GCE

General Studies

Advanced Subsidiary GCE **F732**

The Scientific Domain

Mark Scheme for June 2010

Overview of changes

AS Unit 2: *The Scientific Domain* (F732)	
30% of the total AS GCE marks 1 hr written paper 60 marks	This paper has **two** sections:
	Section A: Candidates focus upon the Scientific Domain and are provided with focused resource material on which they answer a series of short, structured questions.
	Section B: Candidates focus upon the Scientific Domain and are required to write at greater length on **one** of **three** topics.

Differences in the new specification need to be taken account of by those examiners who have marked the legacy specification.

- Change of terminology. The papers will be marked using the term 'levels' not 'bands'. Level 1 being the lowest level.

- The marks for the extended writing sections in each unit is now 30 not 40.

- The time allocation for F732 is 60 minutes.

- The total of marks for Unit F732 is 60 marks.

- Changes to the assessment objectives.

Assessment Objectives

AO1 Demonstrate Knowledge and Understanding

- Demonstrate relevant knowledge and understanding applied to a range of issues, using skills from difference disciplines;

AO2 Analysis and Evaluation

- Marshal evidence and draw conclusions; select, interpret, evaluate and integrate information, data concepts and opinions;

AO3 Understanding Knowledge

- Demonstrate understanding of different types of knowledge, appreciating their strengths and limitations;

AO4 Communication

- Communicate clearly and accurately in a concise, logical and relevant way.

Guidance for Examiners

Do not use ticks in Section B.
Use the following annotations. (In any one script you are not expected to use all of these.)

Yes	recognises a point worthy of credit
Dev	a developed point or development of a point
No	a content error
NAQ	not answering the question
eg	appropriate example
SP/G/Eng	spelling, grammar and language error; you are not expected to correct all of them
(…)	indicates a choice or a key phrase
Rubric	rubric infringement
D	Description
R	Reason
Rep	repetition, often of the question
Ev	Evaluation

Stages to an essay mark

Read and annotate the candidate's response.

Consider its position within the level and a possible mark.

Write a one or more line comment reflecting the AO statements.

eg	AO1	good knowledge
		very limited knowledge and eg
	AO2	examples given
	AO3	personal experience relevant
		restricted personal experience
	AO4	clearly written
		inaccurate Spg

Enter the final mark in a circle.

Generic Mark Scheme for Questions with 30 marks

AO1	Level Descriptor The candidate demonstrates the following abilities where appropriate to:	Marks
Level 5	• select, use and integrate a very good range of relevant knowledge • show a good understanding of the concepts involved	8
Level 4	• select, use and integrate a good range of relevant knowledge • show an understanding of the concepts involved	6–7
Level 3	• select, use and integrate a range of relevant knowledge • show an adequate understanding of the concepts involved	4–5
Level 2	• select, use and integrate a limited range of relevant knowledge • show a modest understanding of the concepts involved	2–3
Level 1	• select, use and integrate some knowledge which may not be accurate • show a restricted understanding of the concepts involved.	1
AO2	Level Descriptor The candidate demonstrates the following abilities where appropriate to:	
Level 5	• interpret and analyse issues and problems well and evaluates them appropriately • use evidence to develop complex reasoned arguments and draw sound conclusions on the evidence	9–10
Level 4	• interpret and analyse issues and problems well and evaluates them competently • use evidence to develop reasoned arguments and draw sound conclusions on the evidence	7–8
Level 3	• undertake some interpretation and analysis of issues and problems and make a superficial evaluation • use evidence to develop arguments and draw conclusions	5–6
Level 2	• demonstrate limited interpretation and analysis of issues and problems with limited evaluation • use evidence to develop limited arguments and draw limited conclusions	3–4
Level 1	• demonstrate poor interpretation and analysis of issues, problems and evaluation • recognise arguments and conclusion.	1–2

