GCE AS/A LEVEL GEOGRAPHY

Specimen Assessment Materials – Units 3 and 4

Marked Student Responses

wjec cbac

The following booklet is compiled from student responses to questions from the Specimen Assessment Materials submitted by their centres to the WJEC. Where typed responses have been used for the purposes of legibility, the original student answer has been reproduced faithfully.

The Principal Examiner, in each instance, has provided detailed comments and an indication of marks/levels where appropriate.

All figures and mark schemes referred to in these responses can be accessed by downloading the original Specimen Assessment Materials from the WJEC Geography A Level homepage.

http://www.wjec.co.uk/qualifications/geography/r-geography-gce-asa-from-2016/

Content:

Unit 3:

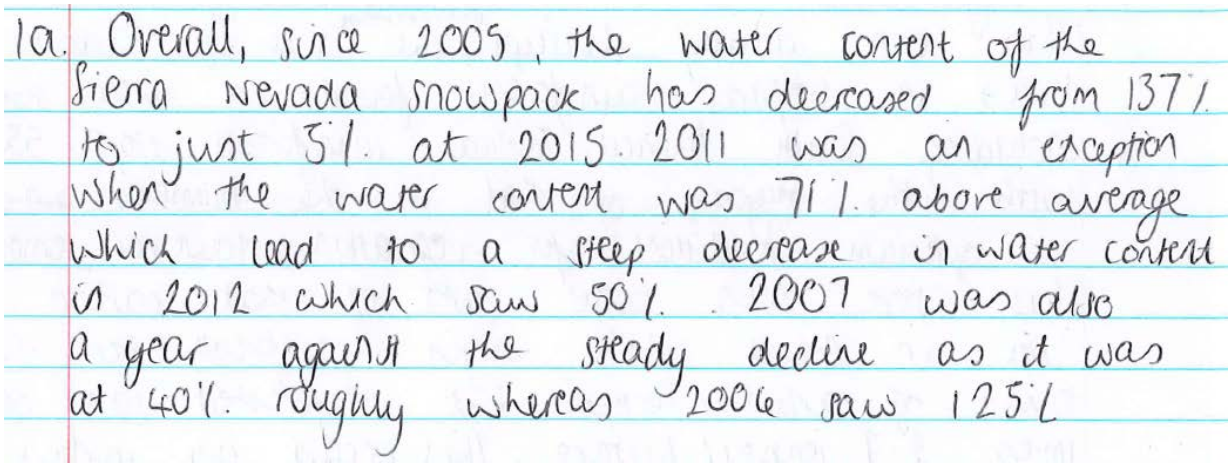
Question	Page
1	3
2	4
3	5-6
4	7-8
5	9
7	10
9	11-13
10	14-15

Unit 4:

Question	Page
3	16-17
12	18-20

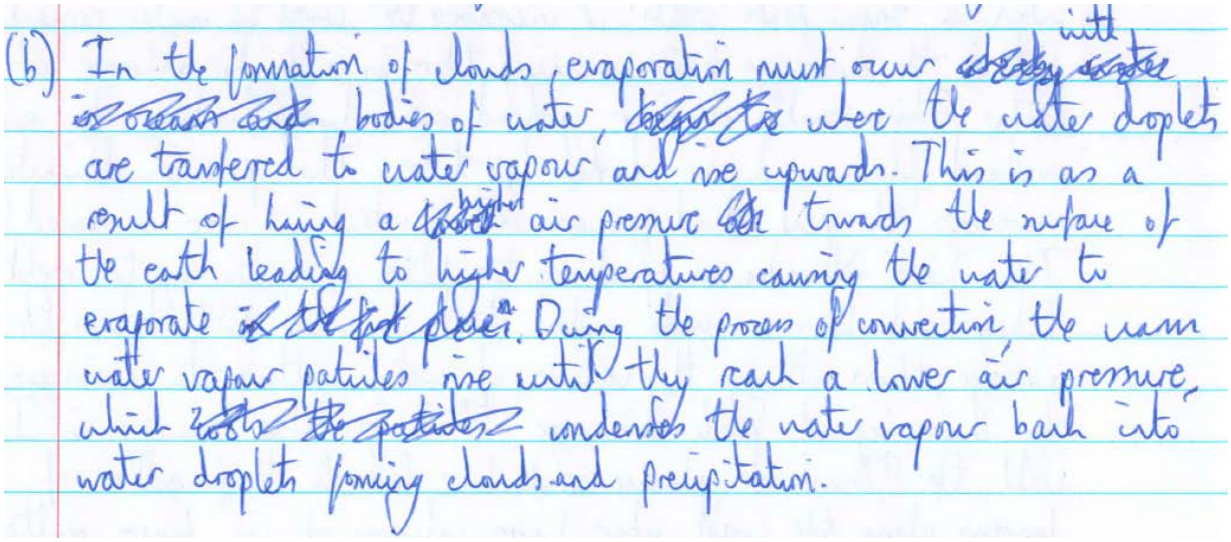
Unit 3: Global Systems and Global Governance

Question 1 a) (3 marks):



1a. Overall, since 2005, the water content of the Siera Nevada snowpack has deecased from 137% to just 5% at 2015. 2011 was an exception when the water content was 71% above average which lead to a steep deecrease in water content in 2012 which saw 50%. 2007 was also a year against the steady decline as it was at 40% roughly whereas 2006 saw 125%

Question 1 b) (4 marks):



(b) In the formation of clouds, evaporation must occur with ~~oceans and~~ bodies of water, ~~this~~ where the water droplets are transfered to water vapour and rise upwards. This is as a result of ~~being a~~ higher air pressure towards the surface of the earth leading to higher temperatures causing the water to evaporate ~~at the first place~~. During the process of convection, the warm water vapour patiles rise until they reach a lower air pressure, which ~~cools the patiles~~ condenses the water vapour back into water droplets forming clouds and precipitation.

Examiner Comments:

Q1 a) (3 marks):
AO3 - **3 marks**. The candidate has recognised the overall trend of the graph and provided data to support, s/he has also described the anomalous 2007 and 2011 data. The answer provides an overview of the graph.

