



GCE A LEVEL MARKING SCHEME

SUMMER 2025

**A LEVEL (NEW)
GEOGRAPHY - UNIT 4
1110U40-1**

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

WJEC GCE A LEVEL GEOGRAPHY
UNIT 4: CONTEMPORARY THEMES IN GEOGRAPHY
SUMMER 2025 MARK SCHEME

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 20 marks and Section B is 22 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 [20 marks]

	AO1 [6 marks]	AO2 [13 marks]	AO3 [1 mark]
Band	<i>Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales.</i>	<i>Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information.</i>	<i>Use a variety of relevant 'geographical skills' to construct arguments and draw conclusions.</i>
3	5-6 marks Secure factual knowledge and confident understanding of relevant concepts and principles. Developed exemplification used with supporting geographical terminology. Well-directed and well-annotated sketch maps / diagrams. Spelling, punctuation and grammar used with a high degree of accuracy.	9-13 marks Accurate application either to interpret or analyse or evaluate. Synthesis of the connections between different elements of the response to the question. Relevant application of the specialised concepts.	1 mark The response is appropriately structured.
2	3-4 marks Straightforward knowledge with some inaccuracies; some understanding of relevant concepts and principles. Appropriate exemplification and geographical terminology is partially evident. Annotated sketch maps / diagrams contain inaccuracies. Spelling, punctuation and grammar used with a reasonable degree of accuracy.	5-8 marks Some application either to interpret or analyse or evaluate with limited range, depth and development. Incomplete synthesis between different elements of the response to the question.	
1	1-2 marks Limited knowledge with errors and minimal understanding. Limited use of examples and terminology; no supporting sketch maps / diagrams. Spelling, punctuation and grammar used with limited accuracy.	1-4 marks Application either to interpret or analyse or evaluate is poor; occasional relevant points are made.	
	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 A: Tectonic Hazards

1. 'Ash falls are the most serious volcanic hazard'. To what extent do you agree? [20 marks]

AO1 [6] AO2 [13] AO3 [1]

Focus: 4.1.2

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- A description of primary and secondary hazards associated with volcanic activity and their effects. (risk/scale)
- 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/scale)
- Pyroclastic flows consist of hot, dense mixtures of ash, rock and gas that can move downslope at speeds of up to 100 km/h for distances of up to 10km. (causality/risk/scale)
- Lava flows are streams of molten rock that pour or ooze from an erupting vent. Lava is erupted during either nonexplosive activity or explosive lava fountains. (causality/risk/scale)
- 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/scale)
- Volcanic landslides may be triggered by seismic activity. (causality/risk scale)
- 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 (H₂O), followed by carbon dioxide (CO₂) and sulphur dioxide (SO₂). (causality/risk/scale)
- Demographic impacts: Mortality, migration, population structure changes. (risk/scale /temporal scale)
- Economic impacts: costs of losses. (risk/scale /temporal scale)
- Social impacts: Health, infrastructure, families. (risk/scale / temporal scale)
- Environmental impacts: Biosphere, lithosphere, hydrosphere, atmosphere. (risk/scale/temporal scale)

AO2

Application of knowledge and understanding is deployed to discuss to what extent ash falls are the most serious volcanic hazard. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Some volcanic activity may result in impacts that are concentrated locally, for example, Eyjafjallajökull – Livestock was taken inside to escape ash/fluoride that was deposited from the volcano on grazing land. (place/scale/risk)
- Some volcanic activity may result in impacts that are more important at a regional or global scale, for example, the Eyjafjallajökull eruption in April and May (2010) caused a range of problems: On one day in Heathrow alone, 1000 flights were cancelled / Europe lost \$2.6 billion of GDP due to the eruption. (place/scale/risk/sustainability)
- The globalisation of the world economy means that volcanic events are more likely to have widespread impacts than they did in the past. For example, following the Eyjafjallajökull eruption, the car industry was very badly affected. (place/globalisation/vulnerability/sustainability)
- Volcanic activity results in hazards operating over different time scales, initially volcanic activity can have local impacts, but over time these may spread more widely, for example, the outpouring of ash from the Eyjafjallajökull eruption led to the skies above Northern Europe being empty of air traffic for several days. (place/risk/temporal scale)
- The scale of the impacts varies according to the nature of the volcanic hazards (effusive or eruptive). Lava flows most dangerous to human life come from effusive fissure eruptions. (place/scale /risk/vulnerability)
- An examination of the severity of the risks associated with volcanic hazards. Lahars and pyroclastic flows pose great demographic risks at a local scale E.g., Nevado Del Ruiz (1985) and Mt St. Helens (1980); however, ash falls can pose a greater risk to economic activity. (place/risk /scale)

AO3

- The skill of presenting well-constructed, coherent, and logical arguments about to what extent ash falls are the most serious volcanic hazard.
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about to what extent ash falls are the most serious volcanic hazard.

Credit other valid approaches.

2. **Evaluate the relative success of short-term and long-term responses to the effects of earthquakes.** [20 marks]

AO1 [6] AO2 [13] AO3 [1]

Focus: 4.1.6

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- A description of primary and secondary hazards associated with earthquakes and their effects. (place/risk/scale)
- A description of short-term responses (implemented in the days and weeks immediately after an earthquake) and long-term responses (implemented in the months and years after an earthquake). (place/scale/temporal scale)
- A description of how the strategies identified manage hazards. The management may refer to how the strategy allows people to avoid the hazard, absorb the impacts of the hazard, or alleviate the impacts of the hazard after it has occurred. (adaptation/mitigation/place/resilience)
- Strategies that respond to the event can be divided into short and long-term responses. Reference could be made to the hazard management cycle. (adaptation/mitigation/place/resilience)
- Strategies used to manage earthquakes can be divided into:
 - (a) Monitoring, predicting, and warnings of earthquakes e.g., Hazard zone mapping / early warning systems/media broadcasts etc. (adaptation/mitigation/place/resilience)
 - (b) Mitigating earthquake hazards and modifying the event, vulnerability, and loss e.g., rescue efforts/provision of aid etc. (adaptation/mitigation/place/resilience)
 - (c) Those that respond to the event – e.g., reconstruction efforts/rehabilitation/building engineering. (adaptation/mitigation/place/resilience/sustainability)

