



ADVANCED
General Certificate of Education
2016

Geography

Assessment Unit A2 2
assessing
Physical Geography and
Decision Making

[AG221]

THURSDAY 26 MAY, MORNING

**MARK
SCHEME**

MARK SCHEMES

Foreword

Introduction

Mark Schemes are published to assist teachers and students in the 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- to 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 that 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
<p>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.</p>	<p>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.</p>	<p>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.</p>	3
<p>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.</p>	<p>The candidate will display evidence of the ability to analyse and interpret the resource material but gaps, errors or misapprehensions may be in evidence.</p>	<p>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.</p>	2
<p>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.</p>	<p>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.</p>	<p>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.</p>	1

Section A

AVAILABLE
MARKS

Option A: Fluvial and Coastal Environments

1 (a) (i) The candidate should outline any **two** ways in which the location depicted has been subjected to human demands. Examples may include: domestic residential demands; increasing pressure of leisure/tourism (trampling, car parking etc); agricultural demands.

Level 3 ([6]–[7])

Two valid demands are identified with clarity. Both of these are described with depth and detail from the resources. There is good use of appropriate terminology.

Level 2 ([3]–[5])

Two valid demands are identified although perhaps with lack of clarity. Both of these are described, although depth and detail from the resources may be restricted. There may be restricted use of appropriate terminology.

Level 1 ([1]–[2])

Only one valid demand may be identified. Alternatively, two incorrect ideas may be presented. Demand/s may be described in a cursory fashion. Use of the resources may be neglected. Use of terminology may be poor.

[7]

(ii) The question demands more than one valid reason for the different management approaches implemented along this coastline, along with information in addition to that presented by the resources. In summary, the areas most heavily used by tourists in the summer months and, therefore, those which provide greatest revenue, are the areas in which investment has been made. The stretch of coastline depicted is heavily managed along certain stretches whilst along others defences have been left to crumble.

Level 3 ([7]–[8])

At least two valid reasons are presented with development. The reasons are strongly supported by information gleaned from the resources. Additional, relevant information is presented. The use of terminology is good.

Level 2 ([4]–[6])

At least two valid reasons are presented but development may be restricted. The reasons are adequately supported by information gleaned from the resources. Although there is some additional information presented, it may lack relevance or precision. The use of terminology may be restricted.

Level 1 ([1]–[3])

The candidate may present only one valid reason or all reasons presented are invalid. The reasons are poorly supported by information gleaned from the resources. Additional information may be absent. The use of terminology may be restricted.

[8]

(b) The candidate is asked to outline the aims of a regional scale river basin management scheme, and to discuss the impacts of this scheme for people and the environment within their chosen location.

AVAILABLE MARKS

Level 3 ([11]–[15])

The answer refers to an appropriate and relevant case study example. Candidates at this level address each element of the question explicitly (aims, impacts upon people, impacts upon the environment) and with validity and clarity. A high level of appropriate case study detail is given. Terminology is good.

Level 2 ([6]–[10])

The answer refers to an appropriate and relevant case study example. Either candidates at this level address each element of the question (aims, impacts upon people, impacts upon the environment), the response may be unbalanced or there may be some lack of clarity, validity and/or depth or candidates omit one element but address the other elements accurately. Case study detail may be restricted. Terminology may be restricted.

Level 1 ([1]–[5])

The answer may refer to a case study of an inappropriate scale or nature. More than one element of the question (aims, impacts upon people, impacts upon the environment) may be neglected. Case study detail may be very restricted. The response may be a cursory one. Terminology may be poor. [15]

30

2 (a) (i) The question demands one argument for (e.g. environmental protection) and one against (e.g. economic cost) planned river management in this area. A variety of responses is acceptable.

AVAILABLE MARKS

Level 3 ([6]–[7])

The response is strongly supported by information developed from the resource. Strong, appropriate outlines (one for and one against) are presented in the relevant context and with clarity.

Level 2 ([3]–[5])

There is some, perhaps restricted, support from the resource. Although appropriate outlines (one for and one against) are presented in the relevant context, there may be a lack of clarity or comments may be underdeveloped.

Level 1 ([1]–[2])

Comments relating to the resource may be absent, or lacking validity or clarity. One argument may be omitted or comments not placed in the relevant context. [7]

(ii) Candidates are asked to describe and explain how any **two** of the strategies set out in the Somerset Levels Flood Action Plan will reduce the problem of flooding.

