GCE A LEVEL MARKING SCHEME

SUMMER 2019

A LEVEL (NEW)
GEOGRAPHY - COMPONENT 3
A110U30-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE A LEVEL GEOGRAPHY

SUMMER 2019 MARK SCHEME

COMPONENT 3: CONTEMPORARY THEMES IN GEOGRAPHY

Guidance for Examiners

Positive marking

Learners are writing under examination conditions and credit should be given for what the learner writes, as opposed to adopting an approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

The mark scheme for this component uses banded mark schemes.

Banded mark schemes
The mark scheme is in two parts to reflect the sections (A and B in the examination paper). Section A is 38 marks and Section B is 45 marks.

The first part of the mark scheme in each section is an assessment grid advising on bands and the associated marks that should be given in responses that demonstrate the qualities needed in the three AOs; AO1, AO2 and AO3 relevant to this component. The targeted AO(s) are also indicated, for example AO2.1c.

The second part of the mark scheme is advice on the indicative content that suggests the range of likely themes and specialised concepts, processes, scales and environments that may be included in the learner's answers.

Banded mark schemes are divided so that each band has a relevant descriptor. The descriptor for the band provides a description of the performance level for that band. Each band contains marks. Examiners should first read and annotate a learner's answer to pick out the evidence that is being assessed in that question. Once the annotation is complete, the mark scheme can be applied. This is a two-stage process.

Banded mark schemes Stage 1 – Deciding on the band
Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptor for that band. Examiners should look at the descriptor for that band and see if it matches the qualities shown in the learner's answer. If the descriptor at the lowest band is satisfied, examiners should move up to the next band and repeat this process for each band until the descriptor matches the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance, if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark candidates down as a result of small omissions in minor areas of an answer.

Banded mark schemes Stage 2 – Deciding on the mark
Once the band has been decided, examiners can then assign a mark. During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.

Indicative content is not exhaustive, and any other valid points must be credited. In order to reach the highest bands of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that is contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

Where the specialised concepts are integral to knowledge and understanding, they are underlined in the indicative content.

The mark scheme reflects the layout of the examination paper. Mark the chosen question in Section A and the two chosen questions from Section B. If the candidate has responded to both questions in Section A or more than two in Section B mark all the answers. Award the higher marks attained for the correct number of required questions; further, possible rubric infringement will be discussed at the marking conference.

Be prepared to reward answers that give **valid and creditworthy** responses, especially if these do not fully reflect the 'indicative content' of the mark scheme.

Section A: Tectonic Hazards - Generic Mark Bands (38 marks)

	AO1 [14 marks]	AO2 [20 marks]	AO3 [4 marks]
Band	*Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales*	*Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information*	*Use a variety of relevant quantitative and qualitative skills to construct arguments and draw conclusions*
4	**10-14 marks** Demonstrates thorough and accurate knowledge; confident understanding of relevant concepts and principles throughout the response that is wholly relevant to the question Demonstrates knowledge and understanding through the use of appropriate, accurate and well-developed examples Wholly appropriate, accurate and relevant supporting geographical terminology is well used Well-directed and well-annotated sketch maps / diagrams are included and should be credited	**16-20 marks** Demonstrates sophisticated application of knowledge and understanding either to analyse or interpret or evaluate in order to produce a full and coherent response that is supported by wholly appropriate evidence Demonstrates application of knowledge and understanding through the synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the confident application of the specialised concepts throughout the response	**4 marks** The response uses wholly relevant qualitative skills to construct clear, coherent and appropriately structured arguments and conclusions
3	**7-9 marks** Demonstrates secure factual knowledge and reasonable understanding of relevant concepts and principles for large portions of the response that is mostly relevant to the question Demonstrates knowledge and understanding through the use of appropriate, generally accurate and developed examples The use of appropriate and mostly relevant geographical terminology is evident Appropriate, basically accurate annotated sketch maps / diagrams are included and should be credited	**11-15 marks** Demonstrates accurate application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a partial but coherent response that is supported by mostly appropriate evidence Demonstrates application of knowledge and understanding through the partial synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the mostly relevant application of the specialised concepts	**3 marks** The response uses mostly relevant qualitative skills to construct structured arguments and conclusions where coherence is variable

	AO1 [14 marks]	AO2 [20 marks]	AO3 [4 marks]
2	**4-6 marks** Demonstrates straightforward knowledge with some inaccuracies; some understanding of relevant concepts and principles that is linked to the question Demonstrates knowledge and understanding through the use of limited examples that may not always be appropriate or accurate The use of geographical terminology is limited Annotated sketch maps / diagrams are basic and should be credited	**6-10 marks** Demonstrates some application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a response which is limited in coherence and is supported by limited appropriate evidence Demonstrates application of knowledge and understanding through the limited synthesis of the connections between different elements of the question Demonstrate application of knowledge and understanding through limited application of the specialised concepts	**2 marks** The response uses limited qualitative skills to construct argument(s) and conclusion(s)that are superficial in structure with minimal coherence
1	**1-3 marks** Demonstrates poor knowledge with errors and minimal understanding and linkage to the question Basic use of examples or if evident, lack relevance to the question asked Geographical terminology is rarely used within the response	**1-5 marks** Demonstrates application either to interpret or analyse or evaluate in order to produce a response which lacks coherence and is unsupported by appropriate evidence Demonstrates application of knowledge and understanding through the superficial synthesis of the connections between different elements of the question Demonstrate application of knowledge and understanding through superficial application of the specialised concepts	**1 mark** The response uses qualitative skills superficially to construct an argument / conclusion that is incomplete and lacks coherence
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

1. 'Quality of governance is the most important factor influencing vulnerability to tectonic hazards.' Discuss. [38 marks]

AO1 [14] AO2.1c [20] AO3.3 [4]

Focus: 3.1.4

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of vulnerability and factors influencing vulnerability could include:

