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Candidate Name _____

Class Index
Number



ST ANDREW'S SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2016
SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC

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GEOGRAPHY

2236/01

Paper 1

Tuesday

23 August 2016

1 hour 40 min

Time: 10.30 a.m. – 12.10 p.m.

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.

Section A

Answer Question 1.

Section B

Answer **one** question.

INFORMATION FOR CANDIDATES

Write all your answers on the Answer Paper provided.

Candidates are encouraged to support their answers with the use of relevant examples.
Sketch maps and diagrams should be drawn whenever they serve to illustrate an answer.

At the end of your examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.

This question paper consists of **7** printed pages.

Section A

This question is compulsory

- 1 a A group of students carried out fieldwork at a beach in West Sussex, South East England. The students were interested to investigate how the sediments varied in size along the beach and decided to conduct their investigation along the transect shown in Fig. 1.

Study Fig. 1, which shows the coastline of the beach.

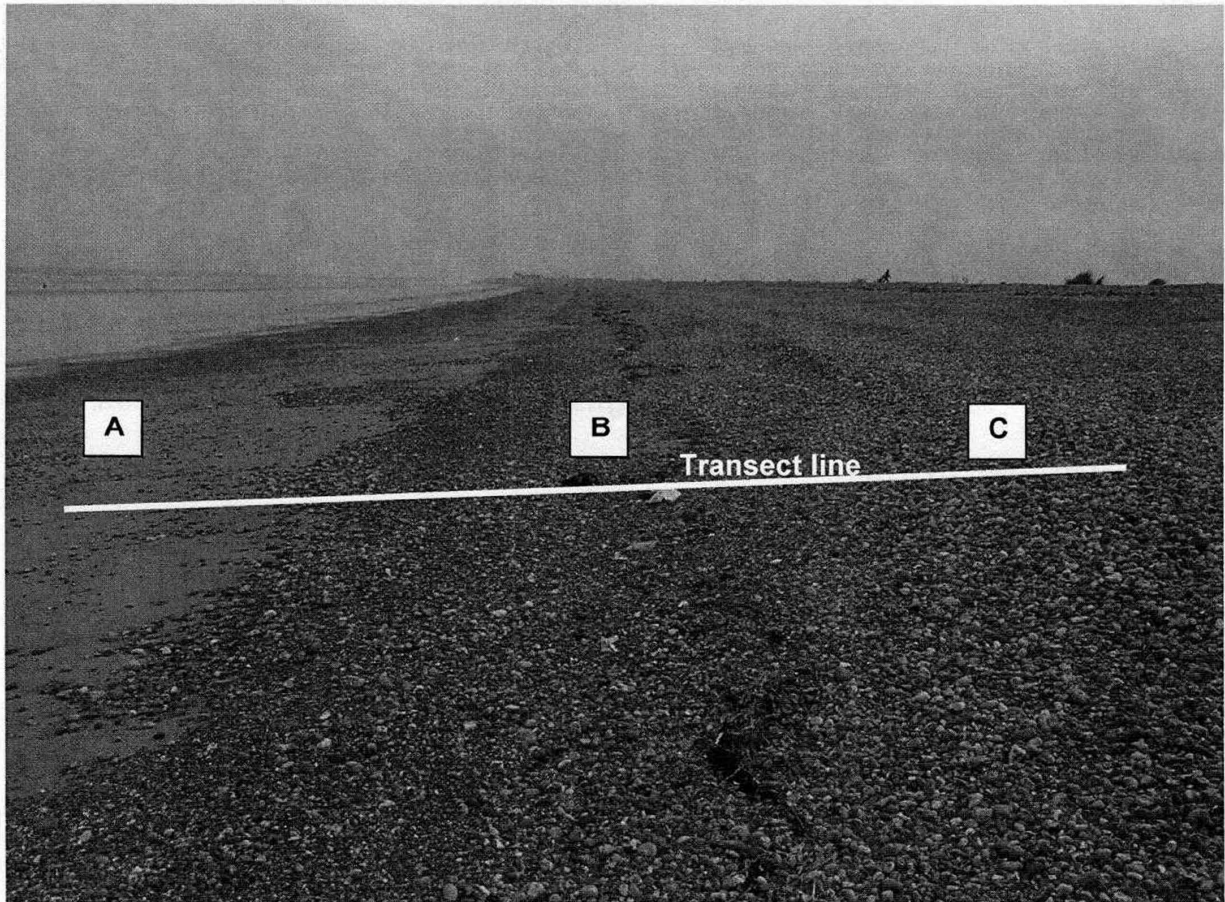


Fig. 1

- (i) Explain why the sediments vary in size along points **A**, **B** and **C** and suggest a hypothesis about the size and location of sediments along the beach. [4]
- (ii) Suggest how data can be collected using the random sampling method to support the hypothesis constructed in **a (i)**. [5]
- (iii) State an advantage and a disadvantage of the random sampling method. [2]
- (iv) Suggest some improvements to increase the reliability of the data collected. [3]

- b As the students walked further up the beach, they noticed the presence of groynes along the coastline as seen in Fig. 2.



Fig. 2

- (i) The students wanted to find the updrift side of the groyne to assess the sediment built up. Suggest how they would be carrying this out. [4]
- (ii) Suggest safety precautions that students need to take to reduce the risk of accident when conducting their fieldwork. [2]
- c The students conducted a survey with 20 locals from 3pm to 4pm to find out the locals' perception of the groynes. Fig. 3 below shows the results of the survey.

Hypothesis: The presence of groynes along the coastline poses more benefits than problems.						
Negative aspects	Score					Positive aspects
	-2	-1	0	1	2	
Unsightly	8	4	6	2	0	Aesthetically pleasing
Dangerous	3	10	3	4	0	Safe
Does not build up beach	4	6	0	6	4	Develops the beach
Erosion still occurs	4	4	3	5	4	Stops all erosion
High maintenance costs	7	5	4	4	0	Low maintenance costs

Fig. 3

- (i) Identify the survey shown in Fig. 3 and evaluate its reliability. [3]
- (ii) Comment on the validity of the hypothesis. Support your conclusion with data from Fig. 3. [2]

[Turn over

Section B

Answer **one** question from this section.

- 2 a Describe the advantages of package holidays. [3]
- b Study Fig. 4, which shows a cliff and shore platform.



Fig. 4

Describe the physical features of the coastline in Fig. 4, and explain the formation of the shore platform. [7]

- c Study Fig. 5, which shows a coral reef ecosystem.

Coral Reefs Reduce Wave Energy and Height

Coral reefs reduce wave energy by an average of 97 percent across all studies globally. The reef crest, or shallowest part of the reef where the waves break first, dissipates 86 percent of wave energy on its own. The whole reef reduces wave height by 84 percent.