Level 3 ([7]–[8])

The response is strongly supported by information developed from the resource. Valid descriptions and explanations of two of the strategies given in the resource are given with depth/detail. There is good use of appropriate terminology.

Level 2 ([4]–[6])

Use of the resource may be restricted. Valid descriptions and explanations of two of the strategies given in the resource are given, but depth/detail may be restricted. Terminology may be restricted.

Level 1 ([1]–[3])

Use of the resource may be cursory. The descriptions and explanations of two of the strategies given in the resource may be cursory, lacking depth/detail or invalid. Alternatively, only one strategy may be addressed. Terminology may be poor. [8]

(b) The candidate is asked to describe the nature and impact of the engineering strategies implemented within a regional case study of coastal protection/management.

AVAILABLE MARKS

Level 3 ([11]–[15])

The answer refers to an appropriate and relevant case study example. Candidates at this level address each element of the question explicitly (nature of strategies, impact of strategies) and with validity and clarity. A high level of appropriate case study detail is given. Terminology is good.

Level 2 ([6]–[10])

The answer refers to an appropriate and relevant case study example. Either candidates at this level address each element of the question (nature of strategies, impact of strategies), the response may be unbalanced or there may be some lack of clarity, validity and/or depth or candidates omit one element but address the other elements accurately. Case study detail may be restricted. Terminology may be restricted.

Level 1 ([1]–[5])

The answer may refer to a case study of an inappropriate scale or nature. More than one element of the question (nature of strategies, impact of strategies) may be neglected. Case study detail may be very restricted. The response may be a cursory one. Terminology may be poor.

[15]

30

Option B: The Nature and Sustainability of Tropical Ecosystems

AVAILABLE MARKS

3 (a) The characteristics of the Oxisol (latosol) the tropical forest zonal soil, are summarised in the table below. A diagram (usually a soil profile) of the soil is a prerequisite of the question which should be used to both describe and explain the distinctive features of the soil.

Characteristic	Description	Explanation
DEPTH	Deep from 4 to 10m	Ancient stable climate, deep chemical and biological weathering due to abundant heat and soil moisture.
COLOUR	Red or red/brown	Dominance of sesquioxides (iron and aluminium) due to strong leaching of the soil (wet climate 1800+ mm)
PROFILE	Shallow A horizon, deep B1 and B2.	Chemical weathering, leaching due to hot, wet climate, and efficient extraction of nutrients.
CHEMISTRY	Acid pH around 4–4.5	Strong leaching of nutrient positive ions replaced by H^+ ions in B horizon
FERTILITY	Thin Ah horizon. Poor nutrient store.	Combination of leaching due to wet climate and the rapid transfer of plant nutrients through root systems.

Level 3 ([6]–[7])

The answer has a relevant diagram that is used in both the description and explanation of the zonal soil's characteristics. A high level of appropriate terminology in description and process is provided.

Level 2 ([3]–[5])

While the response includes a diagram it, or the explanation of the characteristics that it illustrates, is incomplete or lacking in detail.

Level 1 ([1]–[2])

The answer lacks a significant requirement such as a relevant diagram or the explanation of the characteristics is cursory, lacking depth/detail, or invalid.

[7]

(b) **Tropical grassland:** The distribution of tropical grasslands is generally between 5–25°N and 5–25°S of the Equator. Their distribution reflects the location of the wet and dry tropical climate which is controlled by the annual migration of the overhead sun. The low pressure zone where the surface NE and SE trade winds converge is marked by an area of convectional uplift, the ITCZ, and hence rainfall. In December and June the Hadley Cell that dominates the tropical circulation moves away from the Equator shifting this low pressure (Doldrums) and its associated rainfall to give a 'summer' wet season to the appropriate hemisphere. Six months later the Hadley Cell will have shifted the ITCZ low pressure belt and its rain into the other hemisphere leaving the tropical high pressure belt (Horse Latitudes), dominated by subsiding air, to bring a prolonged 'winter' dry or even drought season.

AVAILABLE MARKS

Level 3 ([7]–[8])

The response shows a clear understanding of how the global distribution of tropical grassland links to the seasonal wet/dry climate regime. In turn, this is accurately explained with reference to the elements of the Hadley Cell and the ITCZ and the annual migration pattern. Terminology is appropriate and accurately used.