Q1 b) (4 marks):
AO2 - **3 marks**. The candidate offers a general overview of cloud formation and then more specific statements demonstrating knowledge of the sequence of events leading to cloud formation. There is some repetition within the answer which has not enabled access to additional marks.

Question 2 a) (5 marks):

The first carbon pathway between the land and the atmosphere is photosynthesis. Plants absorb CO_2 from the atmosphere and combine CO_2 with water from the soil to create carbohydrates. Carbon can be stored in plants for a very long time.Another carbon pathway between the ground and the atmosphere is organic matter respiration. Every living organism contains carbon dioxide. Therefore as dead organic matter starts to decompose, it releases CO_2 back into the atmosphere.

Question 2 b) (5 marks):

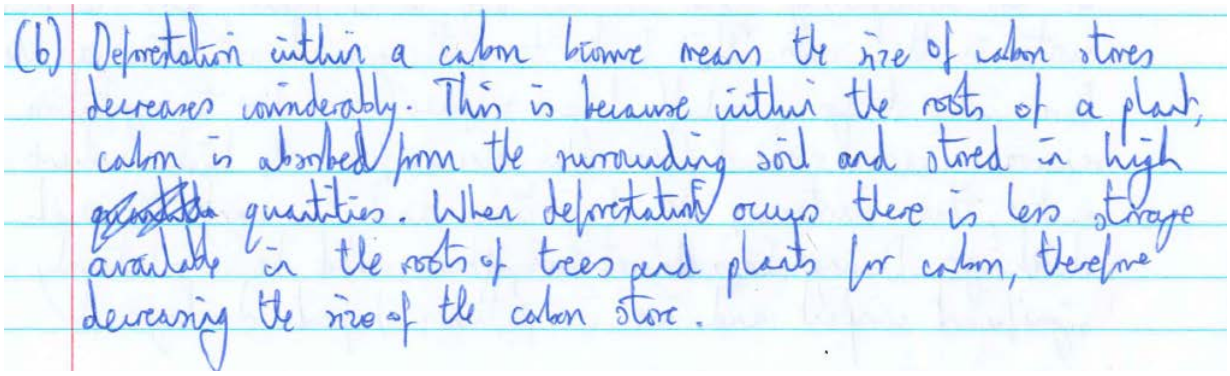
Candidate A

The biome I chose is tropical rainforest. A lot of carbon is stored in trees since wood stores carbon but also because trees absorb CO_2 from the atmosphere and combines it with water from the soil to create carbohydrates. This is photosynthesis.

So deforestation (often implemented through the burning of trees) releases the carbon stored in the trees back into the atmosphere. Deforestation also means there are less trees to absorb CO_2, so not as much photosynthesis will happen which increases the volume of carbon in the atmosphere. There will also be less carbon escaping from the trees into the ground due to there being fewer trees.

But on the other hand, although the trees are being burned/cut, some plants will still exist in the tropical rainforests and will therefore be able to absorb carbon from the atmosphere. But on the whole I believe deforestation will reduce the carbon stores in tropical rainforests.

Candidate B


(b) Deforestation within a carbon biome means the size of carbon stores decreases considerably. This is because within the roots of a plant, carbon is absorbed from the surrounding soil and stored in high quantities. When deforestation occurs there is less storage available in the roots of trees and plants for carbon, therefore decreasing the size of the carbon store.

Examiner Comments:

Q2 a) (5 marks):
AO3 – **5 marks**. The candidate identifies two carbon pathways as photosynthesis and respiration. The answer gives a brief overview of the pathway and correctly identifies that photosynthesis adds carbon whilst respiration removes carbon from the atmosphere.

Q2 b) (5 marks):
Candidate A - AO2 - **5 marks**. The candidate describes how deforestation causes release of carbon into the atmosphere and is confidently able to explain the process. The answer adheres to the command 'to what extent' through the final paragraph which demonstrates applied evaluation, as required for accessing AO2 marks.
Candidate B - AO2 - **3 marks**. The candidate has demonstrated knowledge of the impact of deforestation on size of carbon stores in two ways. This is conveyed as separate statements; the candidate has not adhered to the 'To what extent' command of the question.

Question 3 (18 marks):

3. The drainage basin is a series of rivers, oceans and other bodies of water that carry and transport water.

On one hand, the melting of snow packs or glaciers would have a significant impact on the pattern of discharge. This is because when a snow pack melts, it increases the level of water concentration within the drainage basin meaning there is a higher volume of water. This results in fast ground saturation leading to excess overland flow and a shorter lag time. This process ultimately increases the peak discharge as water content is also increased. The Sierra Nevada snowpack in the USA is continuing to melt today and has a water content that is now 95% below the average, thus altering the volume of water within its drainage basin by increasing its peak discharge. This is also occurring in Iceland with the 'Sunhave' glacier and has led to the formation of lagoons along the coast where large volumes of ice have melted away, thus increasing the peak discharge. *

On the other hand, snowpacks and glaciers not at risk from melting will not have a significant impact on the pattern of discharge within the drainage basin. This is because glaciers and snowpacks are able to store high volumes of water in a solid state meaning there is no change in concentration of water within the drainage basin ~~A lower volume of water results in a lower peak discharge on this case.~~

~~On the other hand~~, * Moreover, another major store within a drainage basin is in vegetation. However, the process of deforestation results in less interception of water as there are fewer plants able to store water in their roots. This leads to faster ground saturation as there is less water storage available below surface level due to vegetation removal. Excess overland flow then occurs from the higher volume of water, thus shortening the lag time and increasing the peak discharge. During ~~this~~ deforestation, there would be a relatively significant impact and rise in pattern of peak discharge.

In conclusion, I believe changes in stores like snowpacks, glaciers and vegetation are concerned will impact the pattern of discharge significantly as a sudden alteration in storage availability of water can have an immediate effect on the peak discharge within a drainage basin.

Vegetation present

① Water and precipitation is intercepted by vegetation and is stored below ground in through flow, meaning the ground takes longer to become saturated

② There is less surface run-off as more water is being intercepted by vegetation, resulting in little change in discharge pattern.

