Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2014

Geography

Assessment Unit AS 1

assessing

Physical Geography

[AG111]

TUESDAY 14 JANUARY, MORNING

MARK SCHEME

MARK SCHEMES

Foreword

Introduction

Mark Schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of 16- and 18-year-old students in schools and colleges. The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes therefore are regarded as a part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

The Council hopes that the mark schemes will be viewed and used in a constructive way as a further support to the teaching and learning processes.

Introductory Remarks

The assessment objectives (AOs) for this specification are listed below. Students must:

AO1 demonstrate knowledge and understanding of the content, concepts and processes;

AO2 analyse, interpret and evaluate geographical information, issues and viewpoints and apply understanding in unfamiliar contexts;

AO3 select and use a variety of methods, skills and techniques (including the use of new technologies) to investigate questions and issues, reach conclusions and communicate findings.

General Instructions for Markers

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all markers are following exactly the same instructions and making the same judgements so far as this is possible. Markers must apply the mark scheme in a consistent manner and to the standard agreed at the standardising meeting.

It is important to recognise that in some cases there may be other correct responses that are equally acceptable to those included in this mark scheme. There may be instances where certain judgements have to be left to the experience of the examiner, for example, where there is no absolute, correct answer.

Markers are advised that there is no correlation between length and quality of response. Candidates may provide a very concise answer that fully addresses the requirements of the question and is therefore worthy of full or almost full marks. Alternatively, a candidate may provide a very long answer which also addresses the requirements of the question and is equally worthy of full or almost full marks. It is important, therefore, not to be influenced by the length of the candidate's response but rather by the extent to which the requirements of the mark scheme have been met.

Some candidates may present answers in writing that is difficult to read. Markers should take time to establish what points are being expressed before deciding on a mark allocation. However, candidates should present answers which are legible and markers should not spend a disproportionate amount of time trying to decipher writing that is illegible.

Levels of Response

For questions with an allocation of six or more marks three levels of response will be provided to help guide the marking process. General descriptions of the criteria governing levels of response mark schemes are set out on the next page. When deciding about the level of a response, a "best fit" approach should be taken. It will not be necessary for a response to meet the requirements of all the criteria within any given level for that level to be awarded. For example, a Level 3 response does not require all of the possible knowledge and understanding which might be realistically expected from an AS or AL candidate to be present in the answer.

Having decided what the level is, it is then important that a mark from within the range for that level, which accurately reflects the value of the candidate's answer, is awarded.

General Descriptions for Marking Criteria

Knowledge and Understanding	Skills	Quality of Written Communication	Level
The candidate will show a wide-ranging and accurate knowledge and a clear understanding of the concepts/ideas relevant to the question. All or most of the knowledge and understanding that can be expected is given.	The candidate will display a high level of ability through insightful analysis and interpretation of the resource material with little or no gaps, errors or misapprehensions. All that is significant is extracted from the resource material.	The candidate will express complex subject matter using an appropriate form and style of writing. Material included in the answers will be relevant and clearly organised. It will involve the use of specialist vocabulary and be written legibly and with few, if any, errors in spelling, punctuation and grammar.	3
The candidate will display an accurate to good knowledge and understanding of many of the relevant concepts/ ideas. Much of the body of knowledge that can be expected is given.	The candidate will display evidence of the ability to analyse and interpret the resource material but gaps, errors or misapprehensions may be in evidence.	The candidate will express ideas using an appropriate form and style of writing. Material included will be relevant and organised but arguments may stray from the main point. Some specialist terms will be used and there may be occasional errors in spelling, punctuation and grammar. Legibility is satisfactory.	2
The candidate will display some accurate knowledge and understanding but alongside errors and significant gaps. The relevance of the information to the question may be tenuous.	The candidate will be able to show only limited ability to analyse and interpret the resource material and gaps, errors or misapprehensions may be clearly evidenced.	The candidate will have a form and style of writing which is not fluent. Only relatively simple ideas can be dealt with competently. Material included may have dubious relevance. There will be noticeable errors in spelling, punctuation and grammar. Writing may be illegible in places.	1

Section A

AVAILABLE MARKS

1 (a) **ICT** – Possible computer programs may include:

- Internet Search Engines
- DTP Software (Publisher)
- Spreadsheets (Excel)
- Databases (Access)
- Presentation Software (Powerpoint)

The use of ICT will depend on the fieldwork and the application may be employed at a variety of stages within the investigation process.