Level 2 ([4]–[6])

The roles of the Hadley Cell and ITCZ are noted, but an incomplete explanation of the atmospheric processes is provided. There may be a lack of reference to the global distribution seen on the map.

Level 1 ([1]–[3])

The answer is significantly restricted perhaps by a poor interpretation of the tropical grassland distribution or an inaccurate explanation of the atmospheric processes. A lack of valid reference to the role of the Hadley Cell and the ITCZ would confine a response to this level. Terminology used may be imprecise. [8]

(c) Firstly, a regional scale case study is required (often the Amazon Basin) and references to it in relation to both trophic structure and nutrient cycling are required. This might include local plant and animal species, soil type, etc.

Level 3 ([11]–[15])

An appropriate case study is used with accurate reference to elements of its trophic structure and nutrient cycling. An accurate description of the links between plants and animals in the trophic system, as well as the key stores and flows in the nutrient cycle, is provided. A high level of appropriate terminology is used.

Level 2 ([6]–[10])

All three key elements of the question are addressed but the depth of the description and/or links to the case study are restricted.

Level 1 ([1]–[5])

Any response that makes no direct use of an appropriate case study beyond its name would be confined to this level. Similarly, an answer lacking reference to either trophic structure or nutrient cycling would be so restricted.

[15]

30

4 (a) The question requires interrogation of the resource material (4A) in order to describe three distinct aspects of the situation in Bangladesh:

- the causes of increased salination;
- the environmental effects; and
- the economic effects of this increase.

AVAILABLE MARKS

Level 3 ([6]–[7])

All three aspects of the question are addressed with accuracy and relevance from the resource. The material is well integrated in the answer with little direct lifting from the text. Appropriate terminology is used.

Level 2 ([3]–[5])

While all three key aspects are addressed the answer may be poorly balanced and/or the resource material may be simply quoted without being adequately developed.

Level 1 ([1]–[2])

One or more of the three key aspects is neglected in the description. Otherwise, the answer may be cursory or the use of terminology poor. [7]

(b) In Salah, Algeria. **Tropical Desert:** Very hot (33–36 °C) in summer (July/August) and temperate (c.12–14 °C) in winter. The total annual rainfall is 40 mm with most months having low rainfall (less than 5 mm). The overhead sun reaches $23\frac{1}{2}^{\circ}\text{N}$ in June accounting for the high temperatures during long days at this latitude but the ITCZ and its associated rainfall does not extend to this region. Rather the area is dominated by the subtropical high pressure system (Horse latitudes) the descending limb of the Hadley Cell ensuring surface high pressure and limited rainfall. The shorter days and lower angle of sun in ‘winter’ November to February accounts for the lower temperatures compared to the summer days with high sun.

Level 3 ([7]–[8])

Accurate use is made of the resource material, appropriately linked to the Hadley Cell in general and the descending subtropical limb in particular. The seasonal temperature variation and the lack of any significant rainfall are clearly explained. Reference must be made to the ITCZ.

Level 2 ([4]–[6])

While the resource is used in respect to temperature and rainfall the explanation is limited in its depth or lacks appropriate links to the elements of the Hadley Cell.

Level 1 ([1]–[3])

There is very limited understanding shown of the role of the Hadley Cell in relation to this climate. The answer may be restricted to a description of the graph only. [8]

(c) A relevant case study is required both in scale and as a tropical forest ecosystem. The description should be specific to the management of the case study given and the attempt evaluated with respect to its sustainability.

AVAILABLE MARKS

Level 3 ([11]–[15])

The candidate addresses sustainability with specific reference to a relevant study. The description is accurate and an evaluation of the management strategies used to achieve sustainability is clearly presented. Appropriate terminology is used along with case study detail.

Level 2 ([6]–[10])

A relevant case study is presented, but either the management detail is limited or the evaluation of the attempt to be sustainable is restricted in its depth or scope.

Level 1 ([1]–[5])

Answers may be confined to this level in several ways including a very limited description of the case study or the lack of an evaluation of the attempt to manage development sustainably.