- Vulnerability – a measure of the extent to which a community/area is likely to be damaged/disrupted
- Governance is a key political factor that can occur at a variety of scales from the local (community council etc.) to regional, national (whether democratic or autocratic) and international (role of UN and NGOs such as International Red Cross/Red Crescent or Oxfam)
- Good governance is vital in managing the hazard before the event (drills, evacuation routes, monitoring), during the disaster (emergency action) and in the recovery and rehabilitation in the post-disaster phase. It can direct, manage and coordinate in a non-corrupt way and recognise the need for outside help (causality) (mitigation)
- The need for governance can be related to the nature of the disaster in terms of location and scale.
- Other factors could include the physical profile of the disaster and its magnitude, frequency and areal extent
- Other human factors include economic factors (level of development and technology), social factors (population density, population profile and levels of education) and geographical factors (location, isolation)
- Useful examples for 'bad' governance could include Nepal and Haiti or, for 'good' governance, China (Sichuan) or Japan (Tohoku)
- Conceptual frameworks, such as Park's disaster-response curve model or the Hazard Management cycle, can provide the scaffolding for distinguishing between 'good' and 'bad' governance

AO2

Application of knowledge and understanding is deployed to discuss whether quality of governance is the most important factor influencing vulnerability to tectonic hazards. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The relative importance of the other factors such as the physical profile of the hazard (magnitude, speed of onset, duration) and other geographical factors such as location, population density and, above all, level of development which may be related to quality and style of governance (interdependence)
- The extent to which quality of governance varies in importance in different tectonic events (place)
- The extent to which government quality can change over time, or vary across a large country such as India or Indonesia (spatial and temporal scales)The longer and more serious the disaster the greater the need for good governance. Localised disasters are more easily managed (temporal and spatial scales)

AO3

Skills evidenced could include:

- The skill ofpresenting well-constructed, coherent and logical arguments about factors affecting vulnerability to tectonic hazards
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the importance of quality of governance in influencing vulnerability to tectonic hazards

Credit other valid approaches.

2. 'Volcanic hazards are predictable and any losses result from human mismanagement.' Discuss. [38 marks]

AO1 [14] AO2.1c [20] AO3.3 [4]

Focus: 3.1.5

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of volcanic hazards and the prediction of volcanic hazards could include:

- Pyroclastic flows consist of hot, dense mixtures of ash, rock and gas that can move downslope at speeds of up to 100km/h for distances of up to 10km (causality / risk)
- Lava flows are streams of molten rock that pour or ooze from an erupting vent. Lava is erupted during either non-explosive activity or explosive lava fountains (causality / risk)
- Ash falls comprise small, jagged pieces of rock, minerals and volcanic glass the size of sand and silt (<2mm) erupted by a volcano. Tephra is > 2mm (causality / risk)
- Lahars comprise ash and debris mixed with water (rain or melted glacier ice - jökulhlaup in Icelandic) and can flow at very high speeds e.g. 22 m/s over long distances, usually along river valleys (causality / risk)
- Volcanic landslides may be triggered by seismic activity (causality / risk)
- Toxic gases. Magma contains dissolved gases that are released into the atmosphere during eruptions. The most abundant gas typically released into the atmosphere from volcanic systems is water vapour (H_2O), followed by carbon dioxide (CO_2) and sulphur dioxide (SO_2) (causality / risk)
- Volcanic eruptions are preceded by a variety of environmental changes that accompany the rise of magma, all of which can be monitored. Monitoring methods for predicting volcanic hazards include earthquake activity, ground deformation, global positioning systems (GPS), thermal changes and geochemical changes (mitigation)
- Prediction is one of the responses to volcanic hazards, others include warning, evacuation, hazard-resistant building design, land use planning, community preparedness and education (mitigation/ adaptation)

AO2

Application of knowledge and understanding is deployed to discuss the extent to which volcanic hazards are predictable and whether any loss of life is due to human mismanagement. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Prediction can be effective for volcanic hazards, although for highly explosive eruptions many of the warning signs are not present and the precise temporal occurrence of the actual eruption reaching danger levels is difficult to predict. As there is no fully reliable forecasting system, losses are inevitable. The Nevado del Ruiz eruption of 1985 was devastating because it was so unexpected. At 10 p.m., lahars ran down the eastern slope of the volcano killing 1800 people in Chinchina, and at 11 p.m. westward-flowing lahars engulfed the town of Armero, burying it 8m deep and killing 22,000
- Aspects of the physical profile of the hazard (magnitude, speed of onset, duration) compromise prediction leading to insufficient time for other responses that will save lives and reduce other losses. Pyroclastic flows pose a great risk because of their speed of onset, however other volcanic hazards also happen suddenly such as lava flows (highly fluid basalt magma can move down a hillside at 50km/hr and can spread a long way from the source e.g. Nyiragongo volcano devastated the town of Goma), lahars (Nevado del Ruiz 1985) and gas emissions (Lake Nyos Cameroon 1986), (temporal scale)
- The choice of response depends on complex and inter-related physical and human factors including geographical location and population density (interdependence) making losses inevitable despite effective prediction

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about volcanic hazards and responses to them
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the extent to which volcanic hazards are predictable and whether any losses result from human mismanagement

Credit other valid approaches.

