OCR
RECOGNISING ACHIEVEMENT

GCE

Geology

Advanced GCE **A2 H487**

Advanced Subsidiary GCE **AS H087**

Report on the Units

January 2009

H087/H487/MS/R/09J

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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REPORT ON THE UNITS

F791/01 Global Tectonics

General Comments
There were some excellent scripts and these candidates demonstrated very good subject knowledge, expressing themselves clearly and concisely and using good technical terminology. Performance at the top end was excellent with a significant number of candidates gaining more than 50 marks out of 60. Very few candidates gained less than 23 out of 60 which indicates well prepared candidates. This is the first time that the new specification has been assessed and it would appear that candidates are prepared for the new parts as well as the more familiar aspects of the specification. There was no evidence that time was an issue – almost all candidates attempted the extended question.

In addition:
Some candidates need to pay far more care and attention to the quality of their written communication. Poor handwriting and spelling continue to be issues for some candidates and they should be encouraged to learn the correct spelling of key geological words and terms. This is particularly important in the new specification which has two marks reserved for the correct spelling of specific terms.

Comments on Individual Questions

Q 1 The quality of responses to this question on discontinuities and Earth structure was very good with a mean of over 10/14.

a) (i) The majority of candidates were familiar with the discontinuities. However, the spellings were sometimes incorrect. This is the kind of question where candidates may be tested on spelling.

The three discontinuities candidates need to know are:

Crust/mantle	Moho/Mohorovicic
mantle/outer core	Gutenberg
outer core/inner core	Lehmann

(ii) Candidates showed a sound understanding of the Lehmann discontinuity, most knowing that it is a phase boundary between the liquid outer core and solid inner core. Other candidates indicated that it is a transitional boundary and others knew the depth at 5100km

(iii) Many candidates knew that discontinuities can be detected by changes in velocity of P or S waves along with refraction or reflection of the waves. Very few students used the incorrect term ‘defraction’. Few candidates described the shadow zones which are key pieces of evidence. Candidates should be familiar with the relevant epicentral angles: 103° to 103° for S waves and 103° to 142° for P waves. Candidates should be prepared to write an extended prose question on the use of seismology as evidence for Earth structure.

b) (i) Many candidates knew that the lithosphere was solid but not many knew any extra detail. Candidates should be aware that the lithosphere constitutes the plates and consists of the crust plus the upper part of the mantle. A few candidates confused the lithosphere with the asthenosphere.

(ii) Many candidates knew that the asthenosphere was (5%) partially molten and very few candidates said *semi molten* which was not accepted. Many candidates knew that the asthenosphere could flow and was rheid. Candidates need to be careful that they do not contradict themselves by saying the asthenosphere is solid and then saying it is 5% partially molten.

c) **(i)** The vast majority of candidates completed the graph with little difficulty. Candidates should be encouraged to be as neat as possible when completing the graph possibly drawing it in pencil first and then in black pen.

(ii), (iii) Only about half the candidates successfully calculated the geothermal gradients. Candidates should be able to calculate gradients and should be encouraged to show their working. Candidates should expect various calculations within examinations, especially spreading rates at Mid Ocean Ridges.

(iv) Many candidates were unsure about whether the geothermal gradient increased or decreased and some responses cited the steepness of the gradient. The simple solution was to use the results from (ii) and (iii).

(v) Candidates could either describe the difference between region **A** and **B** or the differences with depth of region **A**. Candidates clearly understood this and most gained the mark.

(vi) 40% of candidates could name an area of low heat flow. Candidates should be clear that deep sea trenches and cratons have low heat flow.

Teaching Tip
Candidates should also be familiar with high heat flow areas. Candidates could colour code a map of the world with red for high heat flow and blue for low heat flow.

Q2 Candidates found aspects of this question difficult especially finding enough detail to gain two marks in many of the part questions. Evidence for continental drift could be an extended prose question so it must be understood in detail.

a) **(i)** Most candidates were able to discuss the use of fold mountains and indicated some kind of jigsaw like fit.
Candidates should expect evidence for continental drift to be an extended prose question.

Teaching tip
Candidates should be able to draw a map showing Africa and South America joined together with fold mountains crossing the join. They should practise drawing this map and also adding the overlapping cratons, Carboniferous glacial deposits and fossil outcrops.

(ii) Candidates found the lithology evidence more difficult. Candidates could discuss the use of specific rock types like desert sandstones, coal or glacial deposits that form in specific climatic zones or else use the matching outcrops of rock types like Carboniferous glacial deposits in Gondwanaland.

(iii) Most candidates discussed finding the same fossils on different continents. Many also mentioned the idea that most of these organisms could not have swum or flown over the expanse of ocean and so the continents must have been parts of the same land mass. Many candidates could quote specific fossils especially *Mesosaurus* and *Glossopteris*. In addition, candidates could discuss the use of corals as being equatorial/subequatorial palaeolatitude indicators

b) **(i)** The vast majority of candidates could spell Gondwana/Gondwanaland

(ii) The majority of candidates knew two appropriate continents - usually South America and Africa.