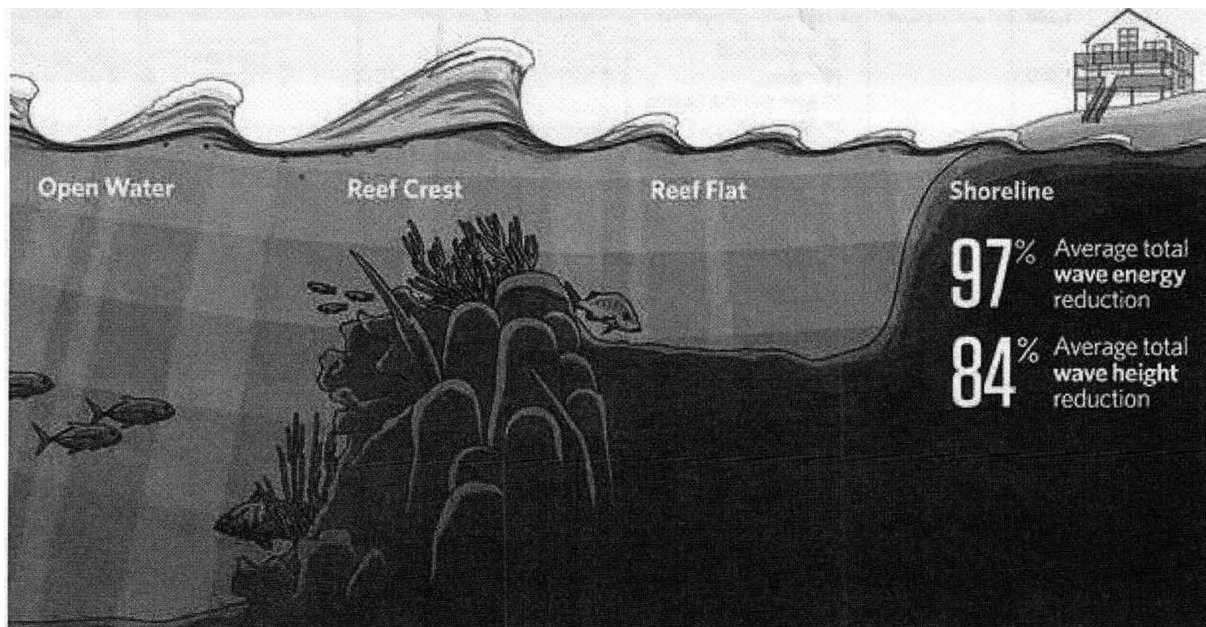


Fig. 5

- (i) With reference to Fig. 5 and what you have learnt, describe the value of coral reefs to people and the environment. [4]
- (ii) Explain the effect of climate change on the coral reef ecosystems in the world. [3]
- d "Hard engineering methods are more effective than soft engineering methods in reducing coastal erosion." To what extent do you agree with this statement? [8]

[Turn over

- 3 a Study Fig. 6, which shows the international tourist arrivals by region from 1950 to 2020.

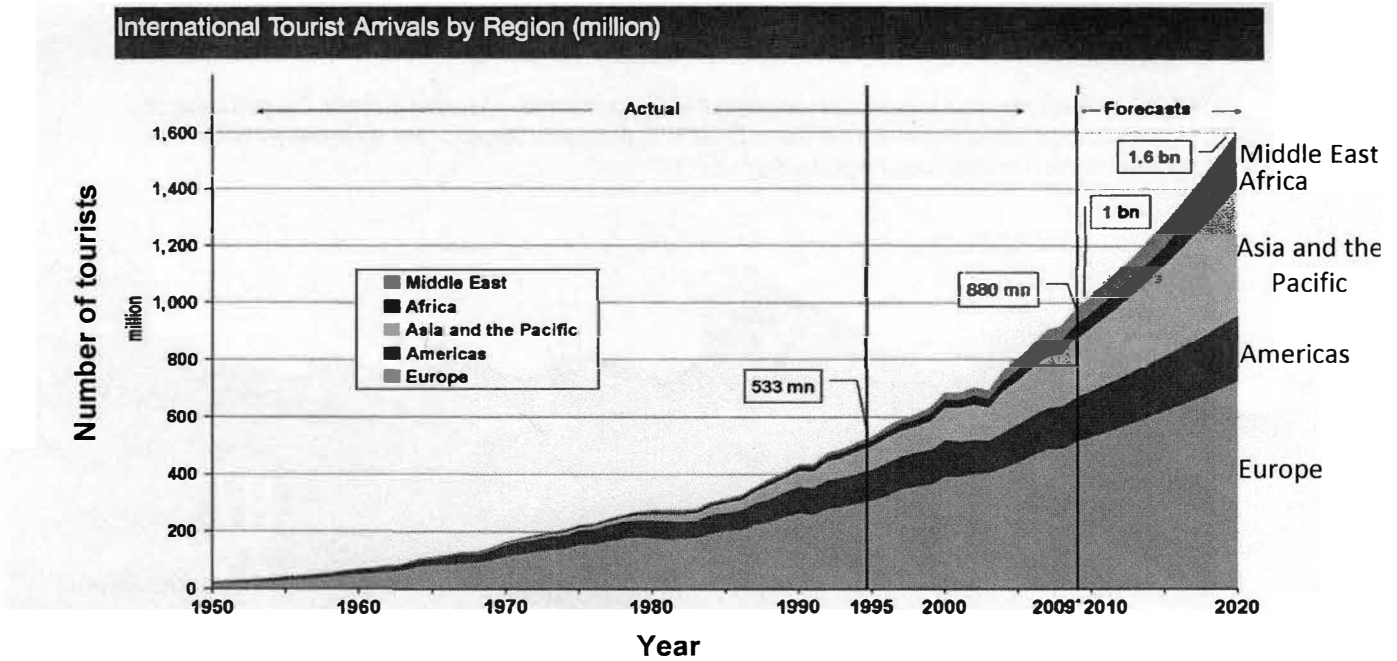


Fig. 6

- (i) Refer to Fig. 6, describe the actual and projected trends of international tourist arrivals from 1950 to 2020. [3]
- (ii) Explain how the developments in technology can support the forecasts made in Fig. 6. [5]
- b Describe how governments can play a crucial role in promoting tourism in their country. [4]

- c Study Fig.7, which shows some tourist sites in the world.

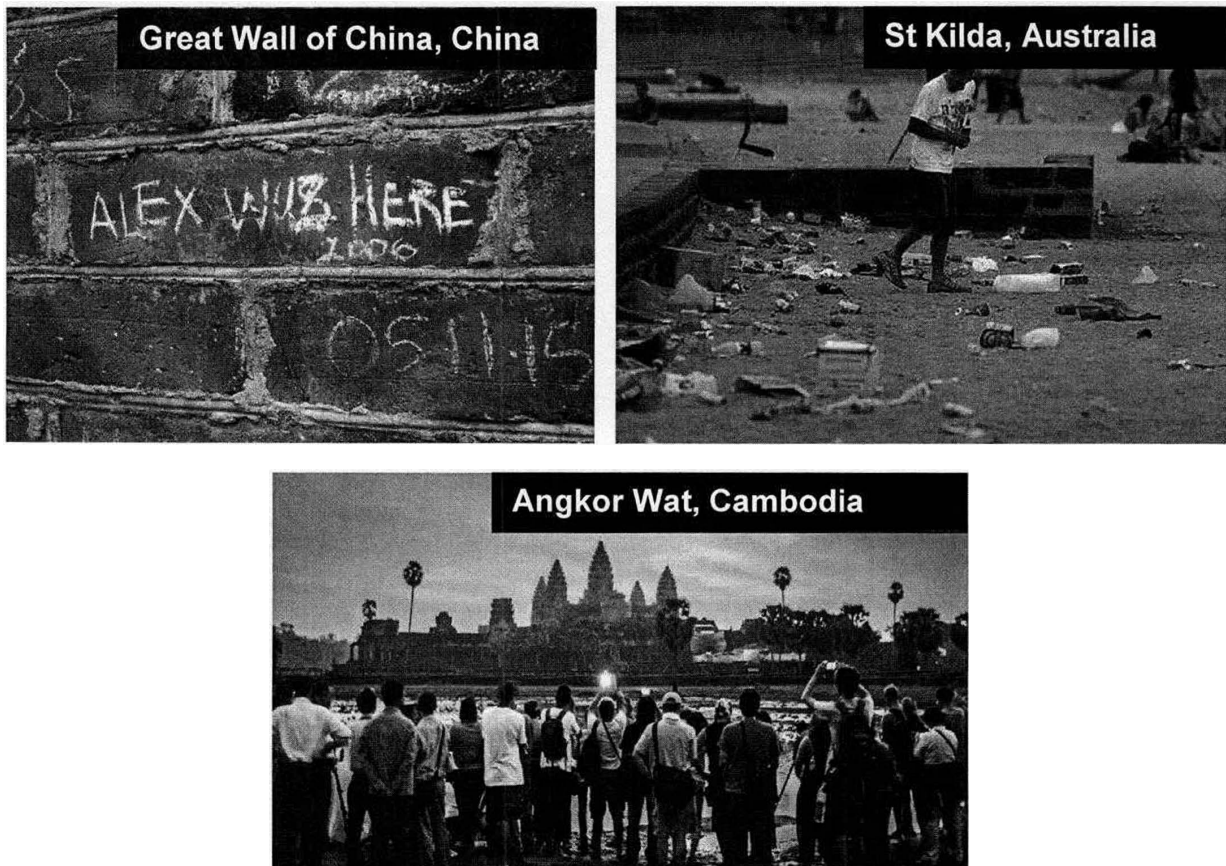


Fig. 7

Using Fig. 7 and what you have learnt, discuss the environmental impacts of tourism.

