

GCE

Edexcel GCE

General Studies (6452)

January 2006

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Mark Scheme (Results)

6452: Scientific Horizons

Section A

1 Give two characteristic features of scientific revolutions (2)

- major/new theory/scientific evidence;
- changes scientists' understanding;
- view of the world is completely changed;
- often leads to new discoveries/inventions.

One mark each point up to 2. If a specific revolution is described, points may be credited if the key features are indicated.

No mark for simply naming a revolution.

2 Identify a significant scientific theory or discovery associated with one of the following. (2)

- Newton: gravitational attraction/laws of motion/nature of light-refraction-colours/calculus;
- Copernicus: heliocentric concept;
- Harvey: motion of the blood round the body;
- Darwin: evolution/natural selection/descent of man/many other biological discoveries (but 'man descended from monkeys' - only 1 mark);
- Hodgkin: structure of vitamins and insulin/use of X-ray crystallography;
- Goodall: social organisation of wild primates;
- Einstein: Brownian motion/relativity theories/relation between energy and matter/photoelectric effect;
- Kroto: making complex organic molecules e.g. buckminsterfullerene;
- Watson & Crick: unravelling structure of nucleic acids/other subsequent discoveries about DNA;
- Hubble: relative motion of galaxies, supporting big bang theory/red shift;
- Marie Curie: radioactivity/new elements;
- Rutherford: properties of the nucleus of the atom;

Link between name and discovery, 1 mark.

Specific reference to discovery, 1 mark.

3 Medical researchers often carry out 'double blind' trials of new drugs. (3)
Half of the trial group of patients are treated with the drug, the other half are treated with a dummy tablet (called a 'placebo'). It is very important that the patient, their doctor, and the researcher do not know which treatment a patient is receiving.

(a) Explain briefly why this 'double blind' procedure is used.

- Does the drug have any effect;
 - Effects of drugs are not uniform - individuals vary;
 - Patient bias/perception;
 - Improvement may not be ascribed to the drug (placebo effect);
 - Doctor/researcher bias;
 - Mention of control/compare/fair test;
 - Reliability/certainty about the results is increased;
- 1 mark each point up to 3 marks.

(b) Briefly describe one ethical issue that might arise from such a trial. (2)

The clearest issue arises if the drug being tested is very effective, and gives a rapid result. If the condition is life-threatening, then researchers have to decide whether to stop the trial and give all the patients the drug, though it is possible the drug may have side-effects which have not yet appeared. Researchers had to stop the trial of a drug for breast cancer because it was effective and it was judged unethical not to give it to the patients receiving the placebo.

- Experimenting on humans (guinea pig)/possible side effect;
- Deception/could be seen as lying;
- Raising possibly false hopes in patient;
- If the drug works, what happens to the trial;

1 mark for a mention of a relevant issue, and another mark for any further explanation.

4 **An American study showed that people living near noisy main roads had fewer friends than those in quiet suburbs.**

(a) Suggest an explanation for this finding. (1)

There are many possible explanations:

- People with few friends prefer to live in a noisy environment, as it lessens their sense of isolation
- People living in less accessible places are unlikely to have friends calling on them
- A noisy environment makes chatting difficult, so friends stay away
- Some people without many friends don't mind living in a noisy place
- Some people are unsociable and find that living in a noisy place tends to keep others away
- People with little money have to buy houses in cheaper, noisier places, and tend to have fewer friends because they don't go out much

There are many more...

1 mark for an explanation.

(b) Suggest briefly how you would test your explanation scientifically. (3)

- Samples/control groups related to their explanation;
- How do we identify and measure an independent variable - such as personality testing for unsociable people;
- How do we quantify and test people for their "number of friends"? This is the dependent variable and must be a component of any explanation;
- Make statistical comparisons;

Up to 3 marks BUT - maximum 2 marks if there is no reference to identifying numbers of friends.

5 **A pair of hedgehogs is released on to an island that has no hedgehogs.**

Assume that:

- a pair of hedgehogs produces two more breeding pairs of hedgehogs a year
- a hedgehog takes one year to become reproductively mature
- hedgehogs live for at least five years
- there is ample food for the hedgehogs during this time

(a) Predict how many hedgehogs will inhabit the island at the end of two years. Show how you worked this out. (2)

This ought to be done simply - there are no tricks or catches. E.g. End of Y1 - 3 pairs (6 hhs); Y2 - 3+6 pairs (18 hhs). If they have done so clearly they may be credited with 9 pairs or 18 single hedgehogs.

- At end of first year 6 (3 pairs) of hedgehogs - 1 mark.
- Any result giving final number as 18 - 2 marks.

(b) Why are such predictions very significant for biology?