AO2

Application of knowledge and understanding is deployed to evaluate the relative success of short-term and long-term responses to the effects of earthquakes. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Comparison of the effectiveness of different measures employed in different environments. (place/scale/sustainability)
- The interdependence of strategies. (interdependence)
- Variation in the effectiveness of the strategies provided according to the nature of the primary and secondary hazards associated with earthquakes. (place/scale) for example the effectiveness of a strategy may vary according to whether the hazard is ground shaking or fire.
- The frequency of the tectonic hazard can determine whether short-term or long-term responses are more effective. (place/scale/temporal scale)
- The magnitude of the tectonic hazard can determine whether short-term or long-term responses are more effective. (place/scale/sustainability)
- The areal extent of earthquakes can determine whether short-term or long-term responses are more effective. (place/scale)
- The level of economic development can determine which types of strategies local communities affected can afford and have a bearing on their effectiveness (place/resilience/sustainability), for example, expensive aseismic buildings in California and Japan do perform well even in high-magnitude earthquakes.

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about the relative success of short-term and long-term responses to the effects of earthquakes.
- 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 relative success of short-term and long-term responses to the effects of earthquakes.

Credit other valid approaches.

Section B: Contemporary Themes in Geography: Generic Mark Bands [22 marks]

	AO1 [9 marks]	AO2 [11 marks]	AO3 [2 marks]
Band	<i>Demonstrate knowledge and understanding of places, environments, concepts, processes, interactions and change at a variety of scales.</i>	<i>Apply knowledge and understanding in different contexts either to analyse or interpret or evaluate geographical issues and information.</i>	<i>Use a variety of relevant 'geographical skills'* to construct arguments and communicate findings.</i>
3	7-9 marks Wide-ranging and thorough knowledge and confident understanding of relevant concepts and principles. Developed exemplification used with supporting geographical terminology. Well-directed and well-annotated sketch maps / diagrams. Spelling, punctuation and grammar used with a high degree of accuracy.	8-11 marks Accurate application either to interpret or analyse or evaluate. Synthesis of the connections between different elements of the response to the question. Relevant application of the specialised concepts.	2 marks A well-constructed, coherent and logical response.
2	4-6 marks Secure, straightforward knowledge and reasonable understanding of relevant concepts and principles. Appropriate exemplification and geographical terminology is partially evident. Appropriate, basically accurate annotated sketch maps / diagrams are included. Spelling, punctuation and grammar used with a reasonable degree of accuracy.	5-7 marks Some application either to interpret or analyse or evaluate with limited range, depth and development Incomplete synthesis between different elements of the response to the question.	1 mark The communication in the response is limited or incomplete.
1	1-3 marks Limited knowledge with errors and minimal understanding. Limited use of examples and terminology; no supporting sketch maps / diagrams. Spelling, punctuation and grammar used with limited accuracy.	1-4 marks Application either to analyse or interpret or evaluate is poor; occasional relevant points are made.	
	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. Examine the relative influence of precipitation on the structure and functioning of different ecosystems. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.2.2

Indicative content

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- An ecosystem is a discrete structural, functional, and life-sustaining environmental system. The environmental system consists of biotic and abiotic components in a habitat. Biotic components of the ecosystem include the living organisms; plants, animals, and microbes, whereas the abiotic component of the system includes basic inorganic elements and compounds, such as soil, water, oxygen, phosphates, and a variety of organic compounds (by-products of organic activities or death.) (interdependence/place/system)
- An understanding of the different net levels of primary productivity linked to the presence of limiting factors such as temperature, moisture, light, and nutrient availability. (place/system)
- An ecosystem is a dynamic system, which relies on the interaction of biotic and abiotic components. (equilibrium/interdependence/place/system/thresholds)
- The ecosystem concept including energy flows. (interdependence/place/system)
- The structure of an ecosystem consists of a series of storage units or trophic levels including autotrophs (primary producers), heterotrophs (consumers), and saprotrophs (decomposers), each of which has ecological niches. (interdependence/place)

AO2

Application of knowledge and understanding is deployed to examine the relative influence of precipitation on the structure and functioning of different ecosystems. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- The two main factors that contribute to the NPP of a biome are P to E ratios (Precipitation to Evaporation) and how far away from the equator they are located (and therefore their proximity to the sun). (interdependence/place)
- As water is a principal requirement for photosynthesis, in the absence of water the importance of temperature diminishes. (interdependence)
- Temperature and moisture also influence the rate of weathering and therefore nutrient availability. (interdependence)
- Ecosystems are complex and rely on a variety of interlinked processes to function effectively. The complexity and interconnections between the limiting factors make it difficult to isolate and examine the relative importance of precipitation. (interdependence)
- Temperature controls the rate of plant metabolism, which in turn determines the amount of photosynthesis. Temperatures need to reach a critical level for an ecosystem to function. (thresholds)
- The influence of temperature can be inferred from the relationship between climatic belts and the distribution of biomes. (causality/interdependence/place/scale)
- The influence of climate change and associated global warming on shifting biomes is indicative of the importance of temperature in influencing the structure and functioning of ecosystems. (causality/feedback)
- Humans are increasingly influencing the structure and functioning of ecosystems through harvesting, the application of fertilisers, controlled environments, and climate change (adaptation/causality/resilience)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about the relative influence of precipitation on the structure and functioning of different ecosystems.
- 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 relative influence of precipitation on the structure and functioning of different ecosystems.

Credit other valid approaches.