Section B: Contemporary Themes in Geography - Generic Mark Bands (45 marks)

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
Band	*Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales*	*Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information*	*Use a variety of relevant 'geographical skills' to construct arguments and draw conclusions*
5	**17-20 marks** Demonstrates wide ranging, thorough and accurate knowledge with a high order of conceptual understanding throughout the response that is wholly relevant to the question Demonstrates knowledge and understanding through the use of wholly appropriate, accurate and well-developed examples Wholly appropriate, accurate and relevant supporting geographical terminology is well used Well-directed and well-annotated sketch maps / diagrams are integrated and should be credited	**17-20 marks** Demonstrates sophisticated application of knowledge and understanding either to analyse or interpret or evaluate in order to produce a full, comprehensive and coherent response that is supported by wholly appropriate, wide ranging and relevant evidence Demonstrates application of knowledge and understanding through the sophisticated synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the confident application of the specialised concepts throughout the response	**5 marks** The response uses wholly relevant qualitative skills to produce well-constructed, coherent, sophisticated and logical arguments and conclusions
4	**13-16 marks** Demonstrates accurate factual knowledge and confident understanding of relevant concepts and principles throughout the response that is relevant to the question Demonstrates knowledge and understanding through the use of appropriate, accurate and developed examples Appropriate, accurate and relevant geographical terminology is evident Appropriate, mostly accurate and relevant annotated sketch maps / diagrams are included and should be credited	**13-16 marks** Demonstrates accurate application of knowledge and understanding either to interpret or analyse or evaluate in order to produce a coherent response that is supported by appropriate evidence Demonstrates application of knowledge and understanding through the synthesis of the connections between different elements of the question Demonstrates application of knowledge and understanding through the relevant application of the specialised concepts	**4 marks** The response uses relevant qualitative skills to produce clear, coherent and appropriately structured arguments and conclusions

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
3	**9-12 marks** Demonstrates secure, straightforward knowledge and reasonable understanding of relevant concepts and principles throughout most of the response that is mostly relevant to the question Demonstrates knowledge and understanding through the use of mostly appropriate, mostly accurate and developed examples Mostly appropriate, accurate and mostly relevant geographical terminology is evident but is variable in its use Appropriate, basically accurate and partial use of annotated sketch maps / diagrams are included and should be credited	**9-12 marks** Demonstrates partial application either to analyse or interpret or evaluate in order to produce a partial but coherent response that is supported by mostly appropriate evidence Demonstrates application of knowledge through the partial synthesis between different elements of the question Demonstrates application of knowledge and understanding through the partial application of some specialised concepts	**3 marks** The response uses mostly relevant qualitative skills to produce a structured response but where coherence is variable
2	**5-8 marks** Demonstrates some knowledge, but limited in scope with some inaccuracies; some understanding of relevant concepts and principles Demonstrates knowledge and understanding through the use of limited examples, which are mostly accurate but un-developed Limited geographical terminology is evident, not all of which is appropriate or accurate Basic sketch maps / diagrams are used but contain inaccuracies. Credit should be given when used appropriately	**5-8 marks** Demonstrates limited application either to analyse or interpret or evaluate in order to produce a limited response where most points are generalised or of limited relevance to the question. Limited synthesis between different elements of the question Demonstrates application of knowledge and understanding through the limited application of some specialised concepts	**2 marks** The response uses some qualitative skills to produce a response with superficial structure, with minimal coherence

	AO1 [20 marks]	AO2 [20 marks]	AO3 [5 marks]
1	**1-4 marks** Demonstrates poor knowledge with errors and minimal understanding and linkage to the question No use of examples or, if evident, lack relevance to the question asked Geographical terminology is rarely used within the response	**1-4 marks** Demonstration of application either to analyse or interpret or evaluate is poor, producing a response which lacks coherence and is unsupported by appropriate evidence Synthesis between different elements of the question is poor Demonstrates application of knowledge and understanding through the superficial application of basic specialised concepts	**1 mark** The communication in the response is incomplete
	0 marks Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted	**0 marks** Response not creditworthy or not attempted

Section B: Contemporary Themes in Geography

3. 'Threats to ecosystem biodiversity from direct action are greater than those from indirect action.' Discuss. [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus:3.2.3

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of ecosystem biodiversity and threats to ecosystem biodiversity from direct and indirect action could include:

- Ecosystem biodiversity is a contraction of 'biological diversity' and is used to describe the variety of life. It refers to the number and variety of organisms within a particular area and has three components: species diversity (measures include species richness and Simpson's Diversity Index), ecosystem (or habitat) diversity; and genetic diversity. Ecosystem biodiversity is often used as a measure of the health of biological systems (resilience)
- Direct threats include threats from industry, agriculture, mining, urbanisation and tourism as well as threats from disease, predation and invasive species
- Indirect threats include threats from population growth and climate change (changing temperature and rainfall patterns, rising sea levels, increased incidence of high impact storms and ocean acidification)
- The biodiversity of some ecosystems is particularly at risk from direct action (causality) e.g. tropical rainforests, such as the Amazon rainforest, are under threat because of deforestation and mineral exploitation
- The biodiversity of some ecosystems is particularly at risk from indirect action (causality) e.g. coral reefs, such as the Great Barrier Reef, are under threat because of climate change and ocean acidification
- The biodiversity of some ecosystems is at risk from both direct and indirect action (causality) e.g. wetlands, such as the East Anglian Fens, are under threat because of industry, pollution (indirect) and tourism (direct)

AO2

Application of knowledge and understanding is deployed to evaluate whether the threats to ecosystem biodiversity from direct action are greater than those from indirect action. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Variation in the nature of the threat (direct/indirect) according to place, as more remote ecosystems at greater distances from human influences are more likely to be threatened by indirect action than direct action
- Variation in the nature of the threat (direct/indirect) according to scale, as ecosystems on a global scale are more likely to be threatened by indirect action (climate change, ocean acidification) than direct action
- Changes over time (time scales) as initially ecosystems will be at greater threat from direct action such as tourism, but with increased ecosystem management (sustainability), indirect threats assume greater importance
- Interdependence of threats as direct threats such as deforestation lead to indirect threats such as climate change
- Positive feedback occurs as the direct threat of deforestation reduces carbon sequestration. Tipping points are reached, destabilising ecosystem equilibrium threatening biodiversity further (feedback, thresholds)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about threats to ecosystem biodiversity
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about whether threats to ecosystem biodiversity from direct action are greater than those from indirect action

Credit other valid approaches.