[5]

- d Assess the contributions of tour operators and non-governmental organisations in protecting tourist areas.

[8]

- End of Paper -

Marking Scheme

Section A

This question is compulsory.

- 1 a (i) Explain why the sediments vary in size along points A, B and C and suggest a hypothesis about the size and location of sediments along the beach. [4]

Explanation: The sediments vary in size due to constructive waves (1). Constructive waves have a stronger swash, carrying all the sediments further landward and depositing the larger sediments at C (1). The weaker backwash of the waves carries smaller/finer sediments from C and along B and finally depositing at A (1).

Hypothesis: The further inland, the larger the sediment size (1) or The closer to the shoreline, the smaller the sediment size (1) or Sediments become larger in size (1) from location A to C (1).

- (ii) Suggest how data can be collected using the random sampling method to support the hypothesis constructed in a (i). [5]

Credit 1m each, max 5m

- Place a quadrat at each point - A, B and C - along the transect
- Collect a sample of sediments at each of the points at squares of the quadrant
- Squares are selected based on random numbers by rolling a dice or from a random number table
- If the sediments are fine, sort them according to size using sieves
- The coarser sediment sizes can be measured using a vernier caliper along the long axis of the sediments
- Record findings in the recording sheet

- (iii) State an advantage and a disadvantage of the random sampling method. [2]

Advantage: No human bias in selection (1)

Disadvantage: The points may not cover all parts of a varied area (1)

[Accept other possible answers]

- (iv) Suggest some improvements to increase the reliability of the data collected. [3]

Credit 1m each, max 3m

- More transects can be chosen to collect data along the stretch of the beach
- Data can be collected more than once, at different times of the day
- Data can be collected on/during different days/months/seasons

[Accept other possible answers]

- b (i) The students wanted to find the updrift side of the groyne to assess the sediment built up. Suggest how they would be carrying this out. [4]

Credit 1m each, max 4m

- Near the water's edge, they can stick the first pole into the sand
- At this spot, they can throw an orange a metre away from the water's edge
- They will then have to observe the patterns of the travelling path of the orange for at least 10 minutes
- Then, they will have to stick the second pole into the sand where the orange finally lands
- They can identify the direction of the movement of the orange
- This direction will indicate the direction of the longshore current and longshore drift
- Hence the side of the groyne facing the longshore drift will be the updrift side

- (ii) Suggest safety precautions that students need to take to reduce the risk of accident when conducting their fieldwork. [2]

Credit 1m each, max 2m

- Watch out for slippery rocks
- Finding out tidal conditions (times of high/low tide)
- Take note of stability of rock surfaces
- Weather forecast
- Observe changes to the weather conditions (too cold, too hot or too wet for fieldwork)
- Take note of size of waves
- Wear covered and protective shoes to protect against sharp rocks or objects

[Accept any other possible answers]

- c (i) Identify the survey shown in Fig. 3 and evaluate its reliability. [3]

- Bi-polar survey (1)

Credit 1m each, max 2m

At least one positive and one negative statement

- Provides both positive and negative aspects (positive)
- Allows for quantitative data (positive)
- Only 5 aspects provided in the survey, limiting it (positive)
- Data collected may not be reliable as the students only interviewed 20 locals (negative)
- The aspects provided in the survey are rather brief and do not provide much details to locals doing the survey (negative)

[Accept other possible answers]

- (ii) Comment on the validity of the hypothesis. Support your conclusion with data from Fig. 3. [2]

The hypothesis is invalid (1). Majority of the locals feel that the presence of the groynes poses more problems than benefits. For example, 60% of the locals find the presence of groynes unsightly and costly to maintain and 65% of the locals surveyed feel that the groynes are dangerous (1).

[Accept other possible answers for supporting]

Section B

- 2 a Describe the advantages of package holidays. [3]

Credit 1m each, max 3m

- Involves a tour usually arranged by a travel agent.
- with transportation, accommodation and most meals included in the package
- Includes the services of guides who speak the local language
- The guides are usually knowledgeable about the sites, habits, culture and history of the places to be visited
- Less planning needed by the tourists e.g. booking of attractions

- b Describe the physical features of the coastline in Fig. 4, and explain the formation of the shore platform. [7]

Credit 1m each, max 3m for description

- Steep-faced cliff / near-vertical rock face
- Uneven rock face with jagged edges
- Presence of lines of weaknesses on the cliff face
- Gently sloping shore platform at the base of the cliff
- Small rocks strewn on the shore platform
- Shore platform is visible during low tide

[Accept other possible answers]

Credit 1m each, max 5m for formation

- Hydraulic action and abrasion may erode a crack or joint on the rock surface gradually enlarging the crack or joint to form a notch
- This notch may be further deepened to produce a bigger hollow space called a cave
- Further erosion by the waves eventually causes the roof of the cave to collapse and form a steep cliff
- As the process of erosion continues, an overhanging cliff is formed
- Eventually, this overhanging cliff will collapse and the materials will be deposited at the foot of the cliff
- Some of these materials may be carried by the waves and thrown against the base of the cliff, thus causing further erosion
- Over time, the cliff will retreat inland and a gently sloping platform – shore platform – appears at the base where the cliff used to be. [reserve 1m]

- c (i) With reference to Fig. 5 and what you have learnt, describe the value of coral reefs to people and the environment. [4]

Credit 1m each, max 4m

- Coral reefs reduce wave energy by an average of 97% and wave height by 84%, thus protecting the adjacent land mass from erosion [reserve 1m]
- Supports the natural ecosystems, allowing a wide range of marine creatures to breed and grow
- Coral reefs support more than 25% of the earth's marine fish species
- Marine creatures that live around reefs provide food for larger creatures
- Parrot fish graze on the living coral polyps
- Coral reefs and their nearby land areas have been developed as tourist attractions
- Maldives is a famous diving site because of its unique limestone rocks and sheltered environments filled with corals, lagoons and fish species
- Resorts and marinas on or near coral reefs allow millions of visitors a year to experience aspects of these distinctive ecosystems
- Jewellery and ornaments made from corals are often favoured as souvenirs by tourists visiting coral reefs

- (ii) Explain the effect of climate change on the coral reef ecosystems in the world. [3]

Credit 1m each

- Rapid changes in sea temperatures and sea levels, caused by climate change, may be faster than the ability of the reefs and their associated life forms to adjust.
- Coral bleaching occurs when higher sea temperatures result
- in the loss of algae and this causes the coral to turn completely white or be bleached.

- d "Hard engineering methods are more effective than soft engineering methods in reducing coastal erosion." To what extent do you agree with this statement? [8]

Answers may include the following points:

Hard engineering methods:

Seawalls

- Seawalls are constructed to protect coastlines against wave attack by absorbing wave energy.
- Most seawalls are made of concrete or stone and are built parallel to the coast.
- They have been constructed in thousands of locations throughout the world.
- Example: Seawalls in the Isle of Wight, United Kingdom
- Limitation 1: Seawalls are costly to build and maintain as constant repairs have to be made to prevent their collapse.
- Limitation 2: Seawalls only absorb some wave energy and reflect incoming waves. Most seawalls only achieve initial success. The powerful backwash of reflected waves washes away the beach materials at the foot of and beneath the seawall. This erosion of waves eventually undermines the base of the seawalls, leading to their collapse.
- For example: a seawall along the coast of Drakes Island in England collapsed due to erosion occurring at its base.