(2)

The expression shows how numbers of organisms, even if they reproduce slowly, grow inexorably and to potentially vast totals if there is nothing to stop them. This was an important insight in Darwin's development of evolutionary theory. Some candidates may mention, correctly, Malthus.

- Biologists can predict changes in populations/large changes are possible/rapid changes are possible;
- Consequences of population changes (extinction, evolution, selection, survival, food supplies etc);

Up to 2 marks.

AO1: 17 Marks

(Total Section A: 17 marks)

Section B

- 6 (a) Write out one example from the article of an analogy. (1)

Automobiles resembling animals.

Accept words to this effect:

“one villain above all keeps rearing its head:”
“lapping up gallons of oil rich fuel”
“belching fumes into the stratosphere/air”
“rigid ... as Victorian missionaries”

Accept the phrases above if they have been quoted within a longer sentence.

Accept phonetic/recognisable spellings.

Do not accept the following:

Any phrase containing the following quotes:

“total lardbutts”
“blue planet”
“smoggy globe”

- (b) Write out two pieces of objective evidence that show trains are wasteful of energy compared to other forms of transport. (2)

In any order:

“...Pendolino trains will weigh more per seat than the new Airbus A380 jumbo jets”
“...cars consume less fuel per seat than trains.”

1 mark for each point. Accept these if they are preceded by any of the sentence of which they are part.

Accept phonetic/recognisable spellings.

Do not accept the following:

“... long distance rail travel is Britain’s least energy efficient form of transport...” 2 marks maximum.

- (c) (i) Which statement represents the best conclusion drawn from Source 1? (1)

B - The environmental lobby needs to reconsider its case.

- (ii) Justify your choice. (2)

If B:

- Some evidence via use of energy for different transport systems;
- This is based on objective evidence;

Up to 2 marks.

If C:

- Use evidence from the passage (eg study from Lancaster);
- This is objective/factual;

Up to 2 marks.

If A: This is an objective statement; 1 mark.

- (d) Norman Baker's argument, in paragraph 2, includes the following points:

A: Using more fuel increases carbon emissions.

B: Cutting fuel prices increases the use of fuel.

C: Cutting fuel prices worsens climate change.

D: Carbon emissions worsen climate change.

- (i) What form of argument is Norman Baker using? (1)

Deductive (allow a definition of deduction eg the conclusion follows inevitably from the premises).

Deductive/deductive argument/deduction/deductive reasoning/deductive thinking/an argument where the conclusion follows inevitably from the premises.

Accept any recognisable spelling.

Do not accept the following:

Factual (argument).

Scientific (argument).

- (ii) Which point represents the conclusion to his argument? (1)

C

- (e) **What evidence does the writer give in paragraphs two and three to support the view that environmentalists are rigid in their thinking? Indicate whether the evidence is fact or opinion or belief.** (2)

The writer uses:

- By implying that “environmentalists” rigidly insist on not using cars (line 6 ff), which is the writer’s opinion/belief;
- “Mr Baker’s finger-wagging party” (lines 10-11) which is opinion/belief;
- Supporters of the congestion charge, argue in a similarly dogmatic way (line 13 -15), also the writer’s opinion/belief.

1 mark each for identifying the evidence AND its nature.

AO2 Mark Scheme

A mark should be given for the level of written communication using these level guidelines:

The answer is clear and lucid, (writing in correct form is taken as a matter of course) arguments are coherent and well laid out, there are very few grammatical or spelling errors.	3 marks (above average)
The answer is broadly understandable, writing is in the correct form, arguments are on the whole coherent, and grammar and spelling do not inhibit communication.	2 marks (average)
The answer is only understandable in parts, writing may be in an inappropriate form, arguments are not clearly expressed, and in places grammar and spelling inhibit communication.	1 mark (below average)
The answer is badly expressed or fails to treat the question too seriously, there may be serious lapses of grammar and spelling OR there is too little of the candidate's own writing to assess reliably (as is sometimes the case in Section B).	0 marks (exceptionally poor)

NB The Quality of Communication marks are not dependant upon the AO3 mark

AO2: 3 Marks

(Total Section B: 13 marks)

Section C

- 7 “The energy resources available to a country profoundly affect that country’s technological development.” (17)

How far do you agree with this statement?

Energy resources are critical to the technological development of a country, because some important technologies are very energy dependent - e.g. building, transport. Agriculture can be improved by use of more mechanical devices, requiring energy. As a result, it is possible to argue that the ready availability of energy resources greatly affect that country. The Industrial revolution in Europe was facilitated by the ready availability of coal - and candidates could expand on this.

Other arguments might flow from the oil-rich countries, whose technologies are largely imported.

Hydroelectric power is available to countries with suitable geomorphology and climate.

Countries with little energy resources, particularly oil, such as Japan, have acquired them from others, and exploited them efficiently to become wealthy.