4. 'Physical factors influence ecosystem succession more than human factors.' To what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.2.5

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Physical factors will vary according to the nature of ecosystem succession selected (psammosere, halosere, hydrosere or lithosere). Knowledge and understanding of physical factors (influencing, for example, psammosere succession) and human factors could include:

- Changes in soil moving from pioneer zone inland: increasing soil moisture/decreasing infiltration rates; decreasing alkalinity of soil; rise in humus, organic content and depth of soil
- Changes in micro-climate include: increasing height of vegetation leading to diminishing wind speeds and increasing temperatures
- Changes in vegetation coverage include: decreasing percentage of bare ground; changes in vegetation coverage; increasing numbers of species (diversity); increasing vegetation height/layers
- Increasing quality of soil allows larger and more diverse plants to become established (moisture, humus, depth improves conditions of growth) (interdependence)
- Increasing shelter and stability promotes a greater range of vegetation (i.e. increases diversity/layers) (interdependence)
- Human factors including fire clearance, deforestation, grazing and agriculture

AO2

Application of knowledge and understanding is deployed to evaluate the influence of physical factors on succession. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The initial physical conditions (water, rock or sand) are important in influencing the specific nature of succession (hydrosere, halosere, lithosere, psammosere) (causality)
- A prisere (primary succession) may not develop into a climatic climax community because of a physical factors such as geology, relief and poor drainage which arrests succession leading to a subclimax (causality)
- Variation in the amount of influence according to place, as more remote ecosystems at greater distances from human influences are more likely to be influenced by physical rather than human factors
- Changes over time (time scales) as initially succession will be influenced more by physical factors, with human factors assuming greater importance as the vegetation becomes more established
- Human factors such as fire clearance may restart succession at a higher level of plant organisation (secondary succession) (causality)
- Maintained human activity, such as regular burning, deflects succession to form a plagioclimax (causality)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about factors influencing ecosystem succession
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the influence of physical and human factors on ecosystem succession

Credit other valid approaches.

5. 'The global importance of India is more economic than political.' Discuss.

[45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.5

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the global importance of India could include:

- India's political influence in global organisations, such as the WTO (globalisation)
- India's active participation in global organisations, governance, conventions and treaties, such as the UN and IPCC (Intergovernmental Panel on Climate Change)
- Economic growth, following the launch of economic reforms in 1991, is driving India's emergence as a regional and global power (causality)
- India has made great strides in fields such as information technology. Its large, skilled workforce makes it a popular choice for international companies seeking to outsource work (globalisation)
- India launches its own satellites and in 2008 sent its first spacecraft to the moon. It also boasts a massive cinema industry, the products of which are among the most widely watched films in the world (globalisation)
- India is home to 5 of the world's top 300 global companies (globalisation)
- India is now ranked as the world's sixth largest economy and is the world's largest democracy

AO2

Application of knowledge and understanding is deployed to evaluate whether the global importance of India is more economic than political. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The interdependence of India's economic and political global influence
- Changes over time (time scales). India's influence within the global community has grown significantly since the economic reforms of 1991. It can be argued that its economic global influence was initially more important than its political global influence. Wealthier nations now see India as a trading partner with enormous potential. India is Asia's third-largest economy and new growth estimates make India the world's fastest-growing economy
- India's economic and political importance varies according to scale. India's political influence is important regionally. It is politically stable and surrounded by Bangladesh, Pakistan, Sir Lanka and Nepal; these countries have all experienced periods of political instability. India's economic influence is more important globally due to its large consumer purchasing power and value and volume of exports
- India's economic and political importance varies according to place. Given the size of India's poor and unskilled population and the massive challenge of domestic poverty and underdevelopment, particularly in rural areas, (inequalities) it is a challenge for the Indian state to allocate scarce resources into making it an economically influential nation. However, with its enormous coastline and respected navy India is well-placed to provide security in a critical part of the global commons
- The five permanent members of the United Nations Security Council support India's claim to join them, earned by India being one of the most consistent contributors to UN peacekeeping operations. In terms of global political power, it may be argued that India has huge potential as it is committed to democratic institutions, the rule of law and human rights, has a huge and talented diaspora, shares many Western values and is culturally rich
- Indian MNCs have an important global economic influence e.g. the relative influence within the global community of MNCs such as Tata Steel and JSW Steel

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about India's economic and political global importance
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions evaluating whether the global importance of India is more economic than political

Credit other valid approaches.

6. 'Strategies to improve resource security in India are not sustainable.' Discuss with reference to water or food or energy security. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.7

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content. If more than one resource is covered, reward the most creditworthy.

AO1

Knowledge and understanding of water, food or energy security and sustainable strategies to improve resource security in India could include:

- Sustainability – meeting the needs of the present without compromising the ability of future generations to meet their needs
- Water security - India has sizable water resources, but also a large and growing population and an increasing demand for water due to industrial development and rising living standards (causality). Rivers in India fluctuate greatly in volume due to the presence of the monsoon and/ or being snow-fed from the Himalayas. Water availability becomes more limited nearer the Thar Desert in the west. Over exploitation of water resources is an issue in some parts of India with problems of over-irrigation, wasting water and lowering of water tables and water loss due to droughts (sustainability). Strategies range from smaller scale rainwater harvesting projects to manage water shortages in Gujarat and Rajasthan to larger scale projects such as the Narmada dam project (mitigation / adaptation)
- Food security - although India has seen impressive economic growth in recent years, the country still struggles with widespread poverty and hunger. India is home to 25 percent of the world's hungry population. An estimated 43 per cent of children under the age of five years are malnourished. India has the world's largest area under cultivation for wheat, rice, and cotton, and is the world's largest producer of milk, pulses, and spices (World Bank 2012). Strategies to improve food security include the Green and Gene Revolutions, new technologies in agricultural mechanisation, increased food processing, improved supply chains and increased investment in agriculture research (mitigation / adaptation)
- Energy security - despite being well endowed with oil and gas reserves (sustainability), consumption exceeds production meaning that India is heavily dependent on crude oil imports net oil import dependency rising from 43% in 1990 to an estimated 71% in 2012. There is an increased focus on developing alternative sources of energy, particularly nuclear, solar and wind. Strategies include those introduced by the state and NGOs (biogas production in rural Maharashtra) (mitigation / adaptation)