[15]

30

Option C: The Dynamic Earth

AVAILABLE
MARKS

5 (a) The resource in this question is a stimulus to describe the evidence behind the modern theory of Plate Tectonics. Both ocean crust and other sources of evidence are required. Ocean floor evidence includes the age of rocks, landforms such as mid-ocean ridges, deep ocean trenches, sedimentation and palaeo-magnetism. Other plate boundary evidence includes the distribution of earthquakes and volcanic activity, parallel coastlines and geological evidence on continental plates such as fossils and mountain trends.

Level 3 ([6]–[7])

Accurate and relevant reference is made to both ocean floor and other plate boundary evidence for continental relocation. A range of evidence is described using appropriate terminology.

Level 2 ([3]–[5])

Both areas of evidence are addressed but the answer is lacking in balance or the description is not well developed.

Level 1 ([1]–[2])

One or other of the two areas of evidence (ocean floor and other) is neglected entirely. Alternatively the evidence provided is limited in both its range and the quality of its description. [7]

(b) A clear description is required for both the process of liquefaction and the nature of tsunamis (2 × [2]).

Liquefaction: is a process where shaking of soft or unconsolidated ground by earthquakes causes it to lose cohesion and act as an unstable base. Water may be forced to the surface but more significantly buildings, pipelines and other structures may have their foundations undermined and sink with serious consequences for the built environment. [2]

Tsunamis: are huge waves often generated by the movement of plates on the ocean floor. They travel at high speed and grow to great heights when approaching a coastline. They can reach 30 m in height and travel several kilometres inland in low-lying coastal regions. [2]. The third element of the question concerns how accurate prediction of these could reduce the impact on people and property. The answer should identify specifically how each would be helped. For example, buildings and development should avoid areas prone to liquefaction (unconsolidated or reclaimed land) or tsunamis (low lying coasts). Also with respect to tsunamis a real-time warning system can alert people to the likelihood of a tsunami arriving, allowing areas to be cleared of people and at least some property. [4] [8]

(c) Firstly, in addressing this question accurate case study description of the impacts of both LEDC and MEDC earthquake activity is required. Secondly, the reasons behind the contrasts in management of the events should be clearly identified. Some candidates will utilize the three influencing factors (knowledge, perception and level of development) noted in the specification. It is probable that management will cover preparation for, as well as short and longer term responses to the event.

AVAILABLE MARKS

Level 3 ([11]–[15])

Accurate description of the earthquake impacts for both studies is provided. The answer clearly addresses contrasts in the management of the events and explains the reasons behind these, possibly highlighting differences in perception, knowledge and stage of development.

Level 2 ([6]–[10])

Answers in which the case study detail for either or both events is limited in depth are confined to this level. Alternatively, the explanation of the factors influencing the management of the earthquake effects is restricted in range or depth.

Level 1 ([1]–[5])

Answers that lack impact detail for one or both case studies would be restricted to this level. Alternatively, a response that does not explain the reasons behind contrasts in earthquake management would be similarly confined to this level.

[15]

30

6 (a) The diagram and explanation required are linked to a destructive plate boundary where two oceanic plates meet. A diagram is a prerequisite though this may vary from a simple outline alongside the written explanation or a more comprehensive annotated version. The processes involved are the focus of the question and so convergence caused by convection currents, subduction of plate material, melting of oceanic plate and eruption of volcanic islands should all be covered.

AVAILABLE MARKS

Level 3 ([6]–[7])

A relevant diagram is provided and the explanation covers all the essential processes linking deep sea trenches and island arcs. Clear and appropriate terminology is used.

Level 2 ([3]–[5])

A relevant diagram is provided but the explanation of the processes is limited in scope and/or depth.

Level 1 ([1]–[2])

An answer of very limited relevance lacking valid explanation of processes or one without a relevant diagram would be confined to this level. [7]

(b) The question requires the use of the resource but also additional material concerning accurate volcanic prediction. It further requires reference to three aspects of prediction namely nature, timing and scale. From the resource it is clear that equipment can be used to monitor volcanoes and that study of the physical evidence from previous eruptions (lava flows, pyroclastic deposits) helps in the prediction of nature, timing and scale of future events. Additional material would include the processes and precursors that could be monitored including seismic events (seismometers), swelling or bulging ground (tiltmeters), steam and gas emissions (correlation spectrometers), etc. While no case study material is required some candidates may well use this to address their description of prediction.