Deforestation has occurred

① The removal of vegetation results in no precipitation being intercepted and a faster rate of ground saturation which leads to excess overland flow and a higher peak discharge.

Examiner Comments:

This is a Band 2 answer demonstrating partial knowledge and understanding of stores within the drainage basin (AO1) and partial suggestions of how the changes in stores can lead to changes in discharge patterns (AO2). The candidate has focused on 'flows' in the opening paragraph, rather than the 'stores' that are the focus of the question.

Whilst it is good to see candidates making use of diagrams to add value to their written answers, in this case, the annotated diagram does not facilitate access to additional marks as it repeats information already contained within the answer.

On balance, the marks would be awarded as follows:

AO1 – **mid Band 2**. Partial knowledge and understanding with generalised exemplification.
AO2 – **lower Band 2**. Partial or unbalanced linkages between changes in stores and pattern of discharge.

Question 4 (18 marks):

4. Describe and evaluate the impacts of recent increases in the atmospheric carbon store on the oceans.

Oceans are the second largest store of carbon, 50 times greater than the atmospheric store of carbon, but they're increasingly becoming victim to the rise in atmospheric carbon stores. Since 1870, carbon has increased to over 400 ppm, mainly due to human impact such as burning fossil fuels and deforestation. This increase in carbon is enhancing the natural greenhouse gas process to cause our global temperatures to increase almost past tipping point.

Carbon is a strong absorber of short wave radiation which is ~~causing~~ allowing less carbon and other gases to escape to space, therefore re-emitting them to Earth and warming our Earth. The warming of Earth is warming the oceans and the biggest problem this has is ocean acidification where waters are chemically changing to become more adicidic. Acidic oceans cannot store carbon very well and so it diffuses from the oceans into the air as particles expand due to heat and waters are less dense. This is an example of a positive energy budget / feedback.

Acidification of oceans causes great damage to marine life such as fish or coral reefs. Acidic oceans cause coral reefs to bleach and also they have more difficulty surviving in warmer temperatures. Many species in the oceans will not cope with the warming and this could

impact the biological carbon pump in the oceans if species die. This also can pose a problem to humans who rely on oceans for food such as fishermen if they cannot catch ~~effic~~ sufficient number of species.

Further, warming of the oceans ~~with~~ from increases in atmospheric store will affect the physical pump of carbon between oceans and air. If less carbon diffuses into oceans from their warming, inputs will not equal outputs and equilibrium is not maintained. The oceans may still release carbon from decomposed marine life or diffusion but this will exceed outputs and decrease the oceans store of carbon. As the oceans hold one third of extra carbon humans add to the atmosphere, this could have knock-on effects to atmospheric stores and/or biospheric stores.

However, on the other hand, as oceans expand, they reveal ~~dark~~ a lower albedo - darker surfaces have less reflectivity - therefore this reduces heat reflected and can decrease temperatures both atmospherically and in the oceans and allow them to continue to store more carbon as they grow but the negative energy budget doesn't exaggerate ocean acidification.

In conclusion, ~~the impacts of~~ increasing atmospheric carbon stores have an immense effect on our oceans, as seen through acidification, and are preventing them from storing as much carbon, creating serious problems for human life due to a positive energy budget.

Examiner Comments:

The candidate shows sound knowledge and understanding of the impacts of increased carbon stores on the oceans. The evidence offered is detailed and there are some supported judgements e.g. "this also can prove a problem to humans who rely on oceans for food such as fishermen if they cannot catch sufficient numbers of species" (a feature of a Band 3 answer). Candidates should be encouraged to use the key words in the question (here "impacts of recent increases… on the oceans") and also try to discuss the implications of these impacts for people and environment. For full marks the candidate would need to consider contrasting and evaluating impacts on located marine environments.

Overall, the marks would be awarded as follows:

AO1 – **mid Band 3**. The candidate shows accurate and relevant geographical knowledge throughout

AO2 – **lower Band 3**. The candidate mostly applies this knowledge and understanding to support the answer with relevant connections between ideas.

Question 5 b) (5 marks):

Many people migrate internationally for different reasons. One reason being economic situations. Many migrate from countries such as Poland to the UK and similar countries because of relative poverty and the differences between people's economic position in society. As they migrate from other countries, the economic differences can be seen as they are willing to do relatively inferior yet essential work for a low wage since the wage is higher than what they received in other countries. The fact that the UK and similar countries employ all kinds of people from different economic backgrounds shows economic difference because some countries only employ rich and educated people.

They might also see cheaper food prices as the UK is part of the European Union's trading block and governments are willing to provide financial support to farmers in order to produce cheap food.

Examiner Comments:

AO1 – **1 mark**. This answer suggests that the candidate is not familiar with this element of the specification. The answer shows some awareness of the willingness of migrants to work for low wages but the candidate is unable to develop this idea or provide further explanation of magnified economic differences.

The mark scheme suggests that candidates could explore ideas such as how the loss of a large number of working age adults from a country could lead to a reduction to the source country's economic output. Other explanatory points could include how remittances could partly offset any losses due to international migration but would not be enough to stop the economic differences between host and source country from becoming greater.

Question 7 (18 marks):

Many places are today popular destinations for international migration flows. In the 70s and 80s migrants were directed towards places such as New York and Paris which are global centres and very powerful cities, economically and culturally. This continues today, with many migrating to similar cities in order to get more ambitious/interesting jobs that pay better. This means that people earn more money and are able to achieve a better living/lifestyle. Also, they will be able to send money back to countries they have migrated from, developing communities there by doing so.

Many migrate to global centres (large and smaller) for educational reasons as well, for example, people moving to the Oxford University area and people from poor or developing countries moving to countries such as the United Kingdom in order to gain an education and to find a better job and to have more economic opportunities.

But people may be migrating for reasons that are different to economic ones, for example they might be migrating from countries such as Syria/Afghanistan and might be refugees migrating to countries like the UK to flee from violence and war and to get a better way of life. Others would flee from places such as sub-Saharan countries and migrate regionally (to other sub-Saharan countries) or internationally to more developed countries due to the lack of access to clean water, death from diseases such as cholera and insufficient nutrition as a result of a lack of money to buy/import food and the lack of money and an unfavourable climate to grow crops and to produce food.