AO2

Application of knowledge and understanding is deployed to discuss whether strategies to improve resource security in India are sustainable. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Challenges to finding sustainable strategies including the lack of political commitment, lack of a comprehensive environmental policy, poor environmental awareness, functional fragmentation of the public administration system, poor mass media concern, and prevalence of poverty (inequalities)
- Assessment of the sustainability of the strategy(ies) which increase resilience and mitigate the effects of resource insecurity
- Comparison of the sustainability of different measures employed in different environments (place)
- Improvements in the sustainability of strategies over time (time scales)
- The interdependence of water, food and energy resource security issues (interdependence)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about strategies to improve resource security in India
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the sustainability of strategies to improve resource security in India

Credit other valid approaches.

7. 'The global importance of China is more economic than political.' Discuss.

[45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.5

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the global importance of China could include:

- China's active participation in global organisations, such as the WTO (globalisation)
- China's active participation in global organisations, governance, conventions and treaties, such as the UN and IPCC (Intergovernmental Panel on Climate Change)
- China's military might is typified by its blue water navy
- China's importance as a major economic power: it has been projected that by 2030 China's economy could be twice the size of the USA's. Economic growth, following the launch of economic reforms associated with China's 'Open Door' Policy and 'Made in China 2025' strategic plan is driving China's emergence as a regional and global power (causality)
- In 2014 Chinese overseas investment surpassed foreign direct investment into China
- Chinese overseas investment is important in both developed and developing countries, especially in the continent of Africa and increasingly worldwide (Belt and Road initiative)
- China is home to 172 of the world's top 2000 companies in 2016 with the greatest representation of any Asian country, outpacing Japan's 127 representatives, South Korea's 67 and India's 56 companies (globalisation)

AO2

Application of knowledge and understanding is deployed to discuss whether the global importance of China is more economic than political. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The interdependence of China's economic and political global influence. As China's economy has grown, its military power has increased. Due chiefly to its rapid economic advance, China has been able to maintain the initiative with respect to international relations, allowing it to carve out its own unique position in the geo-political order
- Changes over time (time scales). Initially China's importance within the global community was due to its economic influence (China is the second largest economy globally and has been the largest contributor to world economic growth since the 2008 global financial crisis). China's economic influence has grown significantly over the past 35 years since the introduction of Deng Xiao Ping's 'Open Door' Policy. More recently China's political global influence has grown. Chinese strategic objectives, including defending national sovereignty and territorial integrity, securing great power status by acquiring regional pre-eminence and safeguarding overseas interests have increased its global political importance.
- China is, in the near term, attempting to replace the United States as the dominant power in East Asia and in the long term to challenge America's position as the dominant power in the world. This is an underlying cause of the current Sino-US trade war
- China's economic nd political importance varies according to place. China's political influence is most strongly felt in East Asia, which has become increasingly China-centric. However, China's economic and political global importance in the developing world is interdependent. China has successfully managed commercial, political and military agreements with states of the ASEAN community and many others, especially in Africa and South America.
- China remains a poor country, with a standard of living only one-fifth of USA's and China's relative poverty (inequalities) may act as a major constraint on China's capacity for its political (soft) power to appeal for several decades
- Many of China's MNCs are state-owned; therefore, it is difficult to disaggregate China's global economic and political importance. China's global 500 companies are mostly state-owned e.g. MNCs such as Sinopec

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about the economic and political global importance of China
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions evaluating whether the global importance of China is more economic than political

Credit other valid approaches.

8. 'Strategies to improve resource security in China are not sustainable.' Discuss with reference to water or food or energy security. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.7

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content. If more than one resource is covered, reward the most creditworthy.

AO1

Knowledge and understanding of water, food or energy security and sustainable strategies to improve resource security in China could include:

- Sustainability – meeting the needs of the present without compromising the ability of future generations to meet their needs
- Water security - China has sizable water resources, but also a growing demand for water due to industrial development and rising living standards (causality). Water resources are unevenly distributed in China (inequality) and there is an increasing demand for water in China's arid north. Strategies include current and proposed mega-dams such as 'Three Gorges Dam', and the South-North Diversion Project, one of the world's most ambitious engineering projects, with an overall estimated cost of more than $80 billion (mitigation / adaptation)
- Food security - land degradation in China will have a direct impact on the food security of the nation. Food security is an increasing issue due to growth in affluence, raising the purchasing power of Chinese people. China has become increasingly reliant on imports and new technologies for their food supply (mitigation / adaptation)
- Energy security – although China has the ability to meet its energy demands from domestic sources due to China's relatively rich endowment in coal, the greenhouse gas emissions, pollution and environmental damage (risk) associated with the combustion of this low grade coal will lead to increases in the cost of environmental amenity and repair. China's drive to ensure that they have a secure supply of energy includes large scale projects such as the 'Three Gorges Dam' and a shift to nuclear energy and renewables, with China's dominance in renewables rapidly spreading overseas, as it increases its foreign investment in renewable energy and supporting technologies (mitigation / adaptation)

AO2

Application of knowledge and understanding is deployed to discuss whether strategies to improve resource security in China are sustainable. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Challenges to finding sustainable strategies. Although the Chinese government has mapped out ambitious environmental initiatives in recent five-year plans, experts say few have been realised
- Assessment of the sustainability of the strategy(ies) which increase resilience and mitigate the effects of resource insecurity
- Comparison of the sustainability of different measures employed in different environments (place)
- Improvements in the sustainability of strategies over time (time scales)
- The interdependence of water, food and energy resource security issues (interdependence). Agriculture accounts for between 65 and 70 percent of China's water use and vast amounts are wasted by inefficient irrigation

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about strategies to improve resource security in China
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the sustainability of strategies to improve resource security in China

Credit other valid approaches.