Level 3 ([7]–[8])

The response is strongly supported by relevant resource material along with other details of prediction in relation to each of the three aspects – nature, timing and scale. Accurate and appropriate terminology is used.

Level 2 ([4]–[6])

Some of the resource material is used along with some additional prediction detail but the overall depth and clarity of the answer is restricted. Possibly the response does not clearly refer to the three elements of prediction noted (nature, timing and scale).

Level 1 ([1]–[3])

Either the response is solely based on the resource or the resource is not used at all. Full answers lack depth and/or understanding. [8]

(c) The focus of the question is on volcanic hazards. Each of the three areas is identified – society, economy and environment, and for all of these reference to places for illustration are required.

AVAILABLE MARKS

Level 3 ([11]–[15])

A range of hazards is accurately described and each of the three areas is evaluated. Relevant places are given for illustration. Terminology is appropriate and the answer is well balanced across the three aspects.

Level 2 ([6]–[10])

Whilst a range of hazards, reference to place and evaluation are given, depth, detail and accuracy may be restricted or the answer unbalanced.

Level 1 ([1]–[5])

A lack of relevant places, description of hazards or evaluation would confine an answer to this level. Poor or inappropriate terminology may be used. [15]

30

Section A**60**

Section B

AVAILABLE
MARKS

7 Introduction: some guiding principles

The ideas outlined in the ‘Guidance on Content’ section are lines of thought that candidates might take in their report. They are not to be seen as the definitive answer, though it is to be expected that the points outlined below will feature, if only in part, in most answers. When allocating marks look favourably on answers which:

- (a) avoid undue verbatim quoting from Resource Booklet and adopt a consistent style;
- (b) use the full range of the resource material appropriate to the task – particularly where it is provided in non-literary format such as printed maps, photographs and infographics;
- (c) apply knowledge and concepts that are not specifically raised in the resource material, yet are both illuminating and relevant to the task;
- (d) maximise opportunities presented by the resource material;
- (e) appreciate that “bias” might exist in resource material which expresses particular views;
- (f) avoid undue repetition of the same answer material in different sections or, if overlap is unavoidable, present it in a fresh way; and
- (g) back up points with specific detail, e.g. giving statistical information where it is provided rather than making vague statements when details are readily available.

Guidance on content

A. Introduction (Briefly describe the proposed project and discuss the need for it.)

A hydroelectric dam has been proposed for Peace River, a remote part of western Canada. It is to be built by BC Hydro, and, if approved, would be the third hydroelectric dam on Peace River. The largest is the Bennett Dam, which has created the enormous Williston Reservoir which is nearly 300 kilometres long. In contrast, the Site C dam is much smaller and will flood just 83 kilometres of river valley. Despite its relatively small size, it is anticipated that Site C will create 5100 gigawatt hours of electricity each year, from six generators each producing 183 MW. At a total cost of \$7.9 billion, it would be the largest infrastructure project in Canada. The artist’s impression (7D3) shows the 1 kilometre concrete dam, 60 metres above the level of the river.

The identified need focuses on the increasing demand for electricity. It is said that customer demand for electricity will rise by 40% over the next 20 years, partly because there will be a projected 1 million more people in British Columbia, and also because of economic growth in the area. Resource 7C1 shows the growing demand for electricity and that the supply is greater than the demand at present. However, depending on what forecast you accept, the demand will exceed the supply somewhere around 2017 or 2020. Even if energy saving and efficiency measures are put in place, the demand will still exceed supply. As it takes time to build hydroelectric plants, the proponents

of the scheme argue that, if this future demand gap is to be addressed, the building must start now.

If only 'need' or 'description' is present, maximum [4]

AVAILABLE
MARKS

Level 3 ([7]–[8])

The candidate clearly describes the project and discusses the need for it. Both are considered fully. Precise figures and facts will be used where possible, particularly from the maps and graphs. Many effective answers will use detail from 7B in the description and from 7C1 for the need.

Level 2 ([4]–[6])

The candidate makes fewer clear and correct points. There is little or no development of any point, but points made are valid. There may be a major imbalance between the description of the project and need for it, or there may be a lack of detail. The answer may concentrate on the more limited information in the text resources.