AO3	Level Descriptor The candidate demonstrates the following abilities where appropriate to:	Marks
Level 5	• demonstrate very good awareness of the differences between types of knowledge • have a very good appreciation of the strengths and limitations of the different types of knowledge	6
Level 4	• demonstrate good awareness of the differences between types of knowledge • have a good appreciation of the strengths and limitations of the different types of knowledge	5
Level 3	• demonstrate awareness of the differences between types of knowledge • have an appreciation of the strengths and limitations of the different types of knowledge	4
Level 2	• demonstrate limited awareness of the differences between types of knowledge • have a restricted appreciation of the strengths and limitations of the different types of knowledge	3
Level 1	• demonstrate very limited awareness of the differences between types of knowledge • have a very restricted appreciation of the strengths and limitations of the different types of knowledge.	1–2
AO4	Level Descriptor The candidate demonstrates the following abilities where appropriate to:	
Level 5	• communicate complex ideas clearly and accurately , using specialist vocabulary where appropriate, in a concise, logical and relevant way • use a wide range of the rules of grammar, punctuation and spelling with accuracy and facility	6
Level 4	• communicate ideas clearly and accurately, using specialist vocabulary where appropriate, in a concise, logical and relevant way • use a range of the rules of grammar, punctuation and spelling with facility	5
Level 3	• communicate clearly, using some specialist vocabulary with facility • use some of the rules of grammar, punctuation and spelling with facility	4
Level 2	• communicate ideas with limited clarity, using some specialist vocabulary • use some rules of grammar, punctuation and spelling	3
Level 1	• communicate with little clarity using occasional specialist terms • use poor grammar and punctuation, and inaccurate spelling.	1–2

Section A

Answer **all** the questions in this section.

Assessment Objective balance

	AO1	AO2	AO3	AO4
Marks	16	8	0	6

Fig. 1 **is a diagram of a sound wave.**
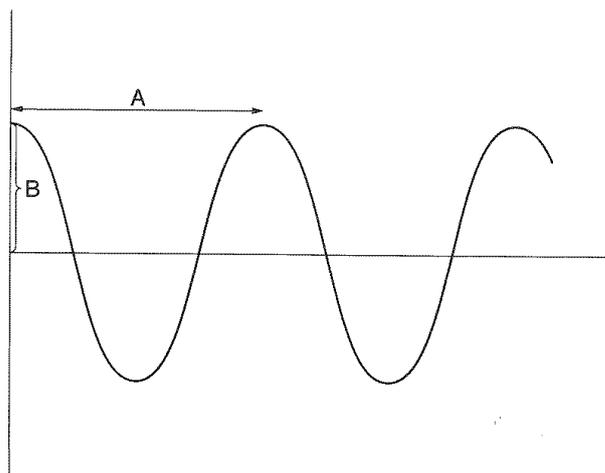
Fig. 1

1 (a) Identify the labels A and B using the words wavelength and amplitude.   [1]

A – wavelength
B – amplitude
Both correct 1 mark.

(b) The speed of sound (V) is defined by the distance that the wave moves in one second. Experiments show that:

$V = \lambda \times f$

where

λ **is the wavelength of the wave (measured in metres)**
f is the frequency, and is the number of waves per second (measured in hertz (Hz)).

Calculate the speed of sound if your instruments measure a frequency of 10 000 Hz and a wavelength of 0.0343 metres.   [4]

Since $V = \lambda \times f$
If $\lambda = 0.0343$ metres and f = 10 000 Hz then

V = 0.0343 x 10 000.
V = 343 metres per second.

2 marks for two correct substitutions in formula.
3 marks for 343.
1 mark for metres per second or ms^{-1}.
An answer of 343 metres per second is acceptable for 4 marks.

(c) **(i)** **Echoes can be used to measure the speed of sound.** **[8]**

Describe how you could obtain an approximate reading for the speed of sound by using a tall building, a 100 metre tape and a digital stop watch.

Concept, at its simplest measure the time taken for an echo to return from the building (1 mark)
Select suitable tall building eg clear view, no obstructions, plane face (1 mark)
Measure distance to site 1 (eg X metres) away from building (1 mark)
Uses sound maker (1 mark)
Test for echo (1 mark)
Wait for quiet (1 mark), wait for a no wind moment (1 mark)
Create sound (1 mark) and simultaneously start stop watch (1 mark)
Calculate speed (1 mark)
Notify police/carry out risk assessment (1 mark).

Allow single marks for these and equivalent steps.

Reserve 2 marks for AO4.

2 – Meaning precise/sharp with very few errors of SPG.
1 – Meaning clear with some errors of SPG.
0 – Meaning not clear with frequent errors of SPG.