Climate is another factor that attracts people to particular destinations, for example, maybe some people decide to migrate because they want warmer weather, therefore they migrate to places like Spain, others would migrate to cooler countries. Climate can also encourage people to migrate because, if there isn't a desirable and suitable climate in a country, it might not be possible to grow crops (because they are too warm, too dry or because of too much rain). This means that people can't feed their families and others can’t make a living, especially farmers.

Others will migrate to popular destinations for cultural reasons and that the cultures of these countries appeal to them. For example, people may migrate to countries such as the United States of America because of the more modern culture, and it's a big power that influences other countries. They may view these destinations as desirable places to migrate since they give people the opportunity to develop business ideas and to become successful individuals. The Gulf States are an example of popular migrant destinations, especially amongst people from Bangladesh. People migrate to this country because there are more jobs, less economic inequality (jobs, wage and employment) and it's a country that allows more freedom, for example many women would migrate to escape violence/unhappy marriages since Bangladesh does not allow divorce. Some people also see destinations as desirable for migration due to less threat of climate change, for example, less chance the area will flood thereby causing vast destruction or less chance of drought leading to nutrition problems.

Examiner Comments:

This answer has accurate and relevant geographical knowledge (AO1) throughout, and partially applies this (AO2) to support the answer with relevant connections between ideas. The evidence is detailed and there are some supported judgements (a feature of a Band 3 answer).

The structure of the answer is clear with the candidate making a statement containing evidence of knowledge and understanding (AO1) and then developing this idea thus demonstrating applied understanding (AO2). Candidates should be encouraged to use the key words in the question (here "some places are popular destinations") and also to try to discuss why some places are not popular destinations.

Overall, the marks would be awarded as follows:

AO1 – **lower Band 3**. The candidate shows mostly accurate knowledge and undersatnding of global migration flows with some detailed exemplification.

AO2 – **mid Band 2**. The evaluation is present but should be further developed to consider why some destinations are more popular than others.

Question 9 (26 marks):

Candidate A

There are several risks facing the majority of cities globally and their severity varies. The first risk I will discuss is big cities and the risk of earthquake. The cities with the highest danger of earthquake globally are Tokyo, Osaka, Delhi, Baghdad, Tehran, Mexico City, Bogota, Lima, Santiago and Jakarta. The countries with a relatively low risk of earthquake are Moscow, Cairo, London, Paris, Madrid, New York and Philadelphia. But one must also consider the size of the population in these cities, for example, Mexico, Tokyo and Delhi would be in more danger in the event of an earthquake because they are high risk areas and they have a population of over 15 million. New York and Mumbai would also be in danger since they have a population of over 15 million but there is less risk of earthquake.
The next risk I will discuss is the dangers of a tsunami. Areas with the highest risk of tsunami lie on the South-western coast of North America, Western/Southern South America, North-East and South Asia. It is therefore these coastal areas that are most in danger. The coastal areas with a medium risk of tsunami are the whole coastal areas of Australia, North-East Africa and Western parts of the coast of North America. The areas with the lowest risk of tsunami are Northern South Africa, the East of North Africa, the UK and South Africa.

Obviously, there are more risks facing areas in danger of tsunami/earthquake if the population is higher because service/aid would have to be provided and more people would need to be saved. Despite this, the tragedies would affect every area, for example, homes and buildings would need to be rebuilt (economic cost), infrastructure such as electricity and roads will have been damaged/destroyed, fires can start, the environment will have been damaged and obviously the demographic effect, which is people being injured or killed, people losing family and friends. It can also mean a lack of resources and economic problems because people can't work/damaged businesses, therefore having to depend on aid from other countries. So obviously, the risk facing cities is very severe.

Another risk I will discuss is the average annual losses of cities in the land area because of rising sea levels in 2050. According to figure 7, the cities with the highest average annual losses will be Barranquilla in South America and Alexandria in South Asia. Some cities with an increase of 250% in

average annual losses are Houston in North America and Sapporo in Asia and Tel Aviv in South Asia. The areas with > 40% increase in average annual losses are Ningbo in South Asia and Algiers in North Africa.

Although there is a greater risk to areas that tend to lose more land to the sea, it is a serious task for all coastal cities that are facing rising sea levels resulting in the loss of land. Some of the problems relating to this will be economic cost in attempting to build flood defences to prevent the floods and this can be a waste of money if they're ultimately ineffective. If land is lost, it will lead to losing homes, and other buildings in those areas which means there is economic stress on people since they won't be able to sell their homes beforehand, meaning the prices of their houses will fall and it will be difficult to buy another house. Having to relocate the people would be a strain on governments and it would densify the population of other areas. Another effect is the loss of agricultural land which may lead to economic problems for farmers and a lack of food/resources as there is no means of growing food.

The last risk I will discuss is terrorist attacks across the world. According to Figure 8, several terrorist attacks have taken place in the north of South America, all parts of Africa, parts of the United Kingdom and a lot also in South and Central Asia. The figure shows that almost 3,000 were killed in New York in 2001. This is a serious risk because the rise in attacks can put people's safety in danger and can encourage them to move to other countries resulting in a fall in population. It may also have an effect on tourism since people will not want to visit violent places – economic problems.

Candidate B

Cities are hotspots for business, travel, leisure, large populations and many more things.With these attributes however, comes a severity of risk which other places with less infrastructure and population will less likely face. Figures 4, 5, 6 and 7 all show different sets of data regarding natural and human risks. The figures shown are not the only risks cities are prone to but for this question I will rank them as I see fit, giving an explanation why.