Level 1 ([1]–[3])

The candidate presents little content and a lot of it is irrelevant to the need for the development or the description of it. Some of the points made may lack validity. There may be excessive verbatim use of resources. [8]

B. The likely impact

AVAILABLE MARKS

(i) Discuss the possible beneficial effects of the proposed development on people and the economy and the counterarguments.

The proposed developments will bring employment opportunities to this area. The building at Site C is said to create about 10 000 person-years of direct employment, and in all the stages of the project there will be about 33 000 jobs provided. Even after it has been completed, there will still be employment with 25 permanent jobs in operating the scheme. The company developing the project, BC Hydro, is aiming to get as much of its workforce locally as possible, so this will directly benefit people in the area. At its peak in November 2019, 1395 rooms will be needed at the work camps giving an indication of the employment required (see graph). They have already put \$1.5 million into training local people. There is also an emphasis on First Nation people who live in the area, to ensure that they get a lot of that training.

The project will affect local people positively in other ways too. Housing will be built in Fort St John with those 40 housing units benefitting local people as they are released as affordable housing.

Those in favour of the development argue that it will promote tourism, as boating and trail walking will be encouraged. The developers are planning to enhance parks along the shore of the new reservoir, spending \$150 000 to do this, as well as building a walking trail along the shore. There will be at least 20 places for Recreational Vehicles to stay at Peace Island Park, encouraging more tourists. The reservoir behind the Site C dam will become an 'instant lake', full of fish for anglers. The habitats of rainbow trout, which are a popular fish for anglers, are anticipated to grow by 230% as a result of the project.

Local people will benefit in other ways also as local communities get \$2.4 million each year for a period of 70 years from BC Hydro from when the dam starts producing electricity.

Very little of land able to grow crops will be affected by the development. Peace Valley will still have 16 000 hectares of farmland and it is expected that agricultural production will increase, as money is spent on agricultural projects such as irrigation and drainage. A fund of \$20 million has been set aside for this.

All of these advantages for people and the economy will all be achieved despite the fact that only 30 landowners will be impacted upon by the proposed development. The proponents of the scheme point to the support for it. As Bruce Anderson said, "the overall picture of opinion in the province remains supportive".

Counter

An independent review has suggested that the proposed development will bring "significant ... social costs".

Fish will be contaminated in the new reservoir. While this is an environmental effect, it will also impact on people as, even at present, there are often warnings that people of the area should avoid eating more than one serving per month of fish.

AVAILABLE
MARKS

The proposal also threatens farmland in the area. The Agricultural Land Reserve (ALR) was established in 1973 to protect farmland from being lost to other uses. Half of British Columbia's ALR is in northern BC. If the ALR law is changed, that could mean the largest loss of farmland from that reserve since ALR was set up. Resource 7C3 tells us that 6469 hectares of farmland will be flooded, taking this productive land out of food production. Resource 7C4 also states that 69 square kilometres of economically valuable forest will be covered in water. Resource 7C3 points out that, of the land flooded, 2601 hectares is Class 1 and 2 farmland, which is the best there is. This is important to people as the potential market garden crops that Peace Valley could produce would be lost. It has been noted that Peace River Valley could provide fresh fruit and vegetables for one million people – this development would jeopardise that production. British Columbia is already heavily dependent on imported food, meaning that this development will make BC even more dependent on imported food. It also emphasises the impact on land with 23073 hectares impacted in all.

There may be even greater effects on the economy. Dams of this sort of scale all around the world have cost more than they projected. While BC Hydro has set aside a contingency fund of \$1.52 billion, other dams have overrun by up to 50%. If that were the case here, the contingency would not match half the \$7.9 billion cost of the project. Should there be a shortfall, this would impact significantly on the local and regional economy.

The indigenous people of the area – the First Nation groups of Cree and Beaver – were promised the rights to hunt and fish “so long as the sun shines, the rivers flow and the grass grows”. Since this development would harm the hunting and fishing, it would seem to be a clear contravention of that treaty. There will also be a loss of more than 100 places of cultural importance to these people at Bear Flats and Farrell Creek. Lynx Creek and Farrell Creek are places where families have been buried and they are important spiritually and ceremonially for these indigenous inhabitants. Additionally, up to 20 families will lose their homes. The First Nations need the area in order to carry out their way of life, hunting for deer, moose and elk, fishing the river and gathering plants for medicine and food. They also gather timber and firewood, and all these activities may be under threat if the project were to go ahead. The First Nations Tribal Chief, Roland Wilson, argued that “the dam just doesn't make sense”.