Groynes

- Low walls constructed at right angles to the shore to retain sediments that might otherwise be removed due to longshore drift.
- These structures absorb or reduce the energy of the waves and cause materials to be deposited on the updrift side of the groyne facing the longshore drift.
- Limitation 1: Groynes are unsightly and expensive to build and maintain.
- Limitation 2: Moreover, no new materials are carried and deposited on the downdrift side which is not protected by the groyne. As a result, longshore drift will gradually erode away the unprotected part of the beach.
- Example: large amounts of sediments were eroded on the downdrift side of the groyne built along Sandy Hook in New Jersey, United States of America. The groyne was eventually demolished.
- To prevent or reduce the erosion of beach materials on the downdrift side of the groyne, the tips of groynes are sometimes angled about 10 degrees, depending on the direction of the prevailing waves.
- If successful, groynes can help sustain and even extend beach areas.

Gabions

- Gabions are wire cages usually filled with crushed rocks.
- These cages are built along a shore or behind a beach to prevent or reduce coastal erosion by weakening wave energy.
- Gabions absorb wave energy better than seawalls,
- This is because the gaps between the rocks allow water to filter through.
- In this way, gabions prove to be successful defences against high energy waves.
- Limitation 1: However, the wire cages are unsightly.
- Limitation 2: They are also costly as they need to be maintained regularly.
- Limitation 3: Gabions are easily corroded by seawater and damaged by excessive trampling or vandalism.
- Example: Gabions were installed when the East Coast Park in Singapore was first reclaimed. The gabions were subsequently removed as they were vandalised.
- Example: Gabions along the Andaman Coast, Thailand, successfully protect the coast from erosion.

Breakwaters

- Breakwaters help break the force of oncoming waves.
- They can be built either parallel to the coast or with one end attached to the coast.
- When constructed offshore, breakwaters can create a zone of calm water behind them.
- Materials are then deposited and build up in this zone of calm water to form beaches.
- The calm water zone is often used as a sheltered harbour for boats.
- Limitation 1: They are aesthetically unappealing and are costly to build.
- Limitation 2: Protect the coast unevenly. Materials deposited in the zone behind the breakwater are protected while those in the zones located away from the breakwater are subjected to wave action and possible erosion.
- Example: Breakwaters built in Portland Harbour, England, resulted in erosion and flooding problems, which affected properties, beaches and communication infrastructure.
- Example: A breakwater at Almeria, Spain, successfully protects the coast from erosion.

Tetrapods

- Tetrapods are four-pronged concrete structures that help dissipate wave energy. They are stacked offshore in an interlocking position.
- In contrast to breakwaters or seawalls, tetrapods allow water to pass around them rather than hit against them. Hence, no powerful backwash is generated, which reduces the possibility of tetrapods being damaged by waves.
- Tetrapods are pre-casted, which means they cast into their final shape before being positioned. They can be placed quickly compared to other structures which may take

time to build while coasts are still under attack from waves.

- Example: Crescent City, a town on the coast of northern California, has used tetrapods for many years to defend against coastal erosion and to reduce the impact of tsunamis, which occurred 31 times between 1933 and 2008.
- Limitation 1: Aesthetically unappealing and expensive to build.
- Limitation 2: They are also dangerous to swimmers, surfers and boaters.

Soft engineering methods:

Planting vegetation and stabilizing dunes

- Planting vegetation such as mangroves can help stabilize coastlines. As mangroves absorb wave energy through their dense root system, the value of maintaining and replanting mangroves is now widely recognized.
- Sand dunes can be stabilized by planting grasses. The roots of grasses anchor the sand and prevent soil erosion. Matting is often put over the dunes, and young grasses are then planted into the sand through the matting. Over time, the grasses become established and the dunes become more stable. The matting then rots away adding nutrients to the soil.
- Example: The coast along Triton Place, Western Australia has vegetated sand dunes.
- Limitation 1: To prevent the vegetated dunes from being disturbed by human traffic, fences and access paths need to be built. One disadvantage of this is the costs of incurred from maintaining the fences and paths, with fences needing to be replaced with taller ones over time as sand accumulates.
- Example: A signboard at Sunset Beach, Australia informs the public about what is happening and helps develop positive attitudes towards these strategies.
- Limitation 2: However, vegetation may take a number of years to be established before it can resist natural elements such as storms and human elements such as trampling and even vandalism.

Beach Nourishment

- Beach nourishment slows down the erosion of beaches. It involves using sand from an external source to replenish the sand on a depleted beach. This sand may come from another beach or be dredged from the sea floor. This measure can successfully change a coast into a wide, sandy beach that offers protection to the inland areas.
- Example: Beach nourishment restored the depleted beach at the coast of Cape May Point in New Jersey, USA.
- Limitation 1: However, trucking or piping sand in may be expensive and time-consuming.
- Limitation 2: Beach nourishment projects around the world have developed problems.
- Example: Coral reefs at Waikiki Beach have been destroyed as sand used for beach nourishment was washed out to the sea and suffocated corals.

Encouraging coral reef growth

- Measures can be taken to encourage coral reef growth. Coral reefs help weaken wave energy and serve as a breeding ground and nursery for fish. Artificial reefs can be created by placing lasting materials such as steel or concrete onto the sea floor. Corals, together with other marine creatures and vegetation, colonise these materials and start to function as a natural reef.
- Example: In the waters of Palau in the Northern Pacific Ocean, sunken ships from World War II have been naturally colonized by corals.
- Example 2: Since 1996, the Maldives, which is a low-lying archipelago in the Indian Ocean, has been operating a coral-growing programme to help curb severe beach erosion on its many islands. A structure of welded construction steel rods has been placed off the coast of one of its resort islands of Ihuru. The structure is charged with low-voltage solar-generated electricity to speed up coral growth. Corals are reportedly growing three to five times faster than normal, and the island now sustains a large

variety of corals, marine animals and organisms.

- Limitation: However, it is not easy to encourage the growth of corals. Sites need to be surveyed to ensure maximum opportunity for growth. The dangers of siltation also need to be overcome or avoided. Coral growth may be slow, taking over 20-30 years before results appear.

A full answer does not need to include all the above points
At each level, students will show the following characteristics

Level 1 (0 – 3 marks)

Mention of only hard engineering or soft engineering methods

No examples given

No evaluation made of methods

No comparison made between hard and soft engineering methods

E.g. Measures can be taken to encourage coral reef growth. Coral reefs help weaken wave energy and serve as a breeding ground and nursery for fish. Artificial reefs can be created by placing lasting materials such as steel or concrete onto the sea floor.

Level 2 (4 – 6 marks)

At least one hard and one soft engineering method mentioned

Some examples given, although lacking in details

Some attempt at evaluation on both methods

Some comparison made between hard and soft engineering method

E.g. Measures can be taken to encourage coral reef growth. Coral reefs help weaken wave energy and serve as a breeding ground and nursery for fish. Artificial reefs can be created by placing lasting materials such as steel or concrete onto the sea floor. For example, in the waters of Palau, sunken ships from World War II have been naturally colonized by corals. However, it is not easy to encourage the growth of corals. Sites need to be surveyed to ensure maximum opportunity for growth.

Level 3 (7 – 8 marks)

Two hard and two soft engineering methods are mentioned

Methods described in detail

Detailed examples given for methods

Good evaluation on methods

Clear and good comparison between hard and soft engineering methods

E.g. Measures can be taken to encourage coral reef growth. Coral reefs help weaken wave energy and serve as a breeding ground and nursery for fish. Artificial reefs can be created by placing lasting materials such as steel or concrete onto the sea floor. Corals, together with other marine creatures and vegetation, colonise these materials and start to function as a natural reef. For example, in the waters of Palau in the Northern Pacific Ocean, sunken ships from World War II have been naturally colonized by corals. However, it is not easy to encourage the growth of corals. Sites need to be surveyed to ensure maximum opportunity for growth. The dangers of siltation also need to be overcome or avoided. Coral growth may be slow, taking over 20-30 years before results appear.