In my opinion, I believe that terrorist attacks are the most severe risk a city can face. Terorist attacks happen very often and are hard to forsee as it can usually be one person acting upon themselves without telling anyone else. Figure 7 shows the attacks since 2000 and there isn't a continent on earth which hasn't been affected by one. One of the biggest in New York in 2001 killed nearly 3000 people. As well as this, many buildings were destroyed, loss of productivity occurred and a nation's nervousness and apprehension increased. The thing with terrorist attacks is that they are sudden, hard to combat and inflict devestating damage. The allure of a city to a terrorist is the high population density and high mortality expectance. It's not only while the attack takes place that is a risk to the cities, it's after it takes place as fear spreads and the economy has to try to recover so that the city can carry on.

The next biggest risk for me is shown via Figure 6. Sea level rise will happen but to what extent it will occur, no one knows. The figure shows 20 cities that will suffer sea level rise. Now you might ask why the loss of land is more severe than a tsunami or an earthquake. Well, the fact is cities hold large populations, some upwards of 10 million people and if sea levels rise, where do these people go? Do they try to forge a new life in surrounding areas or do they repopulate elsewhere. The latter is a severe risk to cities as they will not only lose land which is economically viable, it'll drive out the workforce who work in the city and keep it running. Workers displacing to other cities will not only cause a strain on other cities, but will provide a deficit in workers and money for the city. The reason why it's above tsunamis and earthquakes is that they can usually be forseen and there are already things in place to mitigate the impact. The problem with sea level rise is that whe don't know exactly where it will occur nor by how much it will rise.

The next severe risk is Figure 4 showing earthquake risks. Earthquakes are very destructive and cause devestation and a lot of megacities like Tokyo and Mexico City lie on very high seismic hazard land. If an earthquake happens it has the potential to kill thousands such as in Port-au-Prince where the population is 2 million yet an earthquake killed 10% of it's population, 230,000 people. The thing with earthquakes is that many of the big cities that are most at risk have adequate technology and funds to be able to build earthquake proof buildings or educate the populus. Therefore, risks of earthquakes have diminished and plenty of high-manitude earthquakes have occurred with very little or no deaths.

The least severe in my opinion is tsunami's. In Figure 5 it shows the severity and risk of tsunami's that countries have. The risk presented to areas by tsunami's are less than an earthquake and on the whole less tsunami's occur each year. Also, areas have good defences and tsunami's usually have a long warning time so people can react and act accordingly. Whereas in an earthquake you've usually only got a matter of minutes before you feel the effects. Overall, I believe my order takes into account lots of different aspects of each risk and weighs them accordingly. For some areas, the statements might be slightly different but I believe as a whole, these risks have different severities.

Examiner Comments:

Candidate A – This is a Band 2 answer demonstrating some geographical knowledge (AO1) of the risks for cities, and partial assessment of the risks (AO2) faced by cities. The answer makes use of the data from the resources (AO3) as evidence to support the answer and some attempt is made to analyse these.
The answer is self-limiting because each resource is discussed in turn, but the resources are neither compared nor contrasted thus missing the opportunity for further synthesis which would have enabled access to further (AO2) marks. Where the candidate demonstrates knowledge and understanding of the risks for cities (AO1), these are limited to those identified in the resources, i.e. the answer does not draw on the candidate's own knowledge.
Candidates should be encouraged to use the key words in the question (here "the severity of risks that cities increasingly face") recognising the temporal 'over time' element to contrast with the obvious spatial aspect provided in the resources. Note that a conclusion is NOT required in an "assess" question, but it can be a useful way for candidates to ensure there has been "assessment" through the answer. In any case, it should not solely repeat points that have been made earlier.

Overall, the marks would be awarded as follows:

AO1 – **lower Band 2**. The candidate shows partial knowledge and understanding of the risks faced by cities. Arguments are not always supported by evidence.
AO2 – **lower Band 2**. The response lacks the evaluative element and has not 'assessed' the risks successfully.
AO3 – **lower Band 2**. Some use of the resources but this is not sufficiently developed for Band 3.

Candidate B – This is a sound approach and secures AO2 marks by assessing/ranking the risks at the outset. Some useful synoptic detail is added from the Tectonics unit but the candidate is less secure in discussions around Changing Places (AO1). There is some analysis of maps to provide supporting evidence e.g. reference to Tokyo and Mexico City from Figure 4 (AO3).

Overall, the marks would be awarded as follows:

AO1 – **high Band 2**. The candidate shows partial knowledge and understanding of the risks faced by cities. Arguments are not always supported by evidence. Lacks the required range and depth for Band 3.
AO2 – **lower Band 3**. A sound and structured attempt to assess the risks to cities.
AO3 – **high Band 2**. A well-developed and structured assessment of the increasing severity of risks.