GIS – Geographical Information Systems can be used to analyse information within a spatial context and can thus be of great value in a fieldwork investigation. GIS has the potential to inter-relate, organise, analyse and manage data to reveal relationships, patterns and trends.

Award [3] if the candidate coherently describes the potential or actual use of the chosen tool within their fieldwork investigation.

Award [1]–[2] for a less detailed, less precise answer which may lack convincing linkage to the actual fieldwork. [3]

(b) (i) The technique selected must relate to primary data collection and one of the variables tabulated in the submitted report.

Award [5] for a detailed, well written description of the procedure employed to collect primary data. Where relevant, the answer should specify the variable, the equipment and the technique(s) employed in the field.

Award [3]–[4] for an accurate but less detailed answer. The methodology may be relatively sound with some minor gaps in the procedure described.

Award [1]–[2] for a more simplistic or incomplete methodology with more tenuous linkage to the fieldwork undertaken.
Maximum [2] for detailed discussion of sampling method only, and then only if linked to a tabulated variable. [5]

(ii) Secondary data involves the integration of published data which may be produced in a written, statistical or mapped format. Secondary data can be used at a variety of stages within the investigation – planning, data collection, interpretation, conclusion etc.

Award [3] for an answer which outlines the precise role of a specific secondary source within the study. There must be explicit linkage with the individual fieldwork investigation.

Award [1]–[2] for a more simplistic discussion with limited/no linkage to the individual fieldwork. The source indicated may be general rather than specific. [3]

(c) (i) The statistical analysis performed will depend on the chosen technique, but it must be relevant to the aim/hypothesis of the investigation. Therefore cross-referencing is essential with the submitted report. Credit only calculations put in the box as instructed by the question.

Measures of Central Tendency/Dispersion
Calculation of mean [2]
Calculation of median [2]
Identification of mode [1]
Calculation of range [2]

Spearman's Rank Correlation or Nearest Neighbour Analysis
- Accuracy of calculation [5]
  (Maximum of [3] if Spearman's Rank is performed with less than 7 ranked pairs)
- Statistical Interpretation [2]

N.B. Maximum 4 marks if the statistical technique applied is inappropriate to test the proposed aim/hypothesis. [7]

(ii) The question requests thorough geographical reasoning in relation to the statistical outcome.

Level 3 ([5]–[6]) Relevant explanatory factors and theoretical concepts are proposed in relation to the statistical outcome. The answer displays sound and thorough geographical understanding and is communicated effectively using appropriate geographical terminology.

Level 2 ([3]–[4]) Explanatory factors are proposed but the answer lacks breadth/depth. Reasonable geographical understanding is evident with only tenuous reference to theoretical concepts. Fewer specialist terms may be included. Maximum L2 [3] if explanation relates to an incomplete/invalid/unattempted or different r_s outcome in **1(c)(i)**.

Level 1 ([1]–[2]) Explanation is simplistic with little/no attempt made to include theoretical concepts. Some inaccuracy or omissions may be evident and the quality of written communication may be poor. [6]

(d) Answers will vary depending on the context of the fieldwork and the factors selected. Candidates need to clearly explain their proposed modification and discuss how this could result in improvements to the fieldwork. The answer required is thus two-fold and this is an opportunity for candidates to demonstrate their ability to evaluate. It is reasonable for candidates to offer improvements whilst recognising weaknesses which need to be overcome. For each factor:

Award [3] for an answer which outlines and explains a realistic modification/improvement with a clear understanding of its beneficial outcome for the fieldwork.