Answers should have an appropriate scientific/technological emphasis, although the question might be interpreted by students of economics or geography with their specialist bias. Hence an answer which, for example, describes different energy resources (chemical, thermal, photovoltaic, nuclear, hydroelectric), and indicates that different countries are differently endowed with them; and then relates these to the kinds of technology which are possible or have developed from them, and producing arguments for and against the proposition in the question, with an appropriate conclusion, should achieve a high level.

- 8 “The production of food supplements, in the form of vitamin tablets, mineral preparations, and herbal remedies, is a multimillion-pound industry in Britain today. Such an industry poses a great risk to the health of the public.” (17)

How far do you agree with this view?

Benefits:

- People are aware that for good health, you need certain nutrients
- Your diet may lack some substances
- People become knowledgeable about the health effects of these substances
- People analyse their diets in order to make them as healthy as possible
- The information produced by the manufacturers enables people to assess in what ways their diets might be deficient
- They do not have to bother doctors
- They can seek out health advice from other sources

Dangers:

- People are easily alarmed about their health
- Since they are not medically trained, they may not interpret symptoms correctly
- It is in the financial interest of the industry to convince people that they need the products
- So the firms making the products advertise them, and either imply or state health benefits
- In an ideal world all advertisements would have to be completely truthful
- Some form of central, government regulation of adverts is necessary, to take action against charlatans or opportunists
- People are sometimes naïve about products - for example if taking one tablet a day is beneficial, then taking two must be twice as beneficial. This can be a highly risky action.

Answers should consider the benefits and problems they have identified to draw a conclusion about the importance or otherwise of the industry to the health of the public.

9 “The exploration of space is a waste of time and money”

(17)

How far do you agree with this assertion?

This question anticipates candidates assessing the worth of the space “industry” by looking at its benefits and problems, in relation to its cost. Answers should consider what is meant by the “exploration of space”. They may interpret this as manned space flight or travel, but that is not the only interpretation of “exploration” - space is explored by the use of many different kinds of telescopes and measuring instruments. Some of these are extremely expensive. The question invites some consideration of how else the money for space research might be used.

Benefits

- Solving the technical problems of physical travel into and through space has important technological spin-offs. Answers might elaborate on these
- Sending astronauts into space requires better knowledge of the working of the human body in extreme environments
- Researching and understanding the nature of astronomical bodies and events helps us understand processes on the earth

Problems

- Physical exploration of space by astronauts is very risky and lives have been lost
- The cost of instruments and vehicles is enormous, and many think it is misplaced.

The candidate should weigh up the problems and benefits and come to a conclusion justified by the evidence they have produced.

A03 Level Descriptors and Mark Distributions

No marks are to be awarded for answers that are completely irrelevant or frivolous.

Level 1	<p>Partial, incomplete and inconclusive answers</p> <p>Selects and marshals a limited range of evidence relevant to the question, but with no conclusion, implied or explicit.</p>	1-2 marks
Level 2	<p>Limited, (mainly) one sided answer with a simple conclusion</p> <p>Selects and marshals a limited range of evidence to draw a simple conclusion, which may or may not be appropriate. There may be little explanatory comment.</p>	3-7 marks
Level 3	<p>A developed answer which largely examines one viewpoint or looks at two sides of the argument in a superficial and unspecific manner</p> <p>Selects and interprets evidence, and uses it to draw a justified conclusion or conclusions.</p> <p>At the lower end, explanatory comment is simple and restricted.</p> <p>At the top end it is: either clearly interpreted and applied to a single view of the question OR addresses different views in a superficial way with few specifics and little or no development.</p>	8-12 marks
Level 4	<p>Evidence is used to examine contrasting viewpoints.</p> <p>Selects, interprets and begins to evaluate evidence to show clear awareness of differing points of view, and uses it to draw a justified conclusion or conclusions.</p> <p>At the lower end, the range is limited and the evidence is evaluated in a simple way.</p> <p>At the top end, the range is wider and the evaluation is more developed.</p>	13-16 marks
Level 5	<p>A balanced answer evaluating a wide range of evidence.</p> <p>Selects, interprets and evaluates a wide range of information, concepts and opinions relevant to the question. Marshals and evaluates the evidence clearly and coherently to draw a justified, substantiated conclusion or conclusions.</p>	17 marks

Total A03: 17 Marks

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The answer is broadly understandable, writing is in the correct form, arguments are on the whole coherent, and grammar and spelling do not inhibit communication.	2 marks (average)
The answer is only understandable in parts, writing may be in an inappropriate form, arguments are not clearly expressed, and in places grammar and spelling inhibit communication.	1 mark (below average)
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NB The Quality of Communication marks are not dependant upon the AO3 mark

AO2: 3 Marks

(Total Section C: 20 marks)