4. 'Human factors exert the most significant influence on succession in local scale ecosystems.' To what extent do you agree? [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.2.5

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- Plants colonise a 'sterile' area, such as bare rock or sand dunes they change the physical and chemical components of the environment making the way for a different range of organisms to colonise. (causality/place)
- The colonisation by pioneer communities leads to the establishment of early colonisers (more advanced plants); once the early colonisers have established, they also continue to change the environment in stages. (place/temporal scale)
- With the passage of time, the seral communities will become more complex and comprise larger plants, with each community helping to destroy that which precedes it. (feedback/temporal scale)
- With each sere, soil and moisture conditions improve as humus is provided from the expanding plant cover and soil depth, and the nutrient status of the soil increase. (place/scale/temporal scale)
- Given sufficient time, without interruption, the vegetation will come to comprise a wide range of plants fully adapted to the prevailing climatic conditions (climatic climax) with temperature and precipitation influencing the climatic climax vegetation. (causality/interdependence/place/scale/temporal scale)
- The increasing diversity of plant species increases in biomass, and increase in vegetation height/density/canopy associated with succession is due to the development of the soil which increases in depth, organic content, and associated nutrient status and has improved water retention properties. (feedback)
- The actual species involved in succession in a particular area (place) are controlled by a range of factors including not only the climate but also the geology and associated soil type as the mineral matter from the parent rock will influence nutrient availability and soil texture: the communities that occur on these soils may permanently differ from the surrounding climatic communities creating a subclimax community. (causality)
- A subclimax occurs when the vegetation is prevented from reaching its climax due to interruptions by other local factors including relief and drainage. (causality)
- When people are involved then secondary succession takes place. Secondary succession is more likely to occur on land on which the previous management has been discontinued e.g., abandoned farmland. (causality/place)
- Where human activity has permanently arrested and altered the natural succession and manages the resultant community the succession has achieved a deflected climax or plagioclimax e.g., deforestation. (risk)

AO2

Application of knowledge and understanding is deployed to examine to what extent human factors exert the most significant influence on succession in local scale ecosystems. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. This evidence could include:

- Relative role of human activity in the evolution of an ecosystem (causality/interdependence/place/risk/scale)
- Relative role of physical factors in the evolution of an ecosystem e.g., the role of temperature, moisture, soils etc. (causality/interdependence/place)
- The actual species involved in succession in a particular area (place) are controlled by a range of factors including not only the climate, but also the geology and associated soil type as the mineral matter from the parent rock will influence nutrient availability and soil texture: the communities that occur on these soils may permanently differ from the surrounding climatic communities creating a subclimax community (causality/interdependence)
- With each sere, soil and moisture conditions improve as humus is provided from the expanding plant cover and soil depth and the nutrient status of the soil increase (interdependence/scale/temporal scale)
- Relative role of biotic components in the evolution of an ecosystem e.g., role of flora and fauna. (causality/interdependence/place)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about to what extent human factors exert the most significant influence on succession in local scale ecosystems.
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about to what extent human factors exert the most significant influence on succession in local scale ecosystems.

Credit other valid approaches. Where a candidate fails to recognise an ecosystem at a local scale, responses should be limited to Band 1.

5. 'Economic development in India is influenced more by political factors than the physical environment.' Discuss. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.4

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- The socialist government post 1947 ensured a high level of state control of key industries. Today the economy has had a major about-turn, opening it up to economic globalisation since economic reform in 1991 (causality / globalisation / temporal scale)
- India faced a major economic crisis in 1991 which forced the governing Congress Party to borrow money from the International Monetary Fund (IMF). This opened up the economy to economic globalisation. India is now among the ten fastest-growing economies in the world (causality / globalisation / temporal scale)
- Business process outsourcing in India, which started around the mid-90s, continues to grow. India is now the world's favoured market for BPO companies. The BPO sector in India is estimated to have reached a 54 per cent growth in revenue. The demand for Indian BPO services has been growing at an annual growth rate of 50%. (place / globalisation / scale / temporal scale)
- Special economic zones (SEZs) in India are certain localities which offer tax and other incentives to their resident businesses. Up until 2000, India did not have SEZs, and instead had a number of export processing zones (EPZs), which, although similar in structure to the modern SEZ, failed to attract many firms to India. The government, accordingly, introduced the SEZ in April 2000. (globalisation / place / temporal scale)
- In addition to the role of government, factors responsible for the rapid growth of manufacturing industries include the emergence and investment policies of TNCs E.g. R&D (Research and Development) functions. Hewlett Packard set up Software Universities in 8 cities (it opened in 2009 in Mumbai, Delhi, Pune, Kolkata, Hyderabad, Noida, Chennai and Bangalore) (causality / globalisation / interdependence)
- Technological factors have also played a significant role, particularly the speed and distance over which communications and movement can now take place due to changes in computer, transport and communication technologies (causality / globalisation / scale)
- India's physical environment has played a role in promoting economic growth. E.g. Traditional heavy industry is concentrated in the Damodar valley. The presence of coal mining operations and the availability of iron ore prompted the establishment up of many steel and power plants in the basin area. (causality / inequality / interdependence / place / scale)
- The Indian Himalayan Region extends from the foothills in the south to the Tibetan plateau in the north. The region occupies a strategic position and borders 7 countries. The North Indian states benefit from scenic, mountainous terrain with dense forests and perennial water sources making it attractive for tourism. However, this region is also prone to natural hazards, particularly flooding and earthquakes and infrastructure is poor due to the steep terrain. (causality / globalisation / inequality / interdependence / place)

- The Indo-Gangetic Plain lies between the Himalayas and the Peninsular Plateau. The three major river systems of India – the Indus, Ganga, and the Brahmaputra – fed by seasonal meltwater runoff from major glaciers have deposited alluvium across the plain to depths of 1,800 metres. This region supports fertile agriculture but is subject to flooding. The Coastal Plains occupy a narrow strip from the Bay of Bengal in the East to the Arabian Sea on the West. Important ports such as Mumbai and Cochin located on the Arabian Sea coast and Chennai on the Bay of Bengal coast promote trade. Cities with sector specific SEZs in existence or under development include: Pharmaceuticals and biotechnology (Pune, Aurangabad, Nanded), Manufacturing, engineering and automotive (Amritsar), Information technology (Bangalore, Kolkata), Telecommunications (Sriperumbudur), Textiles (Hassam, Kolkata, Mahindra), Jewellery (Surat, Jaipur). (causality / globalisation / inequality / interdependence / place / scale)

AO2

Application of knowledge and understanding is deployed to discuss whether economic development in India is influenced more by political factors than the physical environment. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The relative importance of political / physical / demographic / social / cultural / economic / technological factors and TNCs on the location and development of economic activity in India. (causality / inequality / interdependence / place / scale)
- An examination of the interdependence of political / physical / demographic / social / cultural / economic / technological factors and TNCs on the location and development of economic activity in India. (causality / globalisation / inequality / interdependence / place)
- Variations in the importance of different factors spatially. E.g. SEZs in existence or under development include: Pharmaceuticals and biotechnology (Pune, Aurangabad, Nanded), Manufacturing, engineering and automotive (Amritsar), Information technology (Bangalore, Kolkata), Telecommunications (Sriperumbudur), Textiles (Hassam, Kolkata, Mahindra), Jewellery (Surat, Jaipur). Kerala is a communist state. However, other states favour a free-enterprise approach. This results in different levels of commitment to enacting land, labour or other business-friendly reforms. Maharashtra is one of the most industrialised states and Bihar one of the least. (causality / globalisation / inequality / interdependence / place / scale)
- Changes in the relative importance of factors over time – After independence in 1947, India's aim was to develop economically without the participation or influence of foreign capital. As a result, economic policies developed a strong anti-export bias. Climate change will increase meltwater discharges in the short-term but may lead to dangerous water shortages in the future. (causality / interdependence / place / scale / temporal scale)

AO3

- The skill of presenting well-constructed, coherent, and logical arguments about whether economic development in India is influenced more by political factors than the physical environment.
- 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 economic development in India is influenced more by political factors than the physical environment.