Award [1]–[2] for an answer which proposes a very general or less realistic modification and provides a more limited explanation of its beneficial influence for the fieldwork.
2 × [3] [6]

Section A **30**

AVAILABLE MARKS

Section B

AVAILABLE MARKS

2 (a) (i)
- Peak Discharge = 67 m^3/sec
- Lag Time = 11 hours (accept + or – 1hr) [2]

(ii) Responses should provide both description and explanation. Typical flash flood characteristics can be observed. Following a short **approach segment** and a steep **rising limb**, a high **peak discharge** of 67 cumecs is recorded at 2pm on the 8th December. A short lag or delay time of only 11 hours is evident and a steep **falling** or **recession limb** typifies the hydrograph.
As outlined in **Resource 2B**, there are many controlling factors in this upland drainage basin which may explain the hydrological response to this rainfall event.

Geology – Rock type influences the proportion of precipitation which percolates into the bedrock to form the ground water store. Impermeable metamorphic rocks have low porosity and permeability which reduces the ground water store and thus reduces the potential for the more gradual base flow component. The impeded percolation often results in saturated soils which reduces infiltration. A larger proportion of precipitation thus is transferred as surface runoff which reaches the river more rapidly producing a high peak discharge and a typically short lag time.

Vegetation – The vegetation cover is often considered to be one of the most important factors influencing surface runoff in the drainage basin. In this upland catchment, vegetation is described as “sparse upland rough grazing pasture” which undoubtedly reduces the capacity for interception storage and evapotranspiration loss. Therefore more rapid and intense surface runoff results in a short lag time and a high peak flow.

Soil – It is reasoned that if the soil is thin then there is a reduced infiltration and soil moisture storage capacity. This reduces the potential of the more gradual sub-surface transfer methods and produces more rapid and voluminous surface runoff – hence the short lag time and high peak discharge.

Gradient – Steeper slopes in the watershed zone of the catchment encourage more overland flow. As the infiltration capacity is reduced when gradients are steep, there is reduced potential for more gradual sub-surface transfers via throughflow and base flow. The short lag response and high peak flow are thus a consequence of rapid and intense surface runoff.

Level 3 ([5]–[6]) A detailed description with effective resource use is provided. A coherent explanation is given in relation to **both** selected factors with a confident use of specialist terminology. Full marks can be awarded for answers including a detailed description of the shape of the hydrograph without mention of values.

Level 2 ([3]–[4]) A less detailed description with more limited resource use may be provided with a more general, less detailed explanation. Alternatively, there may be an imbalance between description and explanation at this stage if only **one** explanatory factor is completed.

Level 1 ([1]–[2]) The candidate provides a more simplistic description and/or explanation. There may be obvious gaps in detail and understanding. Furthermore key terminology is an unlikely inclusion at this response level.

Maximum 4 if detailed description is provided and a sound explanation of only one factor is attempted [6]

(b) **Traction** occurs when the largest boulders and cobbles roll or slide along the river bed. The process is dependent on river energy or discharge. It is most likely to operate when the sediment size exceeds the prevailing energy level of the river (when it is insufficient for entrainment)

Solution is the transfer of material in a dissolved state. This process is independent of river energy or discharge and is most likely to operate if the sediment is soluble e.g. limestone. Alternatively it may occur if the river is acidic and thus has a higher potential to dissolve the sediment.

Mark Breakdown

Award [1] + [1] for an accurate description of each process.
Award [1] + [1] for a valid discussion of the influential conditions. [4] 12

3 **(a)** **(i)** There is a large annual temperature range with a maximum of 27º C in July and sub-zero temperatures in January. Lower rainfall totals (below 40 mm) are experienced in the winter months (November to February) with higher summer totals, e.g. over 100 mm in June.
The Prairie grasslands are dominated by a rich assemblage of herbaceous plants and grasses. Few trees characterise this ecosystem due to the low annual precipitation. Grasses are adapted to the hot Summers with high temperatures and they possess underground storage systems which enables them to cope with low rainfall totals. Additional adaptations to cope with low rainfall totals include spine like leaves with waxy surfaces, long water seeking roots or succulents.
In the cold Winters, with temperatures below 8°C for approximately five months, grasses die back. The root systems keep them alive for revival in Spring. Furthermore, the extensive fibrous root system provides an essential anchor in strong winds.

Mark breakdown

Temperature description with accurate value [1]
Rainfall description with accurate value [1]
Explanation of climatic adaptation or adaptations [2]. [4]

(ii) A variety of soil processes may be influenced by climate. Possible answers include:

- **Humification** – the breakdown/decomposition of organic matter by decomposers and its incorporation into the A horizon. The rate of this process can be influenced by the temperature.