Incorrect height of building methods, with some technically correct points (3+2 max)

(ii) **Suggest two ways to improve the accuracy of your results.** **[4]**

Two ways at 2 each.
One mark for simple point, two marks if developed.
Ways include:

- have help from team of people
- more than one digital stop watch (two people)
- reject anomalous/extreme results/find mean
- beat out the sound, count the duration of time for ten beats to find time for one beat and echo
- repetition at other sites or distances.

Examiners to use their judgements for other suggestions.

(d) **When an aircraft flies past overhead the sound seems to come after** **[3]**
the plane has passed. Explain this phenomenon.

Speed of light much faster (1 mark) than speed of sound (1 mark).
Third mark is linked to context
Light travels faster than sound (1 mark) applied to context (1 mark)
For information only, speed of light 299 792 458 metres/sec when speed of sound 343 metres/sec.

2 **In the days before refrigerators families would shop frequently for food. One family purchased milk every second day, bread every third day, fruit every fourth and meat every fifth. Assume on Day 0 they have shopped for all four items.**

(a) **On which day could they shop for all four items again?** **[5]**

It is acceptable for candidates to produce a rough equivalent of this table to gain the answer of 60 days.
Alternatively the more mathematical will find the lowest common number into which all four will divide exactly ie 60 days.
Those who multiply all four together will come incorrectly to 120 days (1 mark)
Correct answer gains 5 marks

Allocate marks as follows:

- understands the question eg a table or mathematical (1 mark)
- begins with day 1 (1 mark)
- appreciates periodicity of purchase eg two foods correct (1 mark)

Reserve 2 marks for AO4.

2 – Meaning precise/sharp with very few errors of SPG.
1 – Meaning clear with some errors of SPG.
0 – Meaning not clear with frequent errors of SPG.

Incorrect answer maximum of 4 marks

(b) On how many days in this period were none of these foods purchased?   **[5]**

Day	Milk	Bread	Fruit	Meat
0	M	B	F	Me
1				
2	M			
3		B		
4	M		F	
5				Me
6	M	B		
7				
8	M		F	
9		B		
10	M			Me
11				
12	M	B	F	
13				
14	M			
15		B		Me
16	M		F	
17				
18	M	B		
19				
20	M		F	Me
21		B		
22	M			
23				
24	M	B	F	
25				Me
26	M			
27		B		
28	M		F	
29				
30	M	B		Me
31				
32	M		F	
33		B		
34	M			
35				Me
36	M	B	F	
37				
38	M			
39		B		
40	M		F	Me
41				
42	M	B		
43				
44	M		F	
45		B		Me
46	M			
47				
48	M	B	F	
49				
50	M			Me

51		B		
52	M		F	
53				
54	M	B		
55				Me
56	M		F	
57		B		
58	M			
59				
60	M	B	F	Me

There are 16 days when no food is purchased.

The days are 1, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 49, 53, 59.

Allocate marks as follows:

- understands the question (1 mark)
- uses table and lists days (2 marks)
- Correct answer (5 marks).

Reserve 2 marks for AO4.

2 – Meaning precise/sharp with very few errors of SPG.
1 – Meaning clear with some errors of SPG.
0 – Meaning not clear with frequent errors of SPG.

Candidates using a mathematical approach may search for numbers less than 60 that are not divisible by 2, 3, 4 and 5. Credit up to full marks.

Incorrect answer maximum of 4 marks

Section A Total [30]

Section B

Answer **one** question from this section.
Answers should be in continuous prose.

3   **Some experts estimate that the UK will need to increase its sources of energy by 20% in the next ten years. A number of plans have been proposed to close this energy gap. Examine the relative disadvantages of <u>each</u> of the following:**

- **coastal nuclear power stations**
- **renewable energy sources such as wind farms, solar panels and tidal barriers**
- **coal fired power stations close to known coal reserves.**   **[30]**

Assessment Objective balance

	AO1	AO2	AO3	AO4
Marks	**8**	**10**	**6**	**6**

This question involves:

- recognition of the need to increase energy supply
- stating the disadvantages of each strategy
- coming to some summary statement as a result of their examination.

Indicative content

Disadvantages of coastal nuclear power include:

- sites are often attractive places
- threat to tourist industry
- create relatively small amounts of employment
- problems of waste storage and disposal
- pollution of marine environment
- plants are expensive to build
- takes a long time to commission
- history of disasters.
- terrorism
- affecting fishing grounds
- area occupied.

