoning

May/June 2019

MARK SCHEME

Maximum Mark: 50

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **13** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Question	Answer	Marks
1	<p><i>1 mark for any of the following:</i></p> <ul style="list-style-type: none"> • in general, measuring the sales of this particular drug is an unreliable way to measure the number of sufferers from depression: • people could be switching to drug therapy from other types of therapy • people could be switching to ‘modern’ SSRIs from alternative ‘less modern’ drugs • a similar number of people could be taking the drug at a higher dose • a small number of individuals could be taking SSRIs for a longer period • SSRIs may be being used to treat ‘other mental health conditions’ • doctors might be more likely to diagnose depression <ul style="list-style-type: none"> • the profile-raising celebrity publicity campaign might have led to less social stigma about depression... • ...which might have led to increased reporting • the meaning of ‘sales’ is unclear: could refer to the number of pills or packets or the monetary value of the pills sold – in which case a change in packet size or a price increase could be the cause • the passage admits that some data are impossible to collect and then appears to disregard this problem • the reference to sales of drugs for other illnesses cannot be used in this argument as it is possible that there has been an increase in non-chemical treatments for those other illnesses • the figures quoted are over a 3-year period which might not reflect a longer term trend • even if there is a real increase, one cannot assume that the increase will continue at the same rate over a 10-year period 	5

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Question	Answer	Marks
2	<p><i>1 mark for each element (maximum 4 if MC not identified).</i></p> <p>CA (The manufacturers of these foods tell us) we should not be concerned MC (it is clear that) in growing and consuming these foods we are taking a big and unnecessary risk. IC (so) we can dismiss claims by GM food companies that their products are harmless.</p> <p>IC The more GM foods we produce, the greater the possibility for a risk to health.</p> <p>IC GM foods pose a serious risk to the environment. IC (So) animals further up the food chain become endangered.</p> <p>IC We should be suspicious of any safety claims originating from scientists about GM foods.</p> <p>CA (It is often said that) GM foods are needed to feed an increasing human population IC (but) people go hungry because of issues other than food production.</p>	6

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Question	Answer	Marks
3	<p>2 marks for a developed version of any of the following points. 1 mark for a weak or incomplete version of any of the following points.</p> <p><i>Paragraph 1</i></p> <ul style="list-style-type: none"> • <i>Weak analogy / appeal to history</i> – the differences between the safety claims of tobacco companies in the 1960s and claims made about GMOs now are likely to be great. • <i>Assumption</i> – that we now know that the claims of the tobacco companies were false. <p><i>Paragraph 2</i></p> <ul style="list-style-type: none"> • <i>Assumption</i> – that such modifications will be used and that the dangers cannot be avoided (foods containing nuts are widespread but those with allergies are able to avoid them). • <i>Assumption</i> – that there is a possibility of antibiotic resistant bacteria escaping. • <i>Assumption</i> – that these bacteria are harmful to humans or their interests. <p><i>Paragraph 3</i></p> <ul style="list-style-type: none"> • <i>Assumption</i> – that cross-pollination is a realistic possibility. <p><i>Paragraph 4</i></p> <ul style="list-style-type: none"> • The author’s faith in science seems inconstant: doubting it here and asserting it in paragraph 2. • <i>Assumption</i> – that manufacturers and government agencies are not the standard sources of safety information about any new product. • <i>Appeal to ignorance</i> – just because the author has seen no unbiased findings it does not mean that none exist. • The rejection of the claim from the Union of Concerned Scientists that the USDA’s evaluation was based on too little data relies on an arbitrary (and unreasonable) stipulation that more than 500 trials is not enough. • <i>Assumption</i> – that the promises of GM food companies cited as false by the European study were about product safety. 	9

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Question	Answer	Marks
3	<p><i>Paragraph 5</i></p> <ul style="list-style-type: none"> • <i>Non-sequitur</i> – Just because GM foods cannot solve all the problems associated with global hunger, it does not follow that they have no part to play in alleviating it. • Inadequate support for the IC: two of the three examples of ‘issues other than food production’ are in fact issues to do with food production. • <i>Assumption</i> – that if the amount of food per person has never been higher then there is no need to increase total food production. (the above could be expressed in terms of necessary and sufficient conditions) <p><i>Paragraph 6</i></p> <ul style="list-style-type: none"> • <i>Significance</i> – it seems likely that ‘pleasure’ is a very difficult parameter to measure with any degree of objectivity or consensus of understanding • <i>Conflation</i> of organic and ethically produced with natural. • <i>Conflation</i> of ‘believed to be’ with ‘is’. 	