Credit other valid approaches.

6. To what extent do the greatest environmental threats in India result from urbanisation? [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.6

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- The environmental impact of urbanisation across India has been mostly negative as the country develops (inequality / place / risk / sustainability)
Rapid urbanisation has resulted in the development of slums and their associated problems E.g., Dharavi slum in Mumbai. (place / risk / sustainability / scale)
However, other environmental threats have been created by economic growth in India. For example
 - (i) Industrial pollution: E.g. The Bhopal disaster (place / risk / sustainability / scale)
 - (ii) Fossil fuel use – E.g. Air pollution in India has become so severe that yields of crops are being cut by almost half. (place / risk / sustainability / scale)
 - (iii) Soil erosion – Nearly 30 per cent per cent of the country's total geographical area is undergoing degradation according to the ISRO (place / risk / sustainability / scale)
 - (iv) Deforestation – E.g. Over the last 30 years, forests nearly two-thirds the size of Haryana have been lost to encroachments (15,000 sq. km) and 23,716 industrial projects (14,000 sq. km), according to government data (place / risk / sustainability / scale)
- Economic development has also led to the following problems:
 - (i) Water security – E.g. Narmada dam – influence on Gujarat and Madhya Pradesh / Coca Cola in Varanasi (place / risk / sustainability / scale)
 - (ii) Food security - Food security cannot be maintained without water security and as India has become increasingly industrialised the demands on water have increased rapidly. (place / risk / sustainability / scale)
 - (iii) Energy security - The recent growth in affluence has increased the purchasing power of the population, which creates an increasing demand for energy. (place / risk / sustainability / scale)
- Strategies instigated to deal with the problems associated with urbanisation and economic development E.g. Eco-cities – The Taj Eco City initiative, Agra, Uttar Pradesh. (place / mitigation / adaptation / sustainability / resilience)

AO2

Application of knowledge and understanding is deployed to examine to what extent the greatest environmental threats in India result from urbanisation. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion.

This evidence could include:

- The risks posed to the environment will continue to grow without focus on sustainable development. (risk/scale/sustainability/temporal scale)
- A comparison of the environmental pressures associated with urbanisation and economic growth. (place/risk/scale/sustainability/temporal scale)
- The relative importance of the environmental pressures associated with urbanisation in India varies spatially. (causality/place)
- The relative importance of the environmental pressures associated with urbanisation in India varies temporally. (causality/place/temporal scale)
- The relative importance of the environmental pressures associated with urbanisation in India may vary according to scale. (place/scale)
- Examination of strategies instigated to deal with the environmental pressures associated with urbanisation in India. (place/mitigation/sustainability/resilience)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about to what extent the greatest environmental threats in India result from urbanisation.
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about to what extent the greatest environmental threats in India result from urbanisation.

Credit other valid approaches.

7. 'Economic development in China is influenced more by political factors than the physical environment.' Discuss. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.4

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- Between 1949 and the late 1970s manufacturing in China was undertaken almost entirely by state-owned enterprises (SOEs), mainly heavy industries such as oil, chemicals, power, iron and steel (temporal scale)
- During Mao's era, rural industries called town and village enterprises (TVEs) produced heavy goods such as iron, steel, cement, chemical fertiliser and farm tools. After 1978 these enterprises expanded to develop a wider range of businesses. Many Chinese farmers preferred to invest their resources in rural industry rather than agriculture. This encouraged the growth of small businesses run by the most successful peasants. (interdependence/place/ temporal scale)
- Since 1979, five special economic zones (SEZs) and 14 open cities have been proclaimed. These offer reduced restrictions on land, labour, wages, taxes, and planning regulations to overseas firms, especially those involved in high-technology industries. The result has been the emergence and dominance of economic activity in coastal areas, which have received most of the internal investment as well as having imported capital, technology, and entrepreneurial skills, at the expense of the interior. (inequality/place/temporal scale)
- The PRC has established special economic zones in Shenzhen, Zhuhai and Shantou in Guangdong Province, Xiamen in Fujian province and designated the entire province of Hainan a special economic zone (causality/place)
- The 1980s focus on increased productivity forced SOEs towards reform. Large SOEs have improved their management and smaller SOEs eventually privatised. Chinese firms have gradually become more Westernised. (globalisation/interdependence/temporal scale)
- FDI in China increased from US\$3.5 billion in 1990 to US\$139 billion in 2016. (globalisation/scale/temporal scale)
- Technological factors have also played a significant role, particularly the speed and distance over which communications and movement can now take place due to changes in computer, transport and communication technologies (causality / globalisation / scale)
- The Yangtze and Yellow Rivers (Huang He) have supported agriculture for thousands of years, especially rice and wheat farming, which laid the foundation for early population growth and urbanisation. Agricultural activity is concentrated on the fertile low-lying plains and deltas to the east. (causality/inequality/interdependence/place)
- Raw materials such as coal influence the location of manufacturing industry: although coal deposits are widely scattered, most of the total is in the northern part of the country. (causality/inequality/interdependence/place)

- Mountains (like the Himalayas), deserts (like the Gobi), and seas have historically provided protection from invasions but also limited cultural exchange and trade, leading to an internally focused development path. In more recent years, China's long eastern coastline has been transformed into economic powerhouses through the development of port cities like Shanghai and Shenzhen, enabling global trade and attracting foreign investment. (causality/globalisation/interdependence/place)