- 3 a (i) Refer to Fig. 6, describe the actual and projected trends of international tourist arrivals from 1950 to 2020. [3]

Credit 1m each, max 3m

- General trend: All regions experience an increase in the number of tourist arrivals from 1950 to 2020 from 30 million to a projected 1.6 billion.
- The increase in tourist arrivals is the highest for Europe from 30 million in 1950 to a projected 700 million in 2020.
- From 1995 to mid-2009, there was a gradual increase in tourist arrivals from 533 million to 880 million.
- It is forecasted that by 2020, the tourist arrivals will increase twice as much to 1.6 billion compared to 880 million in mid-2009.
[Accept other possible answers]

- (ii) Explain how the developments in technology can support the forecasts made in Fig. 6. [5]

Credit 1m each, max 5m

- Better and affordable transport: Developments in technology have led to great improvements in safety, shorter travelling time and cheaper travelling costs for the average person, increasing tourist arrivals
- Commercial air travel has revolutionized global tourism due to ongoing technological developments in jet aircraft since the 1950s
- The rise in budget airlines have made air transport affordable and enabled more people to travel internationally and more frequently
- More air routes and agreements have made various parts of the world more accessible, increasing tourist arrivals
- The open skies agreement allow commercial airlines to freely decide the routes, capacity and price of the flights, helping the airlines to succeed and boost tourist numbers
- Deregulation of the airline industry allows fares to rise and fall according to market demand, profiting airline companies
- Ease of access to information: Developments in information technology has made information readily available and accessible for tourist, increasing tourist arrivals
- It has also made available updated information
- Provides a platform for travelers to do online booking and research on their destination
- Surveillance, electronic checks and other safety controls research – makes tourists feel safer and more confident about travelling

- b Describe how governments can play a crucial role in promoting tourism in their country. [4]

Credit 1m each, max 4m

- Influence the number of visitors and their length of stay
- Authorise air landings
- Allow the building of facilities such as hotels
- Involved in planning, funding and building infrastructure projects linked to tourism such as airports, roads and ports
- Ensuring the safety and security of sites
- Set up agencies that devise strategies to help promote tourism in their country
- Tourism marketing campaigns and promotional events

c Using Fig. 7 and what you have learnt, discuss the environmental impacts of tourism. [5]

Credit 1m each, max 5m

At least one positive and one negative impact

Reserve 1m for using Fig. 4

- **Increased congestion:** Large number of tourists can cause overcrowding in areas close to popular attractions. This often causes vehicular and pedestrian traffic to become congested. Apart from adding to local traffic, the huge inflow of cars and buses can contribute to air pollution [Angkor Wat]
- **Vandalism:** Cultural, historical or natural sites may be vandalised by individuals or developers, damaging property [Great Wall of China]
- **Pollution and littering:** Authorities sometimes fail to implement measures that would properly manage waste left behind by tourists, leading to degradation of tourist sites [St.Kilda]
- **Conservation of natural environments:** tourism provides funding that helps to conserve environments such as coral reefs, rainforests and mountainous areas / Revenue from entrance fees to national parks and diving sites or even levies on nearby accommodations can be used to help protect and conserve the environment [positive impact]
- **Destruction of habitats:** When there is overcrowding at popular sites, tourists may destroy habitats and wildlife. Tourists may make too much of noise or may trample or take away things from sites as souvenirs.
- **Increased carbon footprint:** With increasing tourism, the amount of greenhouse gas emissions has increased.

d Assess the contributions of tour operators and non-governmental organisations in protecting tourist areas. [8]

Answers may include the following points:

Tour operators

- Tour operators may belong to associations that are increasingly concerned with conserving and protecting environments visited by tourists
- This is because fewer tourists are likely to visit a place if the unspoilt landscapes, rich biodiversity and unique cultures deteriorates
- An example is a group known as Phuket Alternative Tours (PAT), which was set up by a team of tour operators in Phuket in 2006
- Tour operators who want to operate under PAT are required to sign an Environmental and Cultural Code of Practice, which commits members to operate under the following guidelines:
 - 1) Operate in an environmentally sustainable way
 - 2) Seek to enhance the natural environment and the way that the industry uses it
 - 3) Create awareness about environmental conservation for visitors to Phuket

Strengths

- Provide feedback on tourist attractions
- Tour guides offer valuable feedback to tour operator about the social and environmental conditions of a tourist attraction
- Their input are often used by local communities and planning authorities to plan tourism management strategies in a tourist attraction
- Regulate tourist behaviour
- Tourists spend much of their time in a tourist attraction with tour guides or other staff of a tour operator. Therefore tour operators are often in the best position to regulate tourist behaviour.
- This includes preventing tourists from littering, wandering into restricted areas or

- making too much noise to prevent damage to a tourist site.
- In addition, tour operators have an incentive to maintain the quality of an attraction because their attraction is their source of income.

Limitations

- Need to generate profits.
- Tour operators are businesses and need to be profitable, or to make money, to survive
- The need to generate profits can sometimes bring tour operators into conflict with other stakeholders. It may also override concerns to preserve the environment when addressing these concerns would reduce their profits.

Non-governmental organisations (NGOs)

- NGOs are non-profit organisations operating independently of governments.
- A number of NGOs are concerned with tourism's impact on natural and human environments
- Since 1990, The International Ecotourism Society (TIES) has developed guidelines, conducted training courses, provided technical assistance and published research papers related to tourism and the environment.
- It works with numerous organisations, including travel associations and conservation groups in 124 countries.
- Groups such as TIES can be instrumental in achieving sustainable tourism and for protecting the environments frequented by tourists.

Strengths

- Facilitate communication between various stakeholders: NGOs sometimes act as channels of communication between various stakeholders, such as between local communities and tour operators or between tour operators and planning authorities. NGOs sometimes also help encourage other stakeholders, such as local communities, to actively participate in managing the impact of tourism.
- Support various stakeholders in managing the impact of tourism: NGOs support the tourism management efforts of various stakeholders such as local communities and planning authorities. The support comes in the form of additional manpower, expertise or marketing campaigns.

Limitations

- Difficulty in obtaining external funding: often rely on donations and may be hampered by the lack of financial resources.

A full answer does not need to include all the above points
At each level, students will show the following characteristics

Level 1 (0 – 3 marks)

- Brief description on the responsibilities of both stakeholders
- No examples given
- No or weak attempt at evaluation
- E.g. NGOs are non-profit organisations operating independently of governments. A number of NGOs are concerned with tourism's impact on natural and human environments. Since 1990, The International Ecotourism Society (TIES) has developed guidelines, conducted training courses, provided technical assistance and published research papers related to tourism and the environment.

Level 2 (4 – 6 marks)

- Describes the responsibilities of both stakeholders with some detail
- Some examples given, although lacking in details
- Some attempt at evaluation on both stakeholders

- E.g. NGOs are non-profit organisations operating independently of governments. A number of NGOs are concerned with tourism's impact on natural and human environments. Since 1990, The International Ecotourism Society (TIES) has developed guidelines, conducted training courses, provided technical assistance and published research papers related to tourism and the environment. It works with numerous organisations, including travel associations and conservation groups in 124 countries. The NGOs are effective as they sometimes act as channels of communication between various stakeholders, such as between local communities and tour operators or between tour operators and planning authorities.

Level 3 (7 – 8 marks)

- Describes the responsibilities of both stakeholders in detail
- Detailed examples given
- Good evaluation on both stakeholders
- Mention of other stakeholders
- E.g. NGOs are non-profit organisations operating independently of governments. A number of NGOs are concerned with tourism's impact on natural and human environments. Since 1990, The International Ecotourism Society (TIES) has developed guidelines, conducted training courses, provided technical assistance and published research papers related to tourism and the environment. It works with numerous organisations, including travel associations and conservation groups in 124 countries. Groups such as TIES can be instrumental in achieving sustainable tourism and for protecting the environments frequented by tourists. The NGOs are effective as they sometimes act as channels of communication between various stakeholders, such as between local communities and tour operators or between tour operators and planning authorities. NGOs sometimes also help encourage other stakeholders, such as local communities, to actively participate in managing the impact of tourism. They also support various stakeholders in managing the impact of tourism: NGOs support the tourism management efforts of various stakeholders such as local communities and planning authorities. The support comes in the form of additional manpower, expertise or marketing campaigns. However, they face difficulty in obtaining external funding, often rely on donations and may be hampered by the lack of financial resources.