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Question	Answer	Marks
4	<p>‘We should encourage the development of GM foods.’</p> <p><i>Support (827 words)</i></p> <p>Some benefits of GM foods are listed in Doc 2 and there may be more. Unsurprisingly, the hostile and biased Docs 1, 3 and 4 do not cite many benefits, but Doc 1 admits a contribution to increasing food production and this is corroborated by the weed-killer resistance stories in Docs 3 and 4. Therefore, we can assume that there are a lot of potential benefits of GM foods. That said, the only real consideration is whether these benefits outweigh any potential risks.</p> <p>Most implausible of the anti-GM claims is the suggestion that these products are not safe to eat. Doc 1 cites a simplistic explanation for why they might be harmful, but one could equally make a convincing high-school-science case for why they are not: all the protein we ever eat is coded for by genes. Based on the information available in the documents it seems that GM foods are safe (as any other foods) to consume. Doc 2 cites a comprehensive and detailed report. The author of Doc 2 is a science writer who, presumably, has some expertise and ability to know, at least in the general processes of science. The report discussed in Doc 2 is compiled by scientists and based on the work of a range of other scientists. So its credibility seems high. This is in contrast to the claims that GM foods are unsafe in Doc 1. We know nothing about the expertise of an author who might not understand high-school biology. Doc 1’s examples of scientific studies are few and potentially cherry-picked. The credibility of the claims in Docs 3 and 4 is weakened by a lack of expertise – newspapers are not known for their scientific understanding – and also by their clearly biased tone. Doc 2 suggests a newspaper based anti-GM conspiracy and this appears to be corroborated by the two newspaper documents and the ‘campaign’ reference within Doc 3. The study reported by Doc 3 about rats is presumably the same one mentioned in Doc 2 which had to be withdrawn – perhaps because criticisms of the study from fellow scientists, such as the professor of cell biology mentioned in Doc 3, turned out to be correct.</p> <p>The claims about lack of safety in Docs 1, 3 and 4 are weak. Doc 5b shows that GM food has been around in increasing amounts for over 20 years. Doc 1 admits that much of our food already contains GM ingredients and Doc 4 says we have been growing them for years. Thus, if there were any serious health effects we would probably know about them by now. It is not reasonable to dismiss claims made by scientists about heavily-investigated GM foods on the basis of claims by tobacco producers about barely-studied tobacco products 50 years earlier.</p>	30

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Question	Answer	Marks
4	<p>A more plausible concern is that GM crops might have unknown environmental effects, as cited in Docs 1 and 4. Doc 1 implies that 500 is small number of studies but it is much bigger than the one or two anti-GM studies cited by Doc 1. Hence, any conclusions from the 500 are more likely to be reliable. Doc 4 is a piece of newspaper sensationalism that does not make sense. It seems as if this ‘scary’ weedkiller is only being used because the GM crop they are growing is designed to be resistant to 2,4-D. The GM crop and the ‘super-weeds’ might not be resistant to traditional ‘non-Vietnam’ weedkillers. The final quote of Doc 4 suggests that the farmer, and the author, do not really understand what is going on. The more credible Doc 2 admits to some minor environmental concerns but implies that the effects are not enough for the general population to be concerned.</p> <p>The resistance of well-intentioned environmental groups is a problem for the GM food industry. However, Doc 2 points out that the reasons these groups give for resisting GM are similar to the reasons climate change deniers give for rejecting the claims of these very environmental groups. In time, such groups will probably realise the inconsistency of their position and embrace GM technology. GM food may allow us to use fewer harmful pesticides and hence save the bees from extinction.</p> <p>We will almost certainly need GM foods in the future to feed a growing population. Doc 5a shows the population increasing and it also shows that food production has been increasing since well before GM foods. However, there does seem a discernible quickening of the increase in food production in the years since GM foods appeared. Correlation does not imply causation but it is likely that GM food has contributed to an increase in food production. Doc 1’s claim that there are other causes of hunger does not exclude a role for GM foods as part of a solution.</p> <p>There are many potential benefits of GM foods. There is no real evidence of harm to health or of major harm to the environment. On that basis we should encourage the development of GM foods.</p>	