9. 'Development measures give only a partial view of a country's development.' With reference to two or more Sub-Saharan African countries, to what extent do you agree? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.8

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of ~~measures of~~ development and measures of ~~definitions of~~ development related to two or more Sub-Saharan African countries. Responses could include:

- Difficulties in defining the term 'development'. It can be defined as 'the progressive improvement in standards of living and quality of life for an increasing proportion of the population'. The definition is dynamic, due to changing definitions and changes in the development process itself. In response to this dynamism, the term 'development' has been defined in many different ways: in economic terms, in human terms and increasingly in terms of sustainability (sustainability)
- There is a range of simple quantitative measures available to measure aspects of development (e.g.GNI, CBR, CDR, IMR, life expectancy)
- There is a range of composite quantitative measures available to measure aspects of development (e.g. HDI, GII, PQLI)
- There is a range of qualitative measures (freedom, security, the plight of indigenous groups and sustainability) available to assess levels of development
- New indicators are becoming increasingly available e.g. Ibrahim Index of African Governance (IIAG) and the Environmental Performance Indicator (EPI)

AO2

Application of knowledge and understanding is deployed to discuss whether development measures only give a partial view of development. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- As the definition of development has changed over time, so has the range of indicators available to measure it, leading to a more comprehensive picture of development (time-scales)
- Each simple indicator (e.g. GNI, CBR, CDR, IMR, life expectancy) provides information on only one aspect of development, providing a more partial view. In many Sub-Saharan African countries markets are less developed and trading is done informally or through bartering and production of goods may even take place at home, making GNI figures less reliable
- Composite indicators (HDI, GII, PQLI) provide a more comprehensive view of development, but often reflect the interdependence of measures
- The use of both quantitative and qualitative measures is necessary in assessing the level of development of a given country and together they can yield important and unexpected insights into development that neither quantitative nor qualitative measures could generate on their own (interdependence)
- Qualitative indicators have been developed due to the recent emphasis on measuring development in terms of issues rather than statistics and go beyond covering material conditions to provide a more comprehensive picture of development
- Information on development may vary according to the scale of analysis. Measures are more comprehensive in identifying the level of development at a country level. Measures quoted on a national scale hide serious regional and local inequalities (inequality)
- Measures also hide variations in material well-being across society (inequality)
- There are often significant variations in levels of development within countries including regional, ethnic and gender differences. In Kenya, the top 10 per cent richest households control more than 40 per cent of the country's income and the poorest 10 per cent control less than one per cent. Nearly every child in the Central province is enrolled in primary school, only three per cent of women have no education and there are about 20,000 people per doctor whereas in the North Eastern province only one out of three children go to school, 93 per cent of women have no education and there is one doctor for every 120,000 people. In Nigeria although the gender gap in education has narrowed nationally, the distribution of gains has been uneven by ethnic group, with significant gender gaps persisting in the Northwest (Hausa) and Northeast (Kanuri) (inequality)
- The reliability of the statistics e.g. Somalia, where statistics are less reliable than for those on South Africa, influences the reliability of the view of development obtained
- The difficulty of quantifying some measures e.g. gender inequality and freedom influences the reliability of the view of development obtained
- The dated nature of some statistics influences the reliability of the view of development obtained
- The non-availability of accurate statistics for some countries e.g. South Sudan influences the reliability of the view of development obtained

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about measures of development and definitions of development
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question

- The skill of reaching conclusions about whether development measures only give a partial view of development

Credit other valid approaches.

10. 'Political factors influence development more than any other factors.' Discuss with reference to two or more Sub-Saharan African countries. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.3.10/11

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of factors influencing the development of two or more Sub-Saharan African countries could include:

- The influence of political factors including governance, colonialism and neo-colonialism, global organisations and corruption (interdependence / globalisation)
- Neo-colonial influences can lead to instability: 'the resource curse' (globalisation)
- The influence of free trade and trade blocs in promoting and hindering development including subsidies and tariffs, quotas and protectionism (interdependence / causality)
- The influence of MNCs, including foreign direct investment, outsourcing and off shoring (interdependence)
- The influence of tourism and fair trade (globalisation / sustainability)
- The influence of physical factors (e.g. access to a coast, soils, relief, climate and water availability)
- The influence of social factors including education, health and welfare, social and cultural constraints including the role of women and ethnic divisions (sustainability / interdependence / causality/ inequality)

AO2

Application of knowledge and understanding is deployed to discuss the influence of political factors compared to economic, social and cultural and physical factors on the development of two or more Sub-Saharan African countries. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The interdependence of political, economic, physical, social and cultural factors (interdependence)
- The relative importance of factors varies spatially and may vary according to the countries selected for discussion. Physical factors (soils, relief, climate and water availability) may be more important, particularly for landlocked countries experiencing extreme climatic variability (causality / place)
- The constraining effects of climate variability, droughts and / or floods on development (risk). Recurrent natural hazards, particularly drought, constrain development (risk)
- The relative importance of factors varies temporally. Political instability may disrupt economic growth, as with the recent political instability in South Sudan (causality / place)
- The relative importance of factors may vary according to scale. Political factors may be more important at the national scale, but cultural at the regional scale because of ethnic divisions, as in northern Nigeria (scale)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about the factors influencing the development of two or more Sub-Saharan African countries
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the influence of political factors compared to economic, social and cultural and physical factors in the development of two or more Sub-Saharan African countries

Credit other valid approaches.