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GEOGRAPHY

2236/02

Paper 2

Wednesday

24 August 2016

1 hour 30 min

Time: 8.00 a.m. – 9.30 a.m.

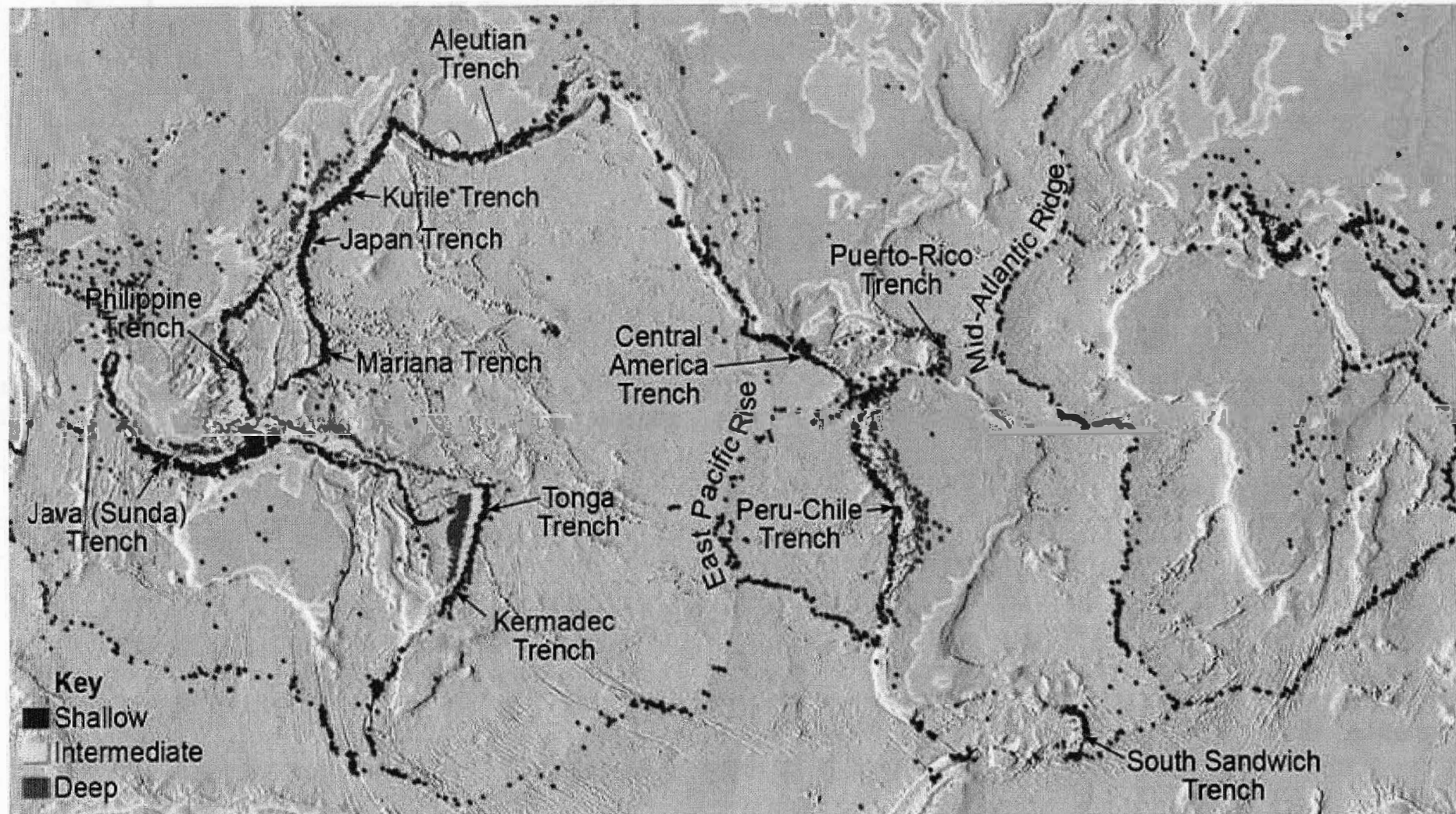
INSERT

READ THESE INSTRUCTIONS FIRST

This Insert contains Figs. 1, 2 and 3 for Question 1, Fig. 6 for Question 3 and Fig. 7 Question 4.

This document consists of **6** printed pages.

Distribution of shallow-, intermediate-, and deep-focus earthquakes.



World map for Question 1

Data from NOAA

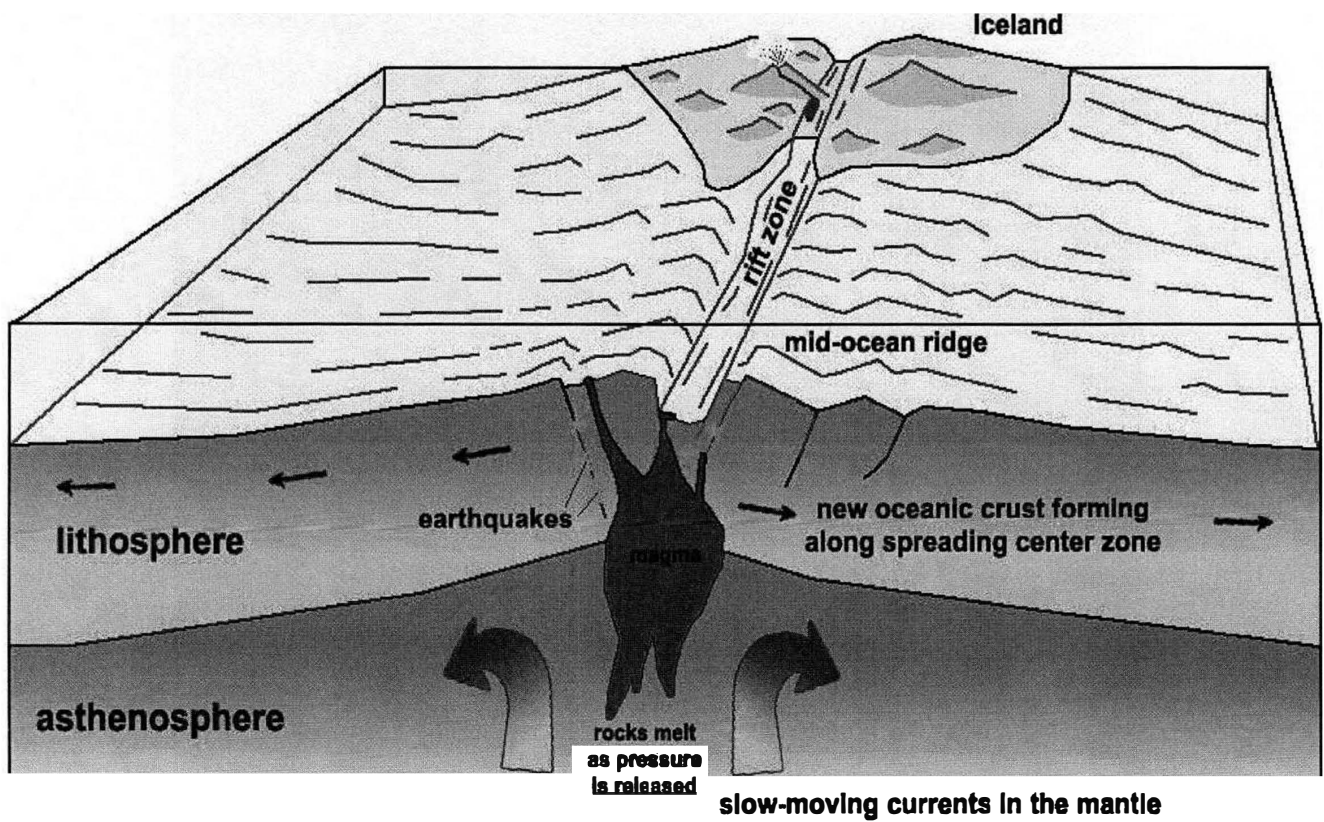
Source: <http://blogs.agu.org/georneys/2011/03/11/why-are-there-earthquakes-and-volcanoes-in-japan-in-response-to-magnitude-8-9-earthquake-tsunami-in-japan/>