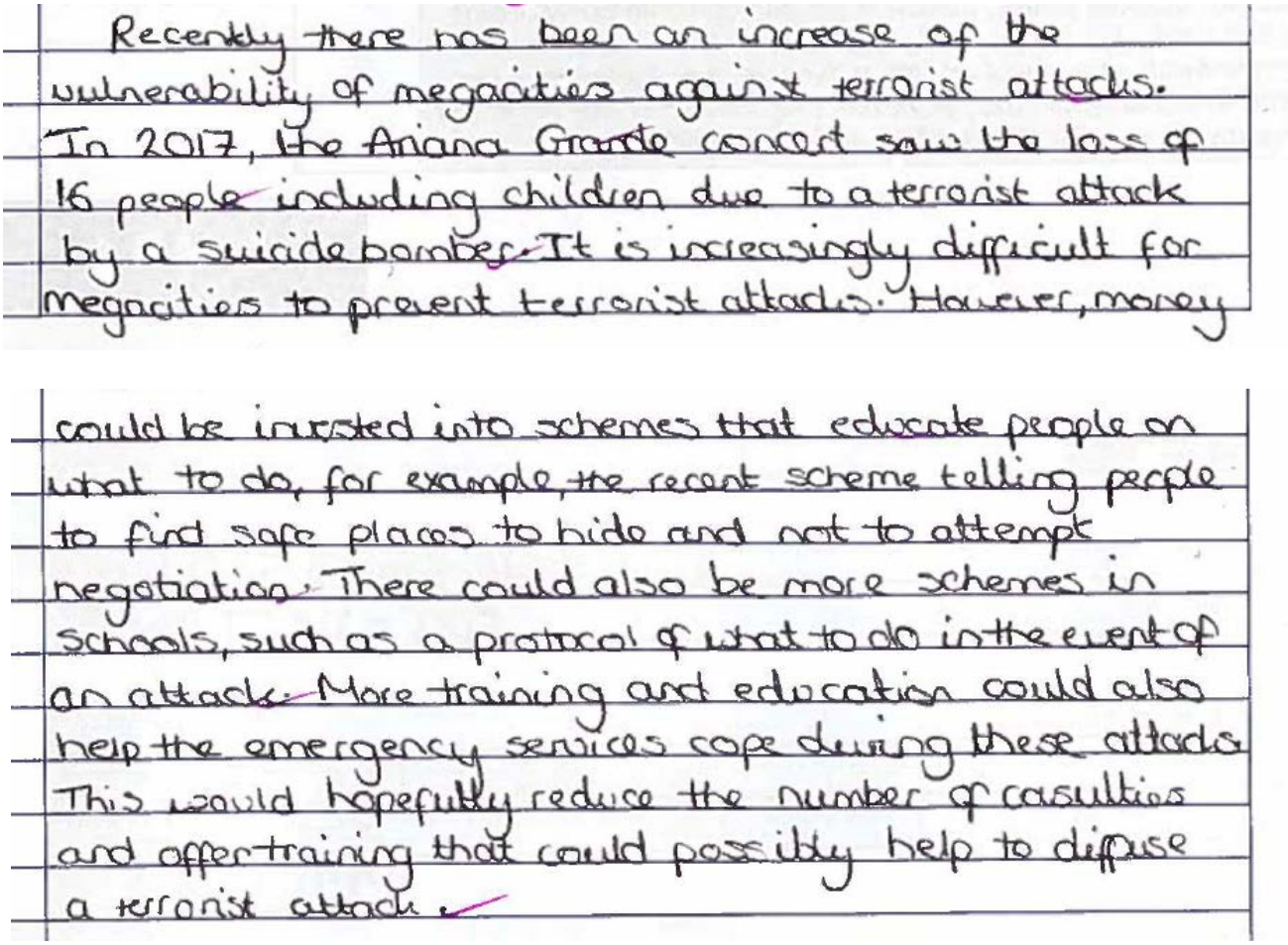
Question 10 (26 marks):

Large megacities can be at significant vulnerability to natural hazards, such as, earthquakes and tsunamis due to the densely populated areas and high consentration of buildings, such as skyscrapers. There are successful management plans that large megacities can use to reduce their vulnerability to different risks.

For example, megacities could start to construct infrastructure that is earthquake proof. An example of this is Japan, they created buildings that would shake during earthquakes instead of collapse and creating a pancake effect. eg? This would reduce the amount of damage to infrastructure and save more lives loss of life due to building collapse. elaborate further

Another management method could be to help during Tsunamis. Megacities could invest money in an early Tsunami warning system that informs local residents of the danger and increases preparation time. Megacities could also build important infrastructure, such as hospitals, away from the coastline, this would decrease the damage that important buildings could face. Areas such as Asia are at a particular risk of Tsunamis. where has this been used sucessfully

Megacities could also invest money into improving their flood defenses and coastal management to help cope with the flooding that may occur as a result of a Tsunami. Improving coastal management schemes would also help megacities manage the amount of annual losses in land due to sea-level rise, it would allow megacities to save more land from the flooding that could possibly occur as a result of the increase in sea level.



Recently there has been an increase of the vulnerability of megacities against terrorist attacks. In 2017, the Ariana Grande concert saw the loss of 16 people including children due to a terrorist attack by a suicide bomber. It is increasingly difficult for megacities to prevent terrorist attacks. However, money could be invested into schemes that educate people on what to do, for example, the recent scheme telling people to find safe places to hide and not to attempt negotiation. There could also be more schemes in schools, such as a protocol of what to do in the event of an attack. More training and education could also help the emergency services cope during these attacks. This would hopefully reduce the number of casualties and offer training that could possibly help to diffuse a terrorist attack.

Examiner Comments:

This answer demonstrates some geographical knowledge (AO1) of the severity of a range of risks for cities, and partial assessment of these risks (AO2). The answer makes limited use of the resources (AO3) other than to identify four types of risks faced by cities.
The answer is self-limiting because each risk is discussed in turn, but the risks (and resources) are neither compared nor contrasted thus missing the opportunity for further synthesis which would have enabled access to additional (AO2) marks. In order to gain additional marks, the candidate is expected to assess uncertain, interlinked risks, synthesise information and come to conclusions highlighting the underlying assumptions contained in the question.
Where the candidate demonstrates knowledge and understanding of the management of risks for cities, s/he successfully draws on their own knowledge of management of risk in a range of cities.
Candidates should be encouraged to make use of the key words in the question (here: "be successfully managed to reduce their vulnerability") recognising the concept of mitigation of risk through reduction of vulnerability. Note that a conclusion is expected in a "To what extent" question.

Overall, the marks would be awarded as follows:

AO1 – **high Band 2**. The candidate shows partial knowledge and understanding of the risks faced by cities.
AO2 – **lower Band 2**. The response lacks the evaluative element and has not addressed 'to what extent' successfully. The response lacks a substantiated conclusion.
AO3 – **Band 1**. Limited use and analysis of the reosurces to support arguments.

Unit 4: Contemporary Themes in Geography

Question 3 (22 marks):

Assess the importance of ecosystems as providers of goods and services.

Ecosystems are the most important providers of goods and services on our planet and it can be argued that ecosystems underpin all of human existence. As a society, we rely heavily on all of the services that ecosystems offer. These are provisioning services, regulating services, supporting services and cultural services. Each of these aids the provision of goods and services at varying levels.