- **Leaching** – the downward transfer of soluble minerals through the soil and beyond to the water table. This process is influenced by temperature as it is common in Spring following snow melt.

- **Calcification** – upward capillary movement of water and $CaCO_3$ which is deposited in the form of calcium nodules. High Summer temperatures influence this evaporation process.

AVAILABLE MARKS

- **Weathering** – the breakdown of the bedrock to produce soil mineral matter. Candidates may discuss the importance of temperature for physical weathering or rainfall (moisture) for chemical weathering.
  Award up to [2] for the description of the soil process in relation to a specified climatic variable. [2]

(b) The question demands description of the selected biotic/abiotic variables, as well as explanation. Explanation should display knowledge of the autogenic processes which act to modify the environment to allow succession to proceed. **Resource 3B** displays a variety of predictable changes associated with vegetation succession.

- Plant height, species diversity and plant cover generally increase during the succession process as the modified soil and microclimatic environment become less hostile and more favourable for plant productivity.Taller terrestrial species and a greater range of species can tolerate the more mature, deeper, more fertile less acidic soils as well as the more sheltered shaded microclimatic environment.

- The soil organic content increases as plant growth and productivity, and thus nutrient cycling, is more efficient in the later seral stages. The decomposition of leaf litter by the more active detrivore population results in the build-up of humus, increasing the organic content of the topsoil.

- Soils become less alkaline and more neutral, (or slightly acidic), as humic acids are released during the decomposition process, influencing the PH value.

Mark Breakdown

- **Description** – Award up to [2] for the description of the selected variables. Candidates should quote figures from Resource 3B for full marks.

- **Explanation** – Award up to [2] for an explanation of each of the selected changes. Answers should display knowledge of the autogenic processes and include the terminology associated with succession.
  2 × [2] [6]

12

4 (a) (i) The chart illustrates a distinctive trend.

The number of major hurricanes appears to rise when sea surface temperatures exhibit an above average increase. This is particularly evident between 1995 and 2004 when sea temperatures rise up to 0.3°C above average and major hurricanes increase to 6 in both 1996 and 2004. Conversely, when sea temperatures fall below average,the number of major hurricane events decrease. This pattern is most evident in the early 1970s when only 1 major event was recorded in 1971 and 1973, when sea temperatures dropped to almost 0.6°C below average. Candidates should be aware that the warm core of water dissipates more readily into vapour providing the fuel, or energy, for small ocean storms to escalate into more powerful systems.

Award up to [3] for a clear description of the inter-related variables. The quotation of figures is a requirement for full marks.

Award [1] for a logical statement of explanation. [4]

			AVAILABLE MARKS
	(ii)	Horizontal heat transfers occur in the atmosphere to maintain the balance between the net radiation surplus received at the Equator and the deficit experienced at the Poles. The key horizontal transfer mechanisms are; • **Winds** – the global wind systems transfer approximately 80% of the heat energy – moving warm tropical air to the Polar regions and cold air from the Poles to the Equator. • **Ocean currents** – approximately 20% of this heat energy exchange is accomplished by ocean currents. Ocean currents that flow away from Equatorial regions are warm, whereas currents that move towards the Equator transfer colder water to this zone of surplus. Award up to [2] for a description of the chosen horizontal heat transfer mechanism. Award up to [2] for explanation in relation to the global atmospheric radiation balance. [4]	
(b)	**(i)**	**Resource 4B** illustrates a negative correlation – lower atmospheric pressure results in higher wind speeds. E.g. a pressure of 905mb generated a wind speed of 300km/hour, whereas a pressure of 1005mb produced wind speeds of 60km/hour. Award [1] for the identification of the negative trend. Award [1] for the quotation of relevant values. [2]	
	(ii)	As air moves from high atmospheric pressure to low atmospheric pressure, the direction is thus initiated by the Pressure Gradient Force. However the path of the wind may be modified by other forces including the Coriolis, centrifugal, frictional force etc Award [1] for an understanding of the importance of the Pressure Gradient Force. Award [1] for an awareness of the modifying influence of additional forces. [2]	12
		Section B	**36**

Section C

AVAILABLE MARKS

5 For each of the fluvial features, candidates should be awarded up to [6] marks. Full credit should be given for well annotated diagrams which incorporate explanation. Answers must display a sound understanding of river processes.