AO2

Application of knowledge and understanding is deployed to discuss whether economic development in China is influenced more by political factors than the physical environment. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Changes in the relative importance of factors over time – Between 1949 and 1976, government locational decisions were dominated by Marxism-Leninism, with a socialist, collectivist and centrally planned agenda dominating. Following the death of Mao Zedong in 1976, China's economy took a major change in direction. In 1978, Deng Xiaoping, the new leader of the Chinese Communist Party, implemented the 'Open Door' policy, which was designed to overcome China's isolation and embrace globalisation. The 1980s focus on increased productivity forced SOEs towards reform. Chinese firms have gradually become more like Western companies. SOEs have attracted TNCs as partners and FDI has been highly significant. (causality/globalisation/interdependence/place/scale/temporal scale)
- An examination of whether socialism has promoted or hindered economic change. (causality/interdependence/place/scale)
- Variations over space – E.g., During Mao's era, rural industries called town and village enterprises (TVEs) produced heavy goods such as iron, steel, cement, chemical fertiliser and farm tools, as well as hydroelectric power. Latterly, these enterprises expanded to develop a wider range of businesses. Many Chinese farmers preferred to invest their resources in rural industry rather than agriculture. TVEs became the backbone of development in rural areas playing a catalytic role in transforming the Chinese economy from a command economy to a market economy. (causality/globalisation/inequality/interdependence/place/scale).
- An examination of the interdependence of physical/demographic/social/cultural/economic/political/social/technological factors and TNCs on economic change in China. E.g., China became the world's manufacturing hub following Mao Zedong's reforms, specialising in the labour-intensive, export-led production of cheap goods that enabled a gradual increase in product complexity. (causality/globalisation/inequality/interdependence/place/scale)
- The relative importance of physical/demographic/social/cultural/economic/political/social/technological factors and TNCs on economic change in China. (causality/inequality/interdependence/place/scale)

AO3

- The skill of presenting well-constructed, coherent, and logical arguments about whether economic development in China is influenced more by political factors than the physical environment.
- 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 economic development in China is influenced more by political factors than the physical environment.

Credit other valid approaches.

8. To what extent do the greatest environmental threats in China result from urbanisation? [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.6

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- The environmental impact of urbanisation across China has been mostly negative as the country develops. E.g., Air quality issues are particularly apparent in urban areas. The cities in China's industrial north regularly make international headlines. (globalisation / place / risk / sustainability / scale)
- However, other environmental threats have been created by economic growth in China:
 - (i) Industrial pollution: Many waterways are polluted, and industrial waste has led to an increased incidence of cancer in some areas - dubbed 'Cancer Villages'.
 - (ii) Soil erosion: Is a particular problem on the Loess Plateau.
 - (iii) Deforestation: Has resulted in desertification in the north and west of China. (place / risk / sustainability / scale / vulnerability)
- Economic development has also led to the following problems:
 - (i) Water security – E.g., Agriculture accounts for between 65 and 70 percent of China's water use and vast amounts are wasted by inefficient irrigation. (place / risk / sustainability / scale / vulnerability)
 - (ii) Food security - Food security cannot be maintained without water security and as China has become increasingly industrialised the demands on water have increased rapidly. (place / risk / sustainability / scale / vulnerability)
 - (iii) Energy security - The recent growth in affluence has increased the purchasing power of Chinese people. This creates an increasing demand for energy and has contributed to debates on energy security within China. (place / risk / sustainability / scale / vulnerability)
 - (iv) (Rapid urbanisation - E.g., Shanghai - Since China's economic reform in the late 1970s, Shanghai has experienced rapid expansion and urbanisation, resulting in environmental and ecological consequences. (place / risk / sustainability / scale / vulnerability)
- Strategies instigated to deal with the problems associated with urbanisation and economic development e.g., Eco-cities. (place / mitigation / adaptation / sustainability / resilience)

AO2

Application of knowledge and understanding is deployed to examine to what extent the greatest environmental threats in China result from urbanisation. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The risks posed to the environment will continue to grow without focus on sustainable development. (risk/scale/sustainability/temporal scale)
- A comparison of the environmental pressures associated with urbanisation and economic growth. (place/risk/scale/sustainability/temporal scale)
- The relative importance of the environmental pressures associated with urbanisation in China varies spatially. (causality/place)
- The relative importance of the environmental pressures associated with urbanisation in China varies temporally. (causality/place/temporal scale)
- The relative importance of the environmental pressures associated with urbanisation in China may vary according to scale. (place/scale)
- Examination of strategies instigated to deal with the environmental pressures associated with urbanisation in China. (place/mitigation/sustainability/resilience)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about to what extent the greatest environmental threats in China result from urbanisation.
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about to what extent the greatest environmental threats in China result from urbanisation.

Credit other valid approaches.

9. 'Quantitative measures are the most effective way of measuring development.'
With reference to selected African countries, to what extent do you agree?

[22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.8

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- Single and composite quantitative indicators of development for different African countries (inequality/place/scale) These may include:
- Demographic indicators – E.g., Birth rate / Death rate / Infant mortality rate. (inequality/place/scale/temporal scale)
- Economic indicators – E.g., GDP per capita. (inequality/place/scale/temporal scale)
- Environmental indicators – E.g., Carbon dioxide emissions per capita. (inequality/place/scale/temporal scale)
- Social indicators – E.g., Literacy rate. (inequality/place/scale/temporal scale)
- Composite indicators – E.g., Gender-related Development Index (GDI) / Gender Empowerment Measure (GEM) / Gender Inequality Index (GII) / Human Development Index (HDI) / The Multidimensional Poverty Index (MPI). (inequality/place /scale/temporal scale)
- Qualitative indicators of development for different African Countries. Subtler aspects of development have been identified, such as democracy, freedom of speech and environmental sensitivity. (inequality/place/scale/temporal scale)
- The Happy Planet Index (HPI) developed by the New Economics Foundation (NEF) and Friends of the Earth (FOE). The Happy Planet Index is based on measures of life satisfaction, life expectancy and ecological footprint. (inequality/place/scale / temporal scale)
- Measures such as the Transparency Index and the Corruption Perceptions Index may also be introduced. (inequality/place/scale / temporal scale)