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Question	Answer	Marks
4	<p><i>Challenge (820 words)</i></p> <p>Some benefits of GM foods are listed in Doc 2, and Doc 1 admits a contribution to increasing food production, which is consistent with the weed-killer resistance stories in Docs 3 and 4. So, one cannot deny that there are some potential benefits of GM foods. However, the most important consideration is whether these benefits outweigh any potential risks.</p> <p>Claims about the health dangers of consuming GM foods are dismissed by Doc 2, but Doc 2 lacks neutrality, having been written from a pro-GM standpoint. The weight of documentary opinion seems tilted towards the idea that GM foods are dangerous, with Docs 1, 3 and 4 all advising caution. Doc 1, although clearly against GM foods, does admit that some studies have shown them to be safe, but asks, reasonably, if they have been studied enough. The analogy about the tobacco industry is relevant in this regard. Doc 5b suggests that GM food was relatively rare before the mid-1990s, which means it has only been consumed in large quantities for 20 years. Tobacco was consumed in large quantities for 400 years before anyone realised it was harmful. Thus it is reasonable to exercise caution when voices associated with the GM food industry claim these products are safe. The discredited study by the French scientists, cited in Docs 2 and 3, does not support a conclusion that GM foods cause tumours but nor does it support a conclusion that they are safe. There is not enough information present in the documents to support a conclusion that GM foods are definitely safe. We should treat Doc 2's suggestion of a newspaper-based anti-GM conspiracy with scepticism. The newspaper reports in Docs 3 and 4 might not be typical.</p> <p>The main concern is that GM crops might have unknown, and potentially devastating, environmental effects, as cited in Docs 1 and 4. Doc 1's informs us that GM farmers tend to grow fewer crop varieties – decreasing biodiversity. This aspect of GM farming could be explained by the suggestion in Doc 2 that domination of GM technology by big business might restrict access to improved seeds by small farmers. Doc 2, while making much of the safety of GM foods with regard to health, does admit to some real environmental issues. One such problem is pesticide resistance, also discussed in Doc 4. Doc 2 also hints at the possibility of worse to come. These GM crops are, effectively, a new species of plant. High-school science also tells us that the introduction of new species can be disastrous for local wildlife, such as the introduction of rats to New Zealand. Doc 1 admits that there have been some studies of environmental effects – one such is discussed in the badly-written Doc 4. However, as with the health concerns, these foods have not been around long enough for us to be sure they are safe. The Union of Concerned Scientists, who presumably have some expertise, have stated that not enough research has been done.</p>	

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Question	Answer	Marks
4	<p>Doc 4 is a piece of newspaper sensationalism that does not make much sense. It does not seem to understand that the scary weedkiller is only being used because the GM crop they are growing is designed to be resistant to that weedkiller, 2,4-D. It does not focus on the real issue – that there <i>has</i> been some of the cross-pollination mentioned in Doc1 and a ‘super-weed’ <i>has</i> been created. The resistance of, presumably, scientifically literate environmental groups is a real problem for the GM food lobby. Doc 2 points out that the reasons these groups give for resisting GM are similar to the reasons climate change deniers give for rejecting the claims of these very environmental groups. However, it is likely that these groups do have some expertise and their only vested interest is in protecting the environment in the future, so their credibility is reasonably high. Thus, GM crops do have effects on the environment and we do not yet know their extent.</p> <p>Claims about needing GM foods to feed an increasing population seem plausible but they are dismissed by Doc 1. Furthermore, Doc 5a shows us that we have been successfully boosting food production, at a similar rate to the growth in population, for over 50 years. Comparing this with Doc 5b we can see that most of this increase occurred without GM crops. There seems to have been little or no change on the rate of increased food production after the introduction of GM crops. An apparent small divergence from the population line could be accounted for by natural variation or by a deceptive use of the secondary y-axis on the graph.</p> <p>There are some potential benefits of GM foods. However, there is not enough evidence to say they do not harm health and there is some evidence of harm to the environment. On that basis we should exercise the precautionary principle and we should not encourage the development of GM foods.</p>	