There is also a potential cost to the economy of damaging ecosystems. The local area stores carbon in its forests, wetlands and grasslands. The value of this storage to the economy is put at between \$6.7 to \$7.4 billion each year. Additionally, as the local ecosystems filter water naturally, damaging them will introduce the need for drinkable water to be filtered, with an associated cost. This is something that the present ecosystems are doing at no cost. The Joint Review Panel also highlight that “the loss of biodiversity ... also has a financial cost”.

NB Some candidates may discuss environmental factors in this section and this is acceptable, so long as they focus on the economic and social impacts of such changes to the environment. In B (ii), should the same environmental factors be revisited, candidates should not merely repeat the information, but should treat it in a fresh way.

Level 3 ([9]–[12])

Candidate states clearly the main benefits and the counterargument. The discussion will be detailed and comprehensive. The account will have many of these characteristics:

- the points made will be consistently relevant and logically structured;
- the ideas will demonstrate insight and a level of sophistication;
- clear understanding of all concepts will be demonstrated;
- use will be made of most of the relevant resource material, including that in diagrammatic form in the infographics and other resources, and understanding of the resources will be demonstrated – no significant points will be omitted;
- figures, where available and appropriate, will be used to good effect; and
- ideas will be expressed clearly and effectively.

AVAILABLE MARKS

Level 2 ([5]–[8])

Candidate will have fewer lines of thought or discussion may be limited. However, while ideas may lack depth and/or detail, they are still adequate. There may be a heavy imbalance between the two sides of the argument. The answer may concentrate on material from one source, e.g. the text, and not utilise the full range of resources available. The account may show deficiencies in the following ways:

- understanding displayed but an over-reliance on verbatim quoting in places, even though appropriate;
- resource material used but some information not as well exploited as it could be;
- largely related to the question but some irrelevant material introduced; and
- ideas not expressed particularly logically or clearly.

Level 1 ([1]–[4])

- Simple understanding demonstrated but sketchily dealt with.
- Excessive verbatim use of resources.
- Some use made of the resource material but many relevant resources omitted.
- Little or no structure or logic in the ordering of content. [12]

(ii) Discuss the potential negative environmental effects of the proposed development and the counterarguments.

In an independent environmental review it was remarked that there would be “significant environmental … costs” if such a development was permitted to take place.

The impact on people of fish contaminated by methyl mercury, something the developers acknowledge will occur, has been noted. However, this would contaminate the whole ecosystem too.

There is other pollution too. Resource 7C4 states that flooding will produce methane as forests decay, and they further argue that there would be another 150 000 tonnes of greenhouse gas added to the atmosphere as a result of Site C dam, the equivalent of having another 27 000 cars emitting greenhouse gases.

Perhaps the main environmental cost is the closing up of the gap along Yellowstone to Yukon (Y2Y). This area along the Rocky Mountains has been established jointly by the US and Canadian Governments to promote

wildlife. The Peace River is one of the few east-west links between Yukon and Yellowstone and makes it vital that it is maintained open for animals to migrate through. There are just 20 000 grizzly bears left, and they are under threat because they need large areas in which to live. If the grizzly bears in the north of Y2Y are cut off from the population in the south, that stops them from mating with other grizzly bears, threatening their genetic stability. It is not just the bears that move through this gap, but also wolves and caribou too. Resource 7C4 points out that sensitive species such as caribou, wolverine and grizzly bear would lose more than half of their habitats. It will also destroy wetlands which currently support migrating birds.

AVAILABLE MARKS

This area is already heavily industrialised with HEP plants, oil and gas sites, and the pipelines and electricity lines which take that power out of the area. Despite this however, the area is still rich in wildlife, leading one group to describe it as "a goldmine of ecological wealth". Should this project progress, it will have a strong negative environmental impact.

Counter

The construction of the scheme will go to great lengths to reduce fish being killed in the turbines of the HPS plant. It has been designed to use large turbines which turn slowly reducing fish kills. In addition, all the entrances to the channels leading to the turbines will be made smooth to reduce any injuries to the fish. While the project is being built and when it is working, the fish will be trapped in the water below the dam and taken upstream, avoiding the turbines altogether.