11. 'Oil and gas resources cannot be managed effectively.' Discuss. [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.4.4

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the management of oil and gas resources could include:

- Managing the imbalance between the supply and demand for oil and gas through transfers, storage and pricing. The 14 members of the cartel, OPEC, influence prices by controlling production. The aim of OPEC is to co-ordinate and unify the petroleum policies of its member countries and ensures the stabilisation of oil markets in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital for those investing in the petroleum industry. The Gas Exporting Countries Forum (GECF) is an intergovernmental organization of 11 of the world's leading natural gas producers (globalisation)
- Managing oil and gas exploration and production by MNCs and national governments. Major MNCs are important players, including Exxon Mobil, BP, Royal Dutch Shell, Total and Chevron. Most state-owned companies spearhead exploration and production. Gazprom is a state-owned Russian MNC. Other state-owned oil companies include Saudi Aramco, NIOC (Iran), Petro China, Pemex (Mexico), NNPC (Nigeria). As oil is discovered in non-OPEC countries, such as Norway and within South America and Africa, government influences have increased. Some, such as Russia, totally control foreign MNCs, others, such as Equatorial Guinea's state-owned oil company, GEPetrol, are corrupt and have a negative influence on oil development.

AO2

Application of knowledge and understanding is deployed to discuss whether oil and gas resources can be managed effectively. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- As both oil and natural gas resources are fossil fuels, a major challenge is the management of global oil depletion (sustainability). Easy-to-produce oil is running out. Oil production has declined in the USA and North Sea and fewer giant oilfields are being discovered
- Technological developments have enabled oil and gas exploration to take place in more difficult and extreme environments (ocean depths e.g. Mexico, Brazil, Libya; areas with extreme weather conditions e.g. Gulf of Mexico where the Deepwater Horizon disaster occurred; fragile environments e.g. Alaska, Greenland) making their management more challenging (risk)
- Oil exploration is a long-term investment and the recent fluctuations in oil prices US$150 a barrel in 2009 and US$50 in 2017 are difficult for oil companies to manage. Below a given oil price, exploration and production becomes uneconomic (thresholds)
- Due to their high demand for oil and gas, emerging economies such as China and India are placing increasing pressure on the management of future global supplies of oil and gas (globalisation)
- Technological changes create the challenge of managing a very dynamic situation as they can increase oil and gas production through enhanced oil recovery and the development of unconventional oil sources such as shale gas, tar sands and extra-heavy oil
- As crude oil is the world's most actively traded commodity in the financial markets it is highly susceptible to shocks, including geopolitical and environmental, such as BPs Deepwater Horizon spill in 2010, increasing the challenge of managing the imbalance of supply and demand (risk and resilience)
- The management of oil and gas resources depends on different stakeholders. A number of players are involved in the supply and demand for oil and natural gas resources (OPEC, MNCs, governments, consumers, environmentalists, scientists, prospectors and technologists) each with different roles and degrees of influence (interdependence)
- Managing oil and gas resources varies over time and space (place). Some governments exercise sound stewardship and investment strategies e.g. Norway, others lack competence and expertise
- Political instability in areas where oil and gas resources are concentrated, such as conflicts in Libya and Crimea, creates challenges for managing transfers, storage and pricing of oil and gas resources effectively (risk)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about the management of oil and gas resources
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about whether oil and gas resources can be managed effectively

Credit other valid approaches.

12. 'Adopting clean technologies for fossil fuels is the only way to meet energy demand sustainably.' To what extent do you agree? [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.4.7

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content. Where candidates have interpreted clean coal technologies for fossil fuels as clean technologies only, credit relevant content relating to meeting energy demand sustainably.

AO1

Knowledge and understanding of clean technologies for fossil fuels and other means and ways in which they canmeet demands for energy sustainably. Responses could include:

- Use of a series of 'clean coal technologies. Carbon capture and storage (CCS) which prevents a build-up of CO_2 in the atmosphere; coal preparation which removes harmful pollutants such as SO_2, NOx and particulates and gasification which produces a gas from coal that is extremely efficient with zero-emissions
- Improving energy efficiency through improved building design, the use of low energy appliances, more efficient vehicles and use of modern telecommunications
- Use of alternative (renewable and recyclable) energy sources

AO2

Application of knowledge and understanding is deployed to discuss the extent to which demands for energy can only be met sustainably by adopting clean technologies for fossil fuels. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Concerns that clean coal technologies are insufficiently advanced. There is significant scepticism whether the technology can be scaled up affordably, reliably and soon enough to make a difference
- Concerns about the cost of clean coal technologies. Power plants with CCS cost about 75 percent more than standard coal plants, and the infrastructure required to transport and store CO_2 is enormous.
- Concerns that clean technologies will delay the transition to renewable energy sources like wind and solar (sustainability)
- Capturing and compressing the carbon requires large amounts of energy, sometimes 20 to 25 percent of the electricity that a coal-fired plant is supposed to produce for consumers (sustainability)
- Concerns about the reliability of storage, as it is not clear how long CO_2 will remain underground (sustainability)
- The relative importance of other sustainable solutions (energy efficiency and use of alternatives) which varies over time and space (place)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about sustainable solutions to meet demands for energy
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the extent to which demands for energy can only be met sustainably by adopting clean technologies for fossil fuels

Credit other valid approaches.