AO2

Application of knowledge and understanding is deployed to examine to what extent quantitative measures are the most effective way of measuring development in selected African countries. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- A comparison of the indicators presented for selected countries.
(inequality/place/scale)
- An examination of the reliability of the different indicators presented.
(inequality/place/scale/temporal scale)
- Some countries may have imbalances in these measures, so a country may have very high levels of wealth and economic development, but poor levels of political freedom and social development. (inequality/place /scale/temporal scale)
- It is therefore better to look at several different measures of development for places before coming to a judgment about its level of development.
(inequality/interdependence/place/scale)
- The most powerful measure is probably the Human Development Index because it combines a variety of variables into one figure. (inequality/place/scale/temporal scale)
- Variations in levels of development between regions, ethnic groups and genders are becoming increasingly important. More recent measures to calculate gender inequality such as the GEM (Gender Empowerment Measure) or GDI (Gender-relate development Index) can be used to help identify development patterns in Africa, which are different from those generated through reliance on more traditional income-focused measures. (inequality/place/scale/temporal scale)
- Qualitative aspects of development are more problematic but reflect more accurately the ways in which development is now viewed.
(causality/inequality/place/scale/ temporal scale)
- Development indicators are based on Western constructs, perceptions, and views of development and may, therefore, be flawed in an African context. (causality/inequality/place/representation)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about to what extent quantitative measures are the most effective way of measuring development in selected 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 to what extent quantitative measures are the most effective way of measuring development in selected African countries.

Credit other valid approaches.

10. 'Tourism is the most important economic factor influencing development.'
Discuss with reference to selected African countries. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.3.10

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- The application of the Clark-Fisher model to examine how the importance of economic sectors varies in countries at different levels of development, over time and over space. (causality/place/scale/temporal scale)
- Influence of tourism on the economic development of selected African countries. (causality/globalisation/place/scale/sustainability)
- Influence of free trade and trade blocs in promoting and hindering development including subsidies and tariffs, quotas, and protectionism. (interdependence/causality)
- Influence of MNCs, including foreign direct investment, outsourcing, and offshoring. (interdependence/place/scale/sustainability)
- The influence of soils, relief, climate, and water availability on development. (place/sustainability)
- Neo-colonial influences can lead to instability: 'the resource curse.' (causality/inequality/globalisation)
- Recurrent natural hazards, particularly drought, constrain development. (place/risk/scale)
- The influence of locational factors e.g., access to ports or a landlocked location. (causality/inequality/place/scale)
- Influence of political factors including governance, colonialism and neo-colonialism, global organisations, and corruption. (causality/interdependence/place/globalisation)
- Influence of social factors including education, health, and welfare, social and cultural constraints including the role of women and ethnic divisions. (causality/inequality/interdependence/place/sustainability)

AO2

Application of knowledge and understanding is deployed to examine whether tourism is the most important economic factor influencing development in selected African countries. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- Tourism and eco-tourism are valuable development tools for some countries in Africa with a significant proportion of GDP generated from this sector. Kenya and Gambia have established a strong tourism base, with the new destinations of Rwanda and Uganda following suit. (place/scale/sustainability)
- The influence of trading blocs has been both positive and negative for Africa. Policies of protectionism and subsidies, tariffs and quotas imposed on exports from Africa can severely hinder development. (causality/inequality/place/risk/sustainability)
- The development of intra-regional trade on the continent is seen by many as the key to ensuring long-term development. The Tripartite Free Trade Agreement (TFTA) was signed in Cairo in 2015, amalgamating three of Africa's main trading blocs: the Southern African Development Community (SADC), the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). The creation of a 'mega bloc' in Africa could positively impact development in Africa in the future. (causality/interdependence/place/scale/sustainability/temporal scale)
- The interdependence of physical, economic, political, social, and cultural factors. (interdependence/place/scale)
- The relative importance of factors varies spatially and may vary according to the countries selected for examination. Physical factors may be more important for landlocked countries experiencing extreme climatic variability (causality/inequality/place/scale)
- The relative importance of factors varies temporally. (causality/place/temporal scale)
- The relative importance of factors may vary according to scale. Economic 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 whether tourism is the most important economic factor influencing development in selected African countries.
- The skill of constructing relevant diagrams, which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about whether tourism is the most important economic factor influencing development in selected African countries.

Credit other valid approaches.

11. 'Fossil fuels and alternative energy sources are both vital for a sustainable future.' Discuss. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.4.1 and 4.4.7

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- An overview of the global distribution of energy sources. (place/scale/sustainability/temporal scale)
- Non-renewable fossil fuel resources have been built up over time and because their rate of formation is very slow, are finite. (place/temporal scale)
- Direct access to fossil fuel reserves is a coincidence of geological history and international boundaries. (place/scale/sustainability/temporal scale)
- There are benefits and problems associated with the use of conventional fossil fuels. E.g., accessibility, cost, ease of use and environmental implications. (place/risk/sustainability)
- Alternatives to conventional fossil fuel sources include nuclear, solar, ocean, wind, biomass, hydrological and geothermal energy. (place/risk/scale/sustainability/temporal scale)
- Renewable energy resources yield a continuous flow that can be consumed in any given period provided current use does not exceed net renewal rates during the same period. (place/scale/sustainability/temporal scale)
- There are benefits and problems associated with the use of renewable energy sources. E.g., While nuclear power is relatively clean in terms of its greenhouse gas emissions there are many issues surrounding its use. E.g., the Fukushima disaster of 2011. (place/scale/sustainability/temporal scale)
- Only certain locations are suitable for certain forms of alternative energy sources: For example, relief factors will influence suitable locations for dam construction and hydropower. Solar energy can be harnessed anywhere that receives sunlight, so it is abundantly available, however, it can also be inconsistent. (inequality/place/ scale/sustainability)
- Different locations and weather conditions will influence the volume of energy that can be generated. Cloud coverage can reduce the amount of solar energy received by an average of 20%. Wind power relies on high and consistent wind speeds. The minimum speed at which a turbine will generate power is between 7 and 10 mph for most turbines. The UK has the best wind energy potential in Europe. This is because of its position – it benefits from the uninterrupted prevailing south-westerlies from the Atlantic Ocean. (inequality/place/scale/sustainability)
- Geothermal power relies on tectonically active environments. (inequality/place /scale/sustainability)

AO2

Application of knowledge and understanding is deployed to discuss whether fossil fuels and alternative energy sources are both vital for a sustainable future. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- An evaluation of the sustainability of alternative energy sources in comparison to conventional fossil fuel resources. (place/sustainability/scale)
- An evaluation based on the finances and human resources available at community/local, regional, and national scales (inequality/interdependence/place/scale/sustainability / temporal scale)
- A comparison of the effectiveness of alternative energy sources and conventional fossil fuel sources at a range of scales (place/scale / sustainability)
- The level of economic development and technological expertise can determine which alternatives to conventional fossil fuel sources can be utilised (causality / inequality / place / scale / sustainability)
- An examination of how the sustainability of alternatives to conventional fossil fuel sources has changed over time. (place / sustainability / temporal scale)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about whether fossil fuels and alternative energy sources are both vital for a sustainable future.
- 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 fossil fuels and alternative energy sources are both vital for a sustainable future.