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Level	Structure	Max 8	Quality of argument	Max 8	Use of documents	Max 8	Treatment of counter positions	Max 6
4	<p>Precise conclusion and accomplished argument structure with consistent use of intermediate conclusions. Likely to include at least two of the following:</p> <ul style="list-style-type: none"> • strands of reasoning • suppositional reasoning • analogy • evidence • examples <p>Argument is structured so the thought process is made clear. Uses vocabulary of reasoning appropriately and effectively to support argument.</p>	7–8	<p>Cogent and convincing reasoning which answers the question which was asked. Subtle thinking about the issue. Use of relevant own ideas and ideas from documents. Very few significant gaps or flaws.</p>	7–8	<p>Perceptive, relevant and accurate use of documents to support reasoning. References 3+ documents. Sustained and confident evaluation of documents to support reasoning. (Two or more valid evaluative references to documents). Able to combine information from two or more documents and draw a precise inference.</p>	7–8	<p>Consideration of key counter arguments and effective response to these. Use of own ideas in response to counter arguments not mentioned in the documents. Use of valid critical tools to respond to counter arguments. Effective use of appropriate terminology.</p>	5–6
3	<p>Clear conclusion that that matches the question. Clear argument structure, which may be simple and precise or attempt complexity with some success. Appropriate use of intermediate conclusions. Use of other argument elements to support reasoning. Generally makes thinking clear. Appropriate use of vocabulary of reasoning.</p>	5–6	<p>Effective and persuasive reasoning which answers the question which was asked. (Although there may be some irrelevance or reliance on dubious assumptions.) Use of own ideas and ideas from documents. Few significant gaps or flaws.</p>	5–6	<p>Relevant and accurate use of documents which supports reasoning. References 3+ documents. Some evaluation and comparison of documents to support reasoning. Inference drawn from at least 1 document.</p>	5–6	<p>Consideration of key counter arguments and effective response to these. Response uses own ideas or is developed from documents. Some use of appropriate terminology.</p>	3–4

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Level	Structure	Max 8	Quality of argument	Max 8	Use of documents	Max 8	Treatment of counter positions	Max 6
2	<p>Conclusion stated but may be 'I agree'.</p> <p>Sufficient clarity for meaning to be clear throughout.</p> <p>Structure may be easy to follow but brief or a longer argument which has a less clear structure.</p> <p>Uses reasons.</p> <p>Some appropriate use of vocabulary of reasoning.</p>	3–4	<p>A reasoned stance which attempts to answer the question which was asked.</p> <p>Some support for the conclusion. (Although there may be considerable irrelevance or reliance on dubious assumptions.)</p> <p>Some thinking / own ideas about the issue.</p> <p>Use of rhetorical questions and emotive language.</p> <p>Some significant gaps or flaws.</p>	3–4	<p>Some relevant use of documents to support reasoning, but some documents used indiscriminately.</p> <p>Some comparison of documents or some critical evaluation of documents or reasoned inference drawn from document.</p>	3–4	<p>Inclusion of counter argument or counter assertion.</p> <p>Response is direct but weak or taken entirely from documents.</p>	2
1	<p>Attempt to construct an argument.</p> <p>Unclear conclusion, multiple conclusions or no conclusion.</p> <p>Disjointed, incoherent reasoning.</p> <p>Use of examples in place of reasoning.</p> <p>Possibly a discourse or a rant.</p> <p>Reasons presented with no logical connection.</p> <p>Documents considered sequentially.</p> <p>Substantial irrelevant material.</p>	1–2	<p>Attempt to answer the general thrust of the question.</p> <p>Attempt to support their view.</p> <p>Excessive use of rhetorical questions and emotive language.</p> <p>Ideas which are contradictory.</p>	1–2	<p>Some, perhaps implicit, use of documents.</p> <p>No attempt at critical evaluation.</p> <p>No comparison of documents.</p>	1–2	<p>Inclusion of counter argument or counter assertion.</p> <p>Response is direct but ineffective.</p>	1