13. 'The UK's weather can be fully explained by the characteristics of different air masses.' To what extent do you agree? [45 marks]
AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.5.3

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the characteristics of different air masses influencing UK weather could include:

- An air mass is a large body of air that has similar temperature and moisture properties. Air masses originate at source regions, which are large, usually flat, areas of water or land, where air can be stagnant long enough to take on the characteristics of the surface below. They move over long distances and the bodies of water and land from which they started will affect the weather of the areas to which they travel
- Air masses are defined according to their origin and the course they travel. The names of the air masses indicate their place of origin and, consequently, the weather they will bring. Tropical air masses will bring warm weather; Polar and Arctic masses will bring cold weather. Continental air masses travel over land and will bring dry weather as they have not picked up much moisture on the way. Maritime air masses travel over the sea so will bring wet weather (causality)
- In the UK there are six air masses that at different times influence the UK's climate and weather (Tropical Maritime, Tropical Continental, Polar Maritime, Polar Continental, Arctic Maritime with some including 'Returning' Polar Maritime)
- The UK's location on the Polar Front is important. The Polar Front marks the path of the Polar Jet Stream. It is along the Polar Front that different air masses collide and the result is complex and variable weather

AO2

Application of knowledge and understanding is deployed to evaluate whether the UK's weather can be fully explained by air mass characteristics. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Although reference to air masses gives an important indication of expected weather, there are other important influences including altitude, latitude and the influence of the Atlantic Ocean (causality)
- The weather of an area is influenced by a combination of factors, including air masses (interdependence). For example, when a tropical maritime air mass reaches the UK it brings with it low cloud and drizzle to windward coasts and hills, but to the lee of high ground, the cloud often breaks up and here the weather, particularly in the summer months, can be fine and sunny
- The scale of analysis is important. In some regions where the weather is influenced by a particular air mass, locally human activities can modify or intensify (feedback) weather characteristics such as in built up areas, creating an urban 'heat island'. On a global scale, climate change is having an increasing influence on the UK's weather characteristics, mainly associated with extremes of precipitation and temperature (place / scale/ thresholds)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about the characteristics of different air masses influencing UK weather
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about whether the UK's weather can be fully explained by air mass characteristics

Credit other valid approaches.

14. To what extent can the damaging effects of human activity on urban climates be reduced? [45 marks]

AO1 [20] AO2.1c [20] AO3.3 [5]

Focus: 3.5.6

This question requires candidates to demonstrate their ability to develop a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.

Indicative content

The indicative content is not prescriptive and candidates are not expected to cover all points for full marks. Credit other valid points not contained in the indicative content.

AO1

Knowledge and understanding of the damaging effects of human activity on urban climates and strategies to reduce the damaging effects could include:

- The main effect of large cities on local climates is to destroy the existing microclimate and create a new one (causality)
- Large cities affect all microclimate variables and 'damage' the climate by: increasing temperatures, particularly during anticyclonic conditions, in the night and in winter; changing atmospheric composition (higher concentrations of gases such as CO_2, NO_x, SO_2 and particulates); increasing the incidence of cloud, therefore reducing amounts of sunshine and increasing the frequency, duration and intensity of fog, including 'smog' (risk)
- Strategies to improve atmospheric composition to increase amounts of sunshine and reduce the frequency, duration and intensity of fog, including 'smog' include: new building materials such as titanium dioxide on building tiles which absorb pollutants and break them down into less harmful chemicals, including calcium nitrate (a salt used in fertilisers), carbon dioxide, and water (Mexico City, Rome, Chicago); the creation of open spaces and tree planting to absorb CO_2 (Curitiba); providing high quality, affordable public transport to cut car usage and reduce emissions (bus rapid transport systems (BRT) such as those operated in Bogota, Colombia and Curitiba, Brazil); encouraging more sustainable forms of transport (in Copenhagen 53% of the population commute to work by bike using a green wave system of cycle paths) (mitigation / adaptation)
- Strategies which reduce energy consumption and lower temperatures include: building design (research in China concluded that from Shanghai southwards light coloured roofs reduce the need for air conditioning by reflecting more sunlight, lowering annual energy usage and cost as well as annual emissions of CO_2, NO_x and SO_2). In a housing development in Singapore (Punggol) the buildings face towards the wind and away from the sun, natural ventilation is favoured over air-conditioning, rooftops collect rainwater and protect against the sun and plants insulate against the heat. Energy conservation is central to new building design in many cities and energy efficient retrofits (Freiburg, Germany and Leeds City Region UK) are as important as improving energy efficiency in new buildings (mitigation / adaptation)
- Other measures to reduce the damaging effects of human activity on urban climates include more compact cities (60% of growth in expected energy consumption is directly related to urban sprawl), the use of more efficient appliances and videoconferencing which reduces the need for travel (mitigation / adaptation)

AO2

Application of knowledge and understanding is deployed to evaluate the extent to which the damaging effects of human activity on climate can be reduced. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Comparison of the success of different strategies employed in different environments (place).Cities that have been successful to date such as Copenhagen and Reykjavik have a number of common characteristics: slow rates of growth/ negative growth rates, favourable locations for renewable energy generation such as Reykjavik for geothermal energy, the political will to implement change and good governance (the mayor, Penalosa, in Bogota was instrumental in introducing the Transmilenio BRT), investment in renewable technologies, advanced construction techniques and transport infrastructure and societies that are educated to recognise the importance of reducing energy consumption (resilience)
- Technology transfer. Even in the poorest cities in Africa a switch from fuel wood to solar through technology transfer, supported by charities such as Solar Aid, has the potential to reduce the damaging effects of human activity on urban climates (inequality / globalisation)
- Improvements in the use of strategies over time (time scales), as with the increased application of technology to finding solutions, the number and availability of strategies should grow (mitigation / adaptation)
- Reference to the intensity of the damaging effects of human activity on urban climates (scale) with the assertion that the greater the damage, the more difficult it will be to reduce the effects
- Reference to topographical (concentration of pollutants in valleys) and meteorological (high-pressure systems prevent the dispersal of pollutants) constraints which intensify the damaging effects of human activity on urban climates, making them difficult to reduce (causality / interdependence)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent and logical arguments about the damaging effects of human activity on urban climates
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question
- The skill of reaching conclusions about the extent to which the damaging effects of human activity on urban climates can be reduced

Credit other valid approaches.