Provisioning services are the systems by which we obtain goods from our ecosystems. Food, fibre, water, building materials and fuel are obtained through provisioning services. These are the very foundation of human life as we need food, water and shelter in order to survive. As well as these components, human society also needs medicines in order to cure any illnesses and diseases that we are susceptible to; these medicines are provided to us through provisioning services. One such example of a medicine provided by an ecosystem is the rosy periwinkle and the study of it. The periwinkle is used to treat known forms of childhood cancer such as leukemia. Provisioning services can also expand the gene pool and can create greater genetic diversity. An example of this is the breeding of wild Peruvian tomatoes with the tomatoes used in agriculture. It led to a 50% higher yield. Arguably, these are the most important services that can be provided by ecosystems as they give society the goods that are needed to sustain it as well as the goods needed to sustain the other species on the planet across all the global biomes.

Regulating services are the systems that regulate our ecosystems. These are beneficial processes as they remove toxins, prevent floods, regulate water, air, soil and climate and control the spread of pests and disease. These systems are essential as they allow the continued growth and survival of our ecosystems. In turn, this benefits humans. For example, blanket bog stores carbon as they are a build up of peat. Peat is essentially semi-decomposed plant matter. The storage of carbon helps to combat climate change as this carbon is not being released into the atmosphere where it traps the heat of the sun. Another way in which regulating services aid human society are through the prevention of floods. Mangrove swamps protect areas of coastline from erosion and flooding. This means that habitats on land and marine nurseries are not destroyed, therefore preserving biodiversity and benefitting every creature that relies on the food found in the areas protected by the mangroves. The composition of wetland areas can also clean contaminated water as seen in the replacement of wetland near New York City to improve the water supply. It appears that without these services, life itself would not be sustained as all food sources would be subject to disease and attack from pests. To add to this, water supplies would easily be contaminated. Therefore, without the regulating services provided by global ecosystems, life itself would not be sustainable.

Supporting services provide the basic infrastructure of life through primary production. This is done through soil formation, the cycling of water and the cycling of nutrients. This process means that there is always growing space, a fresh water supply and constant access to nutrients for the various flora that can be found in the ecosystems around the world, allowing

their continued growth and sustainability. The formation of soil allows the continued use for the growing of food sources as well as creating new areas where things can be grown through the process of succession.

The final services that our ecosystems provide us with are cultural services. These are the non-material benefits of ecosystems that can be obtained in the places where humans interact with each other and with nature in global 'green' and 'blue' spaces. It is believed that being within nature improves our well-being, but, to add to this, nature has historically been known to be an inspiration for the arts which is reflected in many of the ornamental decorations that are or have been created within our ecosystems. However, despite cultural services being of a non-material nature, we can of course use them in tourism and recreation to benefit our economies and conservation efforts. An example of this can be found in the tourism industry surrounding coral reefs. The global value of coral reef tourism is estimated to be around $9.6 billion and creates thousands of jobs. However, this is not vital to our survival as a species.

In conclusion, it is possible to judge supporting services to be the most important of all the ecosystem services. Despite the fact that goods are not actually produced by this service, it provides the processes that allow life itself to exist. Following this in the order of importance would be regulating services as these allow ecosystems to continue to prosper in order to produce the goods and services that we need through the removal of pollutants, pests and disease which would otherwise prevent growth and survival. Provisioning services follow in importance despite the fact that this is how we obtain the goods and services we need. This is because goods and services cannot be obtained unless they are in the correct environment for their provision, hence why it is so easy to threaten the ecosystems on which we rely so heavily. Cultural services do not provide us with anything that we cannot live without, but their importance has increased further in recent years with research into mental health. However, our survival does not depend on this service and so it can be judged to be the least important service that is provided by our ecosystems.

Examiner Comments:

This response lacks consistent case study support but there are some good examples provided here to gain AO1 marks e.g. periwinkle / Peruvian tomatoes. To gain full marks this would need to be a more consistent feature in this essay. There is plenty of analysis here (AO2) but the paragraphs on cultural services and supporting services could be further developed. Specialised concepts are implied here (sustainability/causality), the candidate shows clear understanding of these ideas. The synoptic elements covered are a feature of a very good answer.

Overall, the marks would be awarded as follows:

AO1 – **mid Band 3**. The candidate shows thorough knowledge and confident understanding of relevant concepts and principles with some good factual support and exemplification.
AO2 – **mid Band 3**. Accurate application to assess the importance of ecosystems with clear understanding of sepcialised concepts shown.
AO3 – **Band 3**. A well constructed, coherent and logical response.

Question 12 (22 marks):

'The technological problems associated with alternative energy sources are greater than the environmental problems associated with fossil fuels.' Discuss.

Candidate A

The technological problems are problems caused by the physical technology that is used to harvest or process the electrical energy, it may be lacking or underdeveloped so it can't be used for wider populations. Environmental issues are the direct problems the extraction, processing or transporting of fossil fuels have on the environment.

Alternative energy sources like renewable are more recent developments than the fossil fuel industry this means that the technology required has not been perfected. Wind and solar energy can only create energy in certain conditions, correct wind speed and light intensity respectively. This means that there is an intermittent supply of energy. An intermittent supply means that there are times when this energy can't be created which would leave gaps in the power grid if we only relied on these energy sources. As these are newer sources of energy there are developments in place to create batteries to store the electricity created so it could be used when the wind speed is incorrect r the light is too low, however in the UK today no such battery is viable and we use fossil fuels to top up the power provided by solar and wind. The solar and wind industry don't just face the problem of storing energy but they also face technological problems in creating it as wind energy can only be harvested in a narrow window of wind speeds, if the technology was improved so that the electricity could be created at both high and lower speeds it would be a better replacement for fossil fuels.

Environmental problems regarding fossil fuels are widely discussed as the coal industry is the most polluting of all energy sources due to it releasing billions of tonnes of CO_2 when burnt to create electricity worldwide. Oil is mined from deep in the earth, as new technology allows us to access oil further down there are concerns deep oil mining can cause land to shift and trigger earthquakes and land subsidence that can affect environments on top. Oil spills like the deepwater horizon spill in 2010 can have lasting ecological effects, in this case oil caused a mangrove forest on Cat Island to die, leading to the island to become faster eroding and within 5 years almost the entirety of the 5 acre island had gone. This had an impact on the migratory birds as the island had been one of the biggest breeding sites in Louisiana.