Disadvantages of wind, solar and tidal include:

- amounts of power produced are low
- intrusion on sensitive sites/wildlife habitats
- high maintenance
- not secure for base load
- sources tend to be remote from populated areas
- technology still developing
- land salting, fishing
- eco balance/habitat
- area occupied.

Disadvantages of coal fired power stations include:

- high cost of latest technology
- pollution (water, air and land)
- fuel source is finite
- means of air cleaning disputed
- limited life
- area occupied
- global warming.

These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of a level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'border line' should be awarded the lowest mark in the level.

Levels	Descriptors	Marks
Level 5	These candidates will provide a developed account for each of the power sources (AO1) and come to some suggestion of their relative merits (AO2). They will explore such topics as definitions, time scale and combinations of sources. Personal experience or other examples may be included (AO3). In terms of (AO4) communication, these answers will be clear and well structured and written with facility.	**25–30**
Level 4	These candidates will provide an account of each of the power sources and two of them will be developed (AO1). They will come to some hint of their relative merits (AO2). Definitions and personal experience or other examples may be included (AO3). In terms of (AO4) communication it will be clear and well structured.	**19–24**
Level 3	These candidates will provide some information for each power source (AO1/AO2). Some personal experience or examples may be included. (AO3). In terms of (AO4) communication, these answers will be clear but contain some errors of spelling, punctuation and grammar and a modest structure.	**13–18**
Level 2	These candidates will include all three power sources though one of them will only be in token terms. (AO1/AO2). Personal experience or examples may be included (AO3). In terms of (AO4) communication, clarity will be insecure and their command of spelling, punctuation and grammar as well as structure will be limited and inaccurate.	**7–12**
Level 1	These candidates will include two power sources though one of them will only be in token terms (AO1/AO2). In terms of (AO4) communication, their answers will be unclear with poor sentence structure and errors of grammar and spelling.	**0–6**
Recommended annotation **Intro** for introduction **DM1, DM2**… for disadvantages of nuclear power **DR1, DR2**… for disadvantages of renewable sources **DC1, DC2**… for disadvantages of coal fired stations **RM1, RM2** for comparative points on relative merits **e.g.** for examples **Conc**. for conclusion.		

4   **Scientists have contributed solutions to many medical problems. Current problem areas include:**

- **finding cures for breast cancer**
- **improving fertility for males and females**
- **treating dementia in the elderly**
- **developing vaccines to combat HIV and Aids.**

Funds for medical research are limited.

Select <u>two</u> of these problem areas. Argue the case for giving <u>one</u> of them priority over the other for funding.   **[30]**

Assessment Objective balance

	AO1	AO2	AO3	AO4
Marks	8	10	6	6

This question involves:

- selection of two of the areas
- arguing for one of the chosen areas
- arguing against one of the chosen areas.

Indicative content

The key point here is that funds are limited and all problems can not be given priority.

Cures for breast cancer
For
Affects men and women
Second most common cancer
0.5 million deaths per year
Hereditary nature

Lower priority
Should focus on lung cancer (most frequent)
Present methods acceptably successful
Mainly females

Treating dementia
For
Retention of quality of life
Eases conditions for carers
Reduces other costs in the health service

Lower priority
Often only slight
Only 5% in 65 plus group and 20% in 80 plus ie minority
Not infectious

Improving fertility
For
Desire to build family
Rebuilds for lost child

Low priority
Not life threatening
Expensive
Treatments already available
Adoption available
Problem side effects
Overcrowded world
Designer babies

Vaccines for HIV and Aids
For
33.2 million people live with the disease
2.1 million have died, mainly sub-Saharan Africa
Slows economic growth
Infectious, offspring may have the disease at birth
Research spin offs

Lower priority
Difficulties of logistics in Africa
Treatment expensive in poor countries
Prevention better than cure

These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of a level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'border line' should be awarded the lowest mark in the level.