Where the river was will become a reservoir. This is a new ecosystem but can be a very rich one with the same or even more species being supported than there were in the river. While the fish in the lake will be different from the river fish, some, such as rainbow trout and lake whitefish, are anticipated to benefit from the change to a reservoir. While the numbers of some of the species currently in the river may fall in the reservoir, all of these will still be found in the tributaries to Peace River and downstream from the new dam. Wetlands will be built to compensate for any loss of habitat and part of these will be kept free from fish, allowing dragonflies, reptiles and amphibians to breed more safely. Where new roads are built across routes that amphibians use in their migrations, there will be passages under the roads to allow them to move safely.

The use of Site C will provide a source of energy with very low greenhouse gas emissions with just 10.5 gCO₂e/kWh, compared to 14 for wind turbines, 545 for natural gas and 1000 gCO₂e/kWh for modern coal. This will be much better for the environment.

NB Some candidates may discuss economic factors in this section and this is acceptable, so long as they focus on the environmental impact and its consequent cost. This might be particularly true this year, as the large scale potential environmental damage has been costed towards the end of 7G. In B (i), should the same economic factors have been covered, candidates should not merely repeat the information, but should treat it in a fresh way.

Level 3 ([7]–[8])

Candidate states clearly the main changes and the counterargument. The discussion will be as detailed and comprehensive as the resources allow. The account will have many of these characteristics:

- the points made will be consistently relevant and logically structured;
- the ideas will demonstrate insight and a level of sophistication;
- clear understanding of all concepts will be demonstrated;
- use will be made of most of the relevant resource material, including infographics – no significant points will be omitted;
- figures, where available and appropriate, will be used to good effect; and
- ideas will be expressed clearly and effectively.

AVAILABLE MARKS

Level 2 ([4]–[6])

Candidate will have fewer lines of thought or discussion may be limited. However, while ideas may lack depth and/or detail, they are still adequate. There may be a heavy imbalance between the two sides of the argument. The account may show deficiencies in the following ways:

- understanding displayed but an over-reliance on verbatim quoting in places, even though appropriate;
- resource material used but some information not as well exploited as it could be;
- largely related to the question but some irrelevant material introduced; and
- ideas not expressed particularly logically or clearly.

Level 1 ([1]–[3])

- Simple understanding demonstrated but sketchily dealt with.
- Excessive verbatim use of resources.
- Some use made of the resource material but many relevant resources omitted.
- Little or no structure or logic in the ordering of content.

[8]

C Conclusion (State clearly your decision and justify it on the basis of the greater overall benefits)

AVAILABLE MARKS

The recommendation may overlap with some of the points made in B in relation to the potential economic, social and environmental impact of the dam. However, the emphasis here has to be on the greater overall benefits of developing or not developing the dam and the contrary view. In this section, for example, candidates can weigh up the relative merits of arguable damage to the environment with possible economic development and employment for local people.

There is no mark for stating a decision alone without a justification.

Level 3 ([8]–[10])

Candidate states clearly a decision. A range of reasons is provided in justification.

The account will have many of the following:

- there is evidence that the arguments of both sides are being balanced, one against the other;
- links are made between diverse aspects of resource material, not possible in Section B;
- points are consistently relevant and logically structured; and
- there is a clear grasp of the concepts used.

Level 2 ([4]–[7])

There are fewer lines of thought or discussion, but what there is is relevant and correct or supportable in what is argued. There may be deficiencies such as:

- too much verbatim quoting or overuse of quotations in full;
- important sections of resource material not utilised;
- irrelevant material introduced;
- ideas not expressed particularly logically or clearly; and
- understanding of concepts not always clearly demonstrated.

Level 1 ([1]–[3])

- Few lines of thought and sketchy in detail.
- Large gaps in the use of resource material.
- Little or no structure or logic in the ordering of the concepts.
- There may be excessive verbatim use of resources.

[10]

Format

Clear format headings using the headings provided throughout [1]

Clear subheadings using the subheadings provided in Section B [1]

[2]

Role

Role of Professor Eileen McMullan, advisor for the Canadian Federal Government, adopted [1]

Role maintained [1]

[2]

Graph

Reference in report [1]

Appropriateness of the technique used [1]

Accuracy of the data presented [3]

Conventions (key, labelled axes, title) [3]

[8]

50

Section B

50

Total

110