Many fossil fuel extractions cause devastation to the environment due to the sheer amount of space required. The Tar Sands in Alberta take up 50 million square metres and even if the environment is pledged back it will always return as a worse and less biodiverse ecosystem due to contamination and damage. However, some of the environmental effects of coal, the worst polluter, are trying to be fixed. Coal gasification is the process whereby coal can be turned to gas, this prevents the pollutants CO_2 and sulphur that would usually be burnt off from escaping. They can then be stored or used in other industrial processes leaving coal now in a form like natural gas.

The technological problems caused by alternative energy sources mean that without the use of fossil fuels they alone would supply unreliable electricity. The environmental issues caused by the fossil fuels are being developed on but although they cause pollution and ecosystem degradation they do supply a reliable uninterrupted flow of energy. In today's market the use

of fossil fuels is needed as the world needs a reliable energy source no matter what the cost to the environment. However, the technological issues with renewable energy sources are being addressed and soo they may provide a more reliable source of energy.

Candidate B

Renewable energy sources are ones which are constantly replenished, these are extracted using new technology that is developed. Whilst renewable energies are still being developed non-renewables which are sources of energy of finite amount make up most of the energy supply, however these have many environmental problems associated with the extraction, transportation and use of them.

The main environmental problem associated with the extraction of oil is that oil spills become a risk causing mass destruction to fragile ecosystems. In 2010 the Gulf of Mexico deep horizon oil spilled 4.9 million barrels some of which washed up on Cat Island causing the roots of the mangrove forest to deteriorate. These root systems held the island together, leading the island to be eroded away. This caused a decrease of 800,000 migratory birds in the first 95 days of the spill washing onto the island. These were rare and endangered birds such as brown pelicans which imprint of the island, as there is very little left they cannot breed, and they won't breed elsewhere.

Coal is the most polluting fossil fuel causing emissions of CO^2 which enhances the greenhouse effect and causes respiratory problems in animals, in fact coal produces between 1.47 and 3.6 pounds of CO_2 per KWH. It is also an emitter of SO_2 which causes acid rain which causes many aquatic ecosystems to deteriorate as the waters pH becomes more acidic. As coal is burnt it also produces mercury, which can cause damage to the nervous systems of animals if consumed. Coal is mined, before this can occur trees are removed from the land this reduces the biodiversity of the area as many animals are left without habitats as well as the land becomes infertile as nutrients are removed from the soil. Opencast pits scar the landscape and the machinery used in the area is loud causing animals to migrate away from the area, further reducing the biodiversity. Chemicals from the extraction site can be washed into rivers causing water pollution and killing aquatic organisms such as fish. Despite this legislation states the land must be restored once mining is complete, however it is usually restored to an ecosystem of a much lower standard. Across China in 2004, 3.2 million hectares of land was restored but only 10-20% of it was an equal or higher standard ecosystem of the one that used to be there.

Natural gas is the least polluting fossil fuel emitting between 0.6 and 1.2 pounds of CO_2 per KWH. Despite this gas flaring releases high volumes of toxic gases such as CO_2. However, there has been an increase of extracting gas unconventionally using water, which produces less greenhouse gas emissions. However, fracking is prone to increasing an areas vulnerability to earthquakes and has led to water supplies becoming contaminated.

Renewable energy sources such as solar and wind only produce high volumes of energy at random intervals dependant upon the weather, therefore the more reliant the national grid becomes on them the less reliable energy supply will be. This is mainly because there is no way of storing this energy. It has been proposed to use a lithium battery but this is expensive to develop therefore is only viable in HICs. In addition to this renewable energy sources could be develop further to improve their efficiency as solar only converts 24% of light into

electricity, therefore this could be improved upon, yet again this is an expensive process.

Overall, the technological problems faced by renewable energy supplies is greater than the environmental impacts of non-renewable energy. This is because technology such as carbon capture storage has been developed allowing 90% of CO_2 emissions to be transported underground. This technology is viable and as more places invest into it the environmental impacts of non-renewables will decline over time. Whereas the technological problems of renewables has not been carried out yet and when it is will need developing further until it can be stored in a mass supply - as the proposed lithium battery only holds 2 MG of energy. In addition to this many countries especially HICs have started to shift their energy mix away from fossil fuels and more towards renewable energy therefore the need for technological advancement of renewable energy supplies is a greater problem than the environmental implications of fossil fuels.

Examiner Comments:

Candidate A - The answer demonstrates that the candidate has a mostly secure, straightforward knowledge and a reasonable understanding of relevant concepts and principles (AO1). There is some case study support provided (paragraphs 3 and 4) but the rest of the response is rather generic and lacks support. There is reasonable application of geographical terminology and spelling, punctuation and grammar are used with a reasonable degree of accuracy.

Some analysis / judgements are provided here but the specialised concepts could be identified and discussed in greater depth to gain higher AO2 marks. Better use could be made of evidence to substantiate the arguments provided by the candidate.

Overall, the marks would be awarded as follows:

AO1 – **lower Band 2**. Mostly secure, straightforward knowledge and reasonable understanding of relevant concepts and principles.
AO2 – **mid band 2**. Some application either to interpret or analyse or evaluate with limited range, depth and development
AO3 – **Band 3**. A well constructed, coherent and logical response.

Candidate B - Wide ranging knowledge and understanding is shown (AO1). A variety of examples are provided, with some good statistical support. However, the answer lacks balance according to the demands of the question. The focus of the candidate is firmly on fossil fuels and as a consequence the section on alternative sources lacks depth and detail.

Plenty of analysis is provided here to gain AO2 marks. Judgements are made and there is some application of specialised concepts such as causality and risk during the essay. The answer is logically structured and spelling punctuation and grammar are used with a high degree of accuracy.

Overall, the marks would be awarded as follows:

AO1 – **lower Band 3**. confident understanding of relevant concepts and principles but a lack of balance precludes this from reaching the top end of this Band.
AO2 – **lower Band 3**. Accurate analysis with some application of specialised concepts.
AO3 – **Band 3**. A well constructed, coherent and logical response.