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Fig. 1

Fig. 2 for Question 1

Spreading Centre along Divergent Plate Boundaries

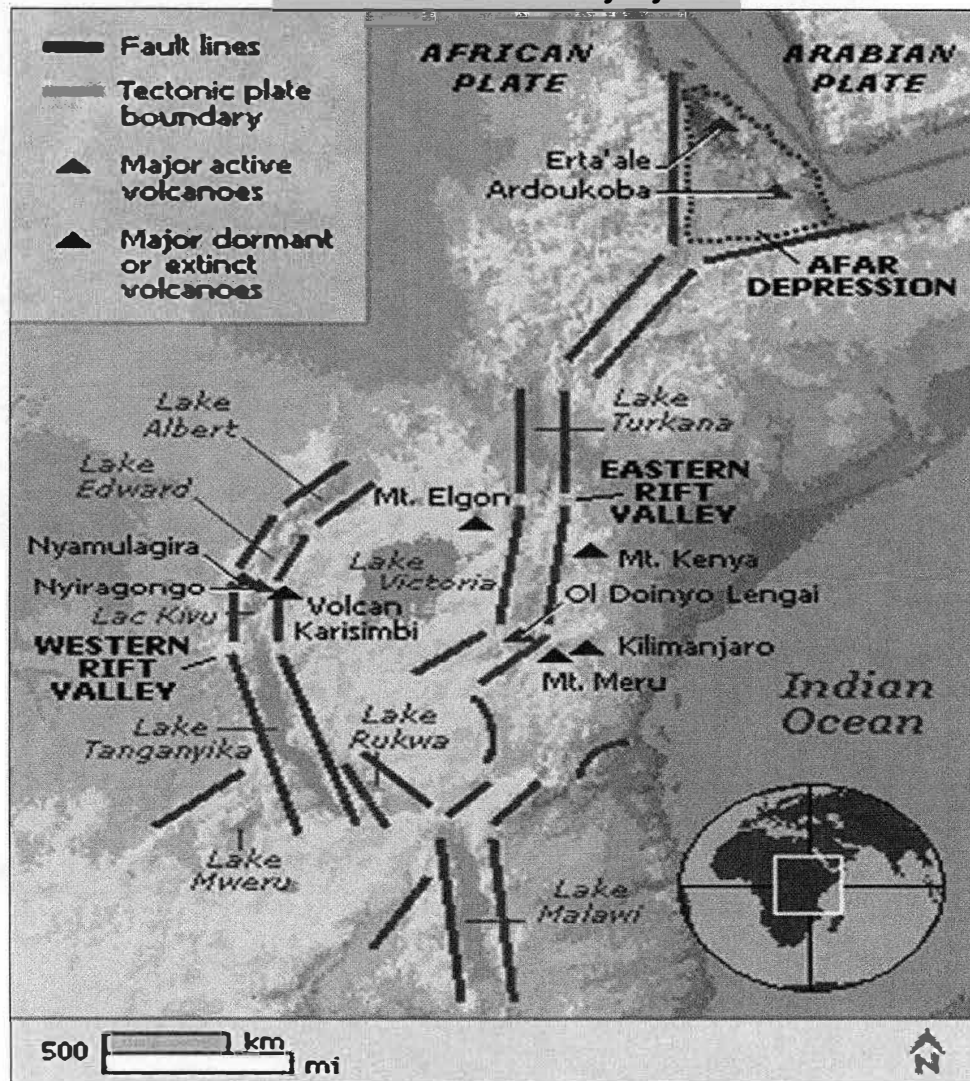


Source: http://geologycafe.com/images/spreading_center.jpg

[Turn over

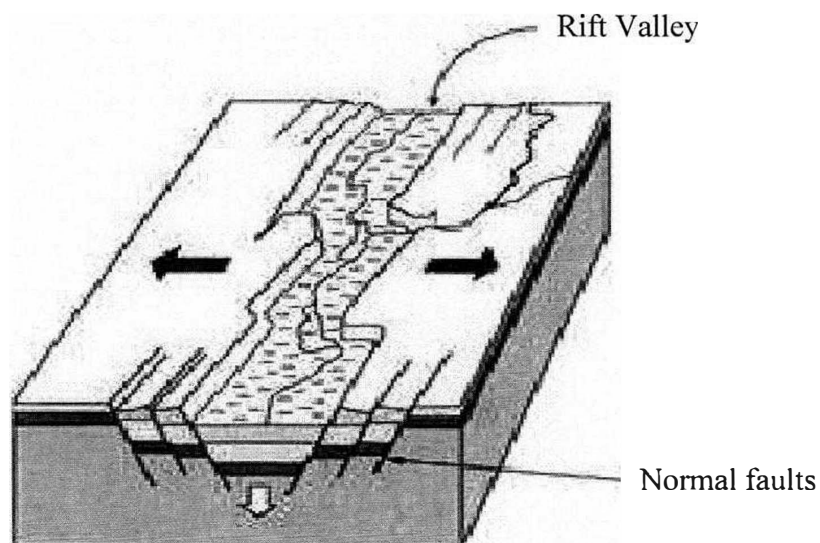
Fig. 3 for Question 1

East African Rift Valley System



Source: <https://anessoriginal.files.wordpress.com/2014/09/earv.gif>

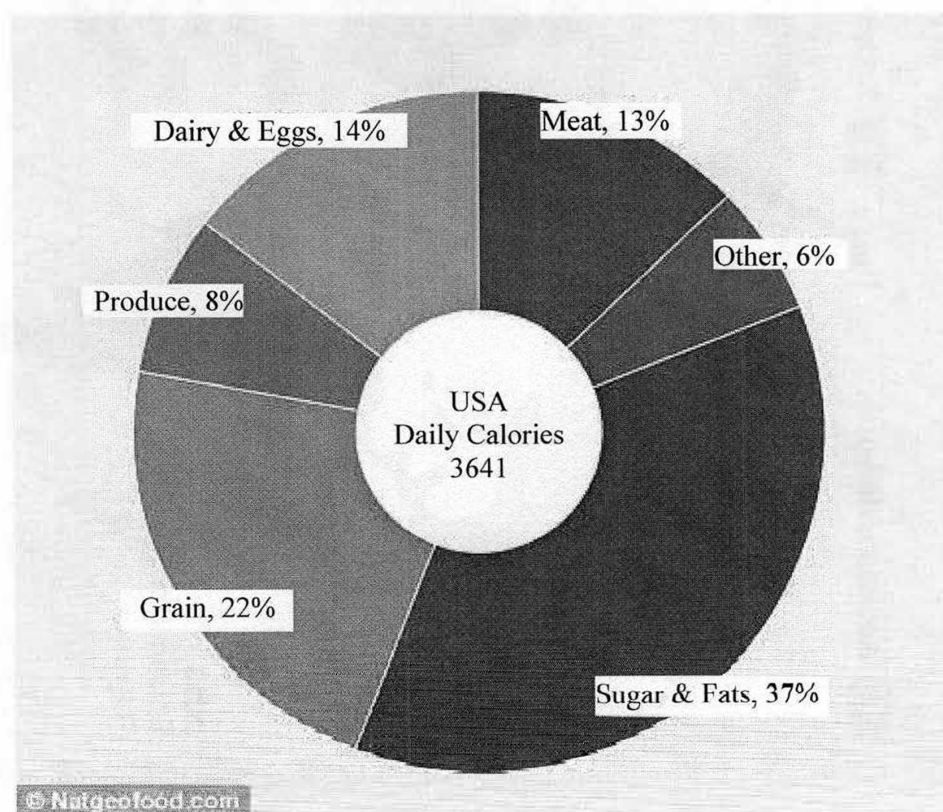
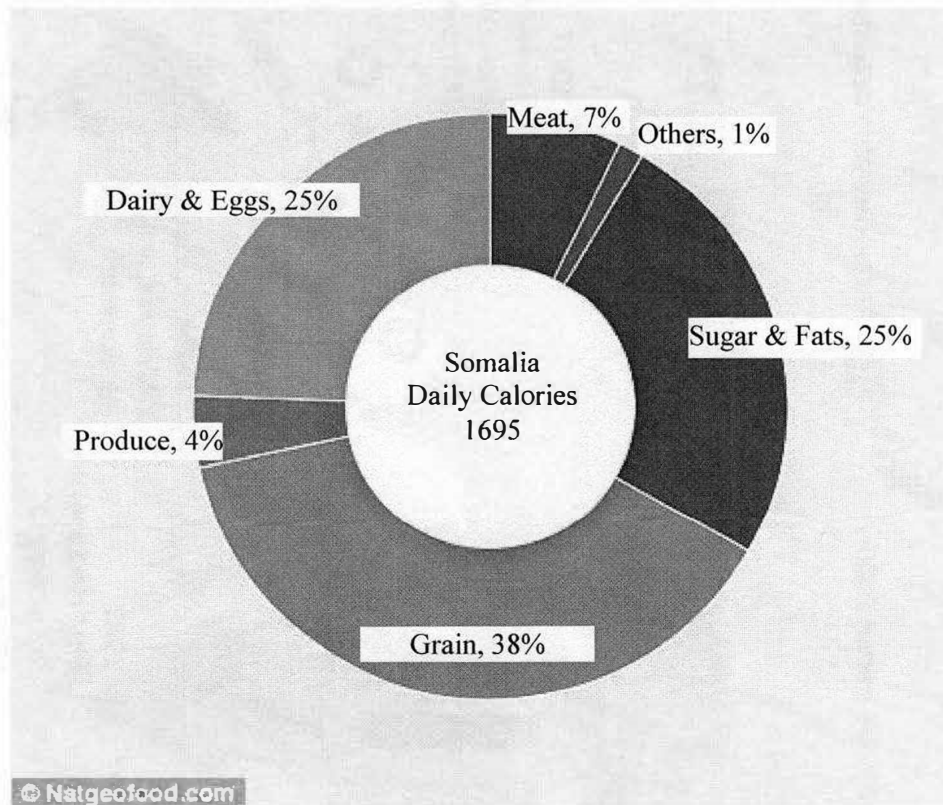
Cross-section of rift valley



Source: <http://www.slideshare.net/jodiecmills/intrusive-extrusive>

Fig. 6 for Question 3

Quantities of food consumed per person, in calories and percentages.



Source: <http://www.dailymail.co.uk/sciencetech/article-2803053/food-thought-infographic-reveals-world-consumes-china-biggest-meat-eaters-germany-drinking-alcohol.html>

[Turn over

The spread of Zika virus

How the Zika virus spread

■ Active transmission ■ Known previous transmission ■ Antibodies also detected

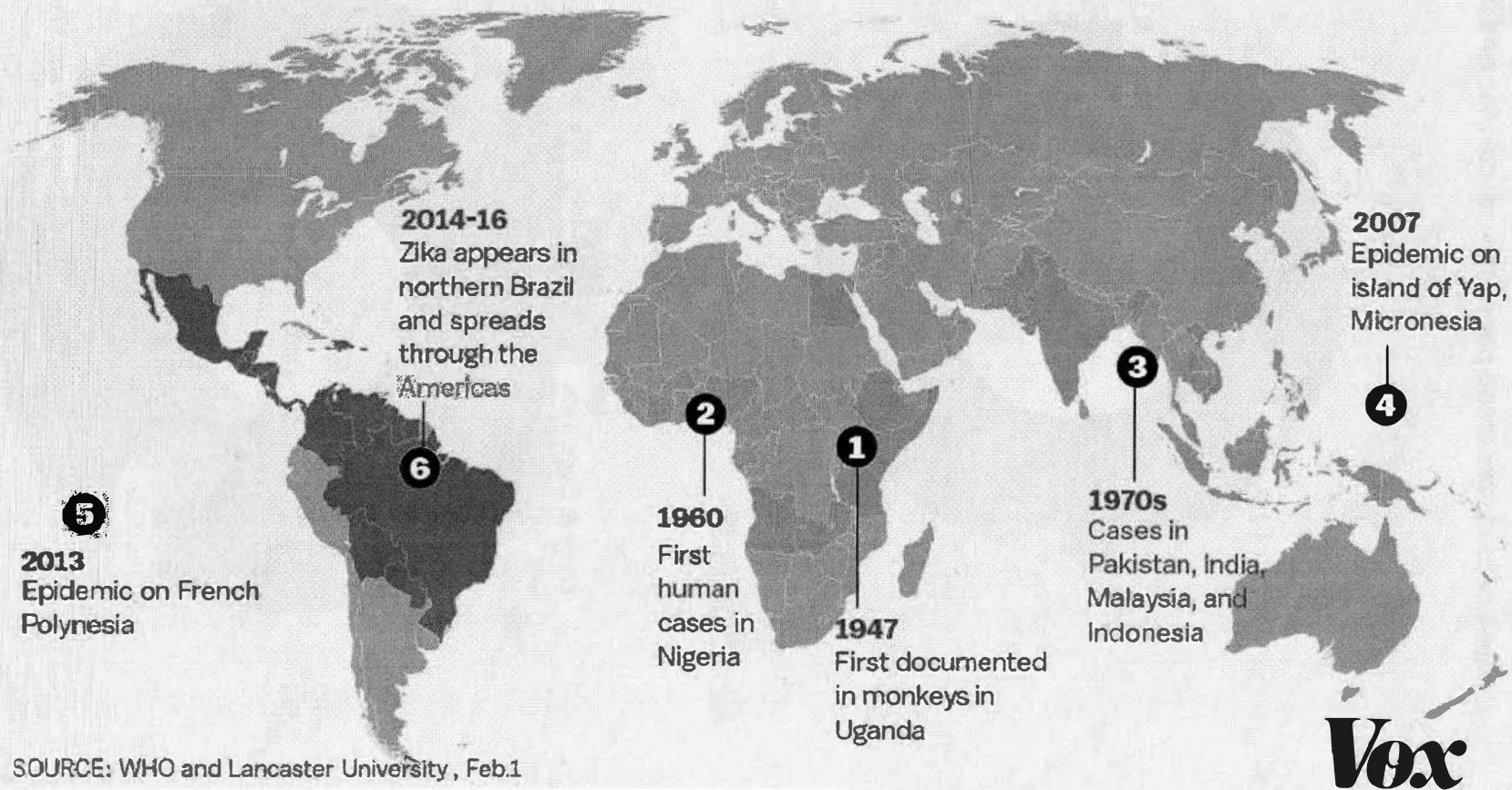


Fig. 7 for Question 4

Source: <http://www.storybench.org/wp-content/uploads/2016/02/howspread.jpg>

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GEOGRAPHY

2236/02

Paper 2

Wednesday

24 August 2016

1 hour 30 min

Time: 8.00 a.m. – 9.30 a.m.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen on both sides of the paper.

You may use an HB pencil for any diagrams or graphs.

Section A

Answer **one** question.

Section B

Answer **one** question.

INFORMATION FOR CANDIDATES

Write all your answers on the Answer Paper provided.

Candidates should support their answers with the use of relevant examples.

Sketch maps and diagrams should be drawn whenever they serve to illustrate an answer.

This Insert contains Figs. 1, 2 and 3 for Question 1, Fig. 6 for Question 3 and Fig. 7 Question 4.

At the end of your examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This question paper consists of **5** printed pages, **1** blank page and **1** Insert.

Section A

Answer **one** question from this section.

- 1 (a) Study Fig. 1 (Insert), which is a world map showing the worldwide distribution of earthquake depth.

(i) Describe the location of areas with intermediate- to deep-focus earthquakes. [4]

(