Ox-Bow Lakes
The continuous shift, or migration, of a meander is accomplished by erosion on the outer bank of the meander loops. The shallow, low velocity flow on the inside of the meander forms a distinctive slip-off slope. The high current velocity may cause more rapid migration of the upper segment meander which may catch up with a lower loop. Eventually the river may break through the neck of the meander, shortening the course of the river, leaving the meander loop abandoned as a "cut-off". The deposition of alluvium eventually "seals off" the former loop producing a seasonal crescent shaped ox-bow lake.

Levees
During flooding, the river overtops its banks and spills out across the floodplain. The increase in friction reduces the energy level of the river and deposition occurs as the competence and capacity of the river is reduced. Consequently the deposition of alluvium occurs in a graded fashion with larger, coarser particles deposited first, closest to the river banks. The finer particles are dropped further from the river. Repetition of this process results in the aggradation of the floodplain with high banks of silt, or levees, formed close to the river channel.

For each feature – the marks are broken down as follows:

Level 3 ([5]–[6]) The candidate produces a well annotated diagram and uses appropriate terminology to coherently explain the river processes involved in the formation of the feature.

Level 2 ([3]–[4]) The candidate produces a less well annotated, or poorly drawn diagram and explanation may be less thorough with fewer specialist terms.

Level 1 ([1]–[2]) The candidate may produce a diagram of a less acceptable standard or an explanation with obvious limitations. There may be weaknesses, gaps or some inaccuracies evident. Specialist terminology may be neglected.

NB Maximum [4] can be awarded for an excellent explanation with no diagram.

[6] × 2 [12] 12

6 The details of the answer will depend on the chosen case study. It must be a small scale ecosystem, which may be a woodland, lake, peatland area etc. The abiotic components should include characteristics such as climate, soils, geology, growing season etc. The biotic components will include the vegetation, fauna, detritivores etc. Candidates need to demonstrate knowledge of how the biotic and abiotic elements contribute to the cycling of nutrients between the soil, litter and biomass stores. There should be good reference to case study specifics throughout.

Maximum Level 1 if an inappropriate case study is selected.

Level 3 ([9]–[12]) The candidate produces a balanced, well written answer which includes specialist terminology and case study specifics. Biotic and abiotic components are accurately described and classified and their interaction within the nutrient cycling process is well understood.

Level 2 ([5]–[8]) The answer may lack balance and fail to address both components. Alternatively it may lack breadth, depth and to some extent case study specifics.

Level 1 ([1]–[4]) The answer displays a very limited, or generalised, knowledge of the ecosystem components and the nutrient cycling process. The answer may address only one aspect of the question. Furthermore, there may be some misunderstanding, possible inaccuracies and a lack of specialist terminology. [12]

AVAILABLE MARKS
12

7 Candidates are required to produce an annotated diagram to display the structure of a depression. A cross-sectional, or plan, view is acceptable and annotation should include the fronts, the warm and cold sectors, wind directions as well as the air masses involved. Case study material is required to exemplify the human effects associated with the weather event. Candidates may use an extreme storm event and positive as well as negative effects are acceptable.

Level 3 ([9]–[12]) An accurate and well annotated diagram is used to display the structure of a mid-latitude depression. The structure of the weather system is coherently described and specific case study details are included to exemplify the human effects.

Level 2 ([5]–[8]) The candidate may produce a less well annotated diagram or a description of the structure which lacks detail. The effects may be more general with a lack of focus on humans and limited detail on impact. The quality of written communication may be reasonable.

Level 1 ([1]–[4]) The candidate produces a more simplistic or incomplete answer. They may fail to address all aspects of the question and only superficial knowledge is evident. There may be no case study material and the quality of written communication may be poor.

Maximum Level 2 if no case study event is specified or if no diagram is attempted. [12]

12	
Section C	**24**
Total	**90**