(iii) This question was answered very well by the candidates, the majority discussing erosion and deposition along the coastlines. Fewer mentioned that the edge of the continent is further offshore from the coastline.

c) **(i)** Most candidates knew that the age of oceanic crust increases away from the Mid Ocean Ridge. About 28% could add a second point explaining either the symmetry about the Mid Ocean Ridge or the idea that new crust was being created at the ridge.

(ii) Most candidates explained how iron rich minerals in cooling magma 'store' the magnetism of the time. Candidates need to have a clear description of this process as many explanations were too vague. 30% of candidates were able to add a second point mainly for mentioning the 'flipping' of the Earth's magnetic field. Candidates need to use an alternative term to *reversing* if the term *reversing* is in the question. Candidates must also be aware of the symmetry of the magnetic stripes around the ridge.

Q3 Question 3 produced a range of excellent responses indicating that candidates had a clear understanding of earthquake measurement and impacts. The average mark was 10/13.

a) **(i)** Almost all candidates were clear that the technology did not exist to record magnitude in 1556.

(ii) Fewer than half the candidates knew a precise definition of *earthquake magnitude,* often using terms such as *strength, size,* or *power* of the earthquake rather than *(strain) energy released*. A few candidates also mentioned seismic wave magnitude. A significant minority also mixed up *magnitude* with *intensity*.
Candidates must learn these definitions and be precise in their application.

(iii) This question was answered very well, with 70% of candidates gaining both the available marks.

b) **(i)** 70% of candidates gave a good definition of a tsunami. Errors occurred when they called it a *tidal wave* with no link to an earthquake or else just called it a wave without any indication of size.

(ii) Only 33% of candidates were able to give an accurate explanation of how tsunamis form by ground movement displacing a body of water. Many discussed the seismic waves themselves creating the wave, which is not the case. Tsunami formation does need to be clarified in candidates' minds.

c) **(i)** Almost all candidates gave an appropriate definition of *intensity* in contrast to the less secure definitions of *magnitude*.

(ii) Half the candidates knew that 12 is the maximum intensity figure currently used in the Mercalli scale. Candidates need to be familiar with the differences between the Richter and Mercalli scales and not get magnitude and intensity confused.

(iii) This was the most difficult part of question 3 requiring candidates to be aware that the nature of the ground has a major influence on intensity, with unconsolidated ground being prone to liquefaction and so giving rise to higher intensity. Candidates instead discussed varying population or building types. This is not relevant, as the Mercalli scale takes account of construction type. A few candidates were also aware of the subjective nature of intensity readings.

(iv) The majority of candidates could locate the epicentre.

d) Most students knew the correct definitions for *focus* and *epicentre*. The main errors were confusing the two terms or not mentioning that the epicentre is on the surface.

Q4

a) **(i)** The majority of candidates knew at least one plate margin example with 25% knowing all three. Candidates should be familiar with a tectonic map of the world.

Teaching tip
Candidates should have a map of the world with named plates marked on as well as the movement directions. Key mountain ranges could also be labelled.

(ii) 80% of candidates gained at least two marks with many gaining full marks for the diagram of a constructive plate margin. Although labels were quite accurate, the diagrams themselves were often poor. Convection currents need to be drawn accurately and not as a small circle adjacent to the ridge.

Teaching Tip
Candidates must practise drawing fully annotated cross-sections of all types of plate margin. Using an A3 sheet allows detailed annotations to be added. Candidates should expect to be asked to add at least four labels to a plate margin diagram.

b) **(i)** About half of the candidates equated the formation age of the earth with the age of the formation of the solar system at approximately 4,500 Ma.

(ii) There were some very impressive answers to this new part of the specification. Most candidates were aware of accretion being the main way that the planets formed. Fewer candidates mentioned the initial gas and dust cloud which started to rotate before gravity attracted most of the material to the centre to form the Sun. Denser material formed the terrestrial planets and the lighter material formed the gas giants.

(iii) The majority of students knew two appropriate planets and could spell them correctly. Candidates must be careful to use capitals where appropriate and write clearly when answering these particular types of question.

Q5 Question 5 proved to be difficult for many students with only 6% gaining full marks with a similar percentage gaining zero. Structural geology questions tend to prove difficult for candidates and this was the case here. Many candidates were able to write in some detail about different types of folds gaining the full 4 marks for this section. Many also named and drew reverse faults. Errors included discussing normal faults and not adding many labels onto the diagram

Teaching Tip
Candidates should be encouraged to practise fully annotating folds and faults as they could also be asked to do just that in short answer questions. Labels could include the location of the oldest rocks for anticlines and synclines and the hanging wall and footwall in reverse faults.

Some mentioned horst blocks which can occasionally form but candidates tended to draw them with normal faults, which is not the case.

A minority of candidates described the formation of cleavage and those that did made excellent use of diagrams. Candidates who discussed tension joints had more difficulty describing them in detail. A significant number of candidates discussed large scale structures like fold mountains and subduction zones and were given credit when linked to annotated diagrams.

Grade Thresholds

Advanced GCE Geology (H487)
Advanced Subsidiary GCE Geology (H087)

January 2009 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	a	b	c	d	e	u
F791	Raw	60	45	40	35	30	26	0
	UMS	90	72	63	54	45	36	0

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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