Levels	Descriptors	Marks
Level 5	These candidates will provide developed accounts of the arguments for their chosen priority and against their other choice (AO1 and AO2). They may engage with scientific issues or personal experience. The role of time scale may be included (AO3). In terms of AO4 (communication) these answers will be clear and well structured and written with facility.	**25–30**
Level 4	These candidates will provide accounts of the arguments for their chosen priority and against their other choice (AO1 and AO2). They may engage with scientific issues or personal experience (AO3). In terms of AO4 (communication) will be clear and well structured	**19–24**
Level 3	These candidates will include both arguments for and against (AO1 and AO2) though they may well be unbalanced. Examples or personal experience may be included (AO3). In terms of AO4 (communication) these answers will be clear but contain some errors of spelling, punctuation and grammar and a modest structure.	**13–18**
Level 2	The arguments for and against will not be clear (AO1). These candidates will be insecure in their recognition of the key issue (AO2). They may include some personal experience that informs their views (AO3). In terms of AO4 (communication) clarity will be insecure and their command of spelling, punctuation and grammar as well as structure will be limited and inaccurate.	**7–12**
Level 1	The arguments for and against will not be secure (AO1). Their recognition of the key issues will be fragmentary (AO2). They may include some personal experience that informs their views (AO3). In terms of AO4 (communication) their answers will be unclear with poor sentence structure and errors of grammar and spelling.	**0–6**
Recommended annotation **Intro** for introduction **F1, F2, F3** ... for arguments for one choice **A1, A2, A3**... arguments against other choice. **Dev** for development of points **e.g.** for examples **Conc**. for conclusion.		

5   In a library the books are usually classified using the Dewey system. Rocks can be classified using the geological time scale and living organisms using the Linnaean system.

A good classification has the following features:

*   members of a class should have maximum similarity
*   there is maximum difference between the different classes
*   the items being classified should only fit into one class
*   each class should have a clearly identified label
*   there should not be many classes with one or few members.

Suggest <u>three</u> reasons for scientists wanting to classify their observations and measurements of such things as rocks, organisms, clouds and chemicals. Describe <u>two</u> difficulties they may encounter when using a classification.   [30]

Assessment Objective balance

AO1	AO2	AO3	AO4
8	10	6	6

This question involves:

*   understanding what classification involves
*   suggesting three reasons for scientists wanting to use a classification
*   describing two difficulties they might encounter.

Indicative content

Three reasons for scientist wanting to use a classification:

*   to sort a large set of observations into smaller groups
*   to search for order/understanding from the groupings
*   to indicate a direction for further enquiry
*   simplification of complex mass of data
*   to organise and find
*   to facilitate communication
*   to assess development and change
*   to describe different situations.

Two difficulties they might encounter:

*   observation fits into two classes
*   interpretation of observations could change
*   lack of knowledge of subjects (exploratory research)
*   lack of measurements
*   inability to identify.

These descriptors are intended as a first guide to examiners. They indicate the characteristics of a top of a level answer. Marks within a level are awarded when an answer does not include all the parts or qualities shown in the descriptor. Answers which are 'border line' should be awarded the lowest mark in the level.

Levels	Descriptors	Marks
Level 5	These candidates will give three developed reasons for scientists wanting to use a classification (AO1). Their account will be linked to an example, such as rocks or plants, to develop the points (AO2). They will give good descriptions of two difficulties (AO1) in context (AO2). They can be expected to show evidence of AO3 through the exploration of classification rules or personal experience. In terms of AO4 (communication) these answers will be clear and well structured and written with facility.	**25–30**
Level 4	These candidates will offer three reasons and one of them will be developed (AO1). They will link their account to an example. They will offer two difficulties one of which will be developed (AO2). They can be expected to show a little evidence of AO3 through exploration or classification rules or personal experience. In terms of AO4 (communication) will be clear and well structured.	**19–24**
Level 3	These candidates will introduce three reasons for using a classification and two difficulties though only one or two of the five will be developed. (AO1 and AO2). Some limited demonstration should be present in terms of personal or reported experience.(AO3). In terms of AO4 (communication) these answers will be clear but contain some errors of spelling punctuation and grammar and a modest structure.	**13–18**
Level 2	These candidates will introduce three of the five elements and none will be developed. (AO1 and AO2). There will be little evidence of AO3. In terms of AO4 (communication) clarity will be insecure and their command of spelling, punctuation and grammar as well as structure will be limited and inaccurate.	**7–12**
Level 1	These candidates will offer two or fewer of the five elements of the question and none will be developed (AO1 and AO2). In terms of AO4 (communication) their answers will be unclear with poor sentence structure and errors of grammar and spelling.	**0–6**
Recommended annotation		

Recommended annotation
Intro for introduction
R1, R2 and R3 for the three reasons for using a classification
Diff 1 and **Diff 2** for difficulties when using classification
Dev for development
e.g. for examples
Conc. for conclusion.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance
programme your call may be recorded or monitored