Credit other valid approaches.

12. Evaluate the factors influencing energy mixes at a national scale. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.4.6

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- The energy mix of a country depends upon many different factors. These include energy security issues, the availability of indigenous energy resources, the level of economic development, and government policies.
(causality/interdependence/place)
- Geological factors influence oil and gas traps and the formation of deltaic swamps in which coal formed. For example, Saudi Arabia has large oil reserves and Russia has large oil and gas reserves. Geological factors also influence the location of active areas for geothermal energy such as Iceland (causality/place)
- Certain forms of renewable energy are constrained by climatic factors. Solar power requires high insolation rates; wind power relies on high, constant wind speeds characteristic of areas affected by westerly wind belts, and hydropower is usually linked to areas of high precipitation (causality/place)
- Relief factors include the influence of relief on creating suitable locations for dam construction. (causality/place)
- Geographical endowment: Nepal is a landlocked country, devoid of fossil fuels. However, the country is rich in water resources. Since 1996, in conjunction with the UNDP, nearly 400 micro-hydro power plants have been built in the most remote and impoverished areas. (causality/place)
- Certain locations provide favourable conditions for sustainable energy generation from waves, tides, and biofuels (causality/place)
- R+D / expertise E.g., Nuclear power: France is heavily reliant on nuclear power and derives about 75% of its electricity from this source.
(place/sustainability/scale)
- Economics / political policy: India is a developing economy. 75% of Indian energy demand is provided by fossil fuels. Globally, India is the third largest coal producer. As a result, coal is the primary energy source, accounting for over 70% of power generation. (causality/place/scale/sustainability)

AO2

Application of knowledge and understanding is deployed to evaluate the factors influencing energy mixes at a national scale. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- A comparison of the energy mixes used in different countries. (causality/inequality/place/scale)
- An examination of the importance of physical factors. In terms of geological factors, the USA has the largest reserves of coal, followed by Russia, China, Australia, India, and Ukraine. Russia is one of the world's major producers of oil and natural gas. Geology is the most important factor in determining the location of active areas for geothermal energy; Iceland provides 87% of its demand for hot water and heat with geothermal energy. In response to dwindling oil reserves, India has implemented an extensive programme of renewable energy development. (causality/inequality/ interdependence/place/vulnerability)
- An examination of the importance of economic factors. Building large-scale hydroelectric projects is expensive and time-consuming for countries like Nepal. As a result, simpler solutions are needed for remote rural communities – the answer is micro-hydro projects. (causality/inequality/interdependence/place/ sustainability/vulnerability)
- An examination of how the energy mix of countries has changed over time. Fossil fuels are finite and there is a consensus between industry leaders and analysts that world oil production will peak between 2010 and 2030. (feedback / place / systems / sustainability / temporal scale).

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments about the factors influencing energy mixes at a national scale.
- 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 factors influencing energy mixes at a national scale.

Credit other valid approaches.

13. 'Seasonal variations in the position of the ITCZ are the most important influence on the characteristics of tropical climates.' Discuss. [22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.5.2

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- Tropical climates are the first of the five major climate groups in the Köppen climate classification. Tropical climates are defined by a monthly average temperature of 18 °C (64.4 °F) or higher in the coolest month and feature hot temperatures all year-round. Annual precipitation is often abundant in tropical climates and shows a seasonal rhythm but may have seasonal dryness to varying degrees. There are normally only two seasons in tropical climates, a wet (rainy / monsoon) season and a dry season. E.g., Manaus, located in the Amazon rainforest in Brazil. The highest monthly rainfall is in March with over 300 mm and the lowest rainfall occurs in August with under 50 mm. Temperatures vary little throughout the year. The highest monthly temperature is 29°C, which occurs in September. The lowest monthly temperature is 26°C, which occurs in December and January. The annual temperature range is 2°C.
(place/scale/temporal scale)
- There are three climate types in the tropical group: Tropical wet; tropical monsoon; and tropical wet and dry. (place)
- Tropical Wet: Places with a tropical wet climate are also known as rainforests. These equatorial regions have the most predictable weather on Earth, with warm temperatures and regular rainfall. Annual rainfall exceeds 150 centimetres (59 inches), and the temperature varies more during a day than it does over a year. The coolest temperatures, about 20° to 23° Celsius (68°-73° Fahrenheit), occur just before dawn. Afternoon temperatures usually reach 30° to 33° Celsius (86°-91° Fahrenheit). Rainforests experience very little seasonal change, meaning average monthly temperatures remain constant throughout the year.
(place/scale/temporal scale)
- Tropical wet climates exist in a band extending about 10° of latitude on either side of the Equator. This part of the globe is always under the influence of the intertropical convergence zone. The ITCZ follows a pendulum-like path during the year, moving back and forth across the Equator with the seasons. It moves north during summer in the Northern Hemisphere, and south during the northern winter. (causality/place/temporal scale)
- Tropical Monsoon: The Monsoon climate regime is most clearly seen over India. The wet monsoon season occurs with the movement of the ITCZ into the region bringing an area of low pressure and drawing in hot moist winds from off the ocean. Rainfall is increased by orographic uplift where these moist winds are drawn over uplands e.g., the Western Ghats in India.
(causality/place/scale/temporal scale)
- Seasonal changes can be illustrated by the Monsoon climate that occurs mainly on the eastern side of the continental land masses in the Tropics extending

approximately across 5 – 20 degrees of latitude. The climate is marked by a distinct hot, wet and a cooler dry season which is determined by the annual movement of the ITCZ between the Tropics and associated movement of pressure belts and the seasonal reversal of winds consequent upon this.

(causality/place)

- Tropical wet and dry climates are sometimes called ‘savanna’ climates after the grassland ecosystem defined by wet and dry periods. They have three seasons. One season is cool and dry, while the warm, moist ITCZ is in the opposite hemisphere. Another season is hot and dry as the ITCZ approaches. The last season is hot and wet as the ITCZ arrives and the region experiences months as a tropical wet climate. (causality/place/temporal scale)

AO2

Application of knowledge and understanding is deployed to examine whether seasonal variations in the position of the ITCZ are the most important influence on the characteristics of tropical climates. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- All climates are the product of many factors. The rainy, tropical climate of West Africa, for example, is influenced by the region’s location near the Equator (latitude) and its position on the western side of the continent. (causality/interdependence/place)
- Although global atmospheric circulation gives an important indication of broad climate types in terms of pressure systems and winds and drives ocean currents, there are other important influences including continentality (the differential heating of land and sea affecting pressure patterns and seasonal wind directions) and altitude (influencing both precipitation and temperature) (interdependence)
- The role of world ocean currents which are influenced by the distribution of the land masses as well as the Earth’s tilt and rotation (causality)
- The influence of continentality. The Monsoon climate regime is most clearly seen in the Indian subcontinent, because of the size of the landmass and its relief (causality/place/scale)
- The influence of periodic changes associated with ENSO and the Indian Ocean Dipole. (causality/temporal scale)
- Anthropogenic climate change is having an increasing influence on climate types, mainly associated with extremes of precipitation and temperature (place/risk/thresholds)
- At the micro-scale human activities have an influence on temperature, wind, precipitation, and humidity. (causality/place/scale)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments, which discuss whether seasonal variations in the position of the ITCZ are the most important influence on the characteristics of tropical climates.
- The skill of constructing relevant diagrams, which are annotated to meet the requirements of the question.
- The skill of reaching conclusions about whether seasonal variations in the position of the ITCZ are the most important influence on the characteristics of tropical climates.

Credit other valid approaches.

14. Evaluate the impacts of hazards associated with high-pressure systems.
[22 marks]

AO1 [9] AO2 [11] AO3 [2]

Focus: 4.5.5

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.

Likely themes and specialised concepts include:

AO1

Knowledge and understanding could include:

- Knowledge and understanding of the term hazard and the impacts of hazards associated with high-pressure systems in either tropical or temperate climates. (place/risk)
- The definition of a climatic hazard is an extreme climatic/weather event(s) causing harm and damage to people, property, infrastructure, and the environment. It includes not only the direct impacts of the climate/weather event itself but also the other (secondary) hazards 'triggered' by that event. (place/risk/scale/temporal scale)
- In tropical regions high-pressure systems are associated with low rainfall, high evaporation rates and drought, triggering secondary hazards of a falling water table, loss of vegetation, wildfires, soil erosion and desertification. (place/risk/scale/temporal scale)
- In temperate regions high-pressure systems result in low rainfall and drought, triggering secondary hazards in summer of falling water tables and loss of vegetation. In winter high-pressure systems are associated with frost and fog and secondary hazards may include temperature inversion with air pollution intensifying the fog conditions. (place/risk/scale/temporal scale)
- Students should have knowledge of both the short-term and long-term impacts of high-pressure climatic hazards on the environment and human activity. (adaptation/place/resilience/risk/scale/sustainability/temporal scale)
- There may be a reference to demographic effects at both time scales such as deaths and long-term migration. (place/scale/temporal scale)
- Economic effects may analyse losses in the short term such as cessation of production and costs of damage in the long term, such as the effects on economic activity and infrastructure. (place/risk/scale/sustainability/temporal scale)
- Social effects may include observations on health, homelessness, and bereavement. (place/risk/scale/sustainability/temporal scale)
- There may also be consideration of the effects on the environment such as deforestation and salinisation. (place/risk/scale/sustainability/vulnerability)

AO2

Application of knowledge and understanding is deployed to evaluate the impacts of hazards associated with high-pressure systems. Synthesis will be demonstrated by the drawing together of evidence to reach a rational conclusion. The evidence could include:

- The longer the duration of the high-pressure system, the greater the severity of impacts. (place/risk/scale/temporal scale)
- The severity of impact may vary seasonally (place/temporal scale). In temperate regions the hazards associated with winter anticyclones such as frost and fog plus pollution lead to impacts such as difficult driving conditions and dangers for shipping. (place/risk/scale/temporal scale)
- Interdependence of impacts for example wildfires cause impacts in the short-term (loss of life and property) and in the long-term (cessation of agricultural production) affecting their severity (place/risk/scale/temporal scale)
- Variations over space. The high-pressure hazard of drought has severe impacts over a much larger geographical area. (place/scale/temporal scale)
- The impact is dependent upon the severity of the event and the path/track and spatial extent of that weather event; the density distribution of the people and density and types of human activity in the areas affected and the preparedness and capacity of the authorities and the people to cope with the impact of the event. (place/risk/resilience/scale)
- Nature of onset of hazard (causality) as the speed of onset is much faster for low-pressure than high-pressure systems (the latter are often referred to as a 'creeping hazard'). (place/risk/scale/temporal scale)
- Category of impact – demographic, economic, social, environmental. (place/scale)
- The social impact of bereavement is severe. (place/scale/temporal scale)
- Economic impacts e.g., crop damage caused by high-pressure hazards may be more severe for a higher-income country with a more advanced economy. (place/risk/scale/sustainability)
- Variations in the impacts of hazards associated with high-pressure systems over different time scales. (place/scale/risk/temporal scale)
- Levels of development: High-income countries affected by high-pressure systems may have more strategies in place to mitigate against the impacts of hazards, reducing their severity. (place/scale/resilience/sustainability/vulnerability)

AO3

Skills evidenced could include:

- The skill of presenting well-constructed, coherent, and logical arguments, which evaluate the impacts of hazards associated with high-pressure systems.
- The skill of constructing relevant diagrams (qualitative skills) which are annotated to meet the requirements of the question.
- The skill of reaching conclusions, which evaluate the impacts of hazards associated with high-pressure systems.

Credit other valid approaches. Do not credit responses or parts of responses focused on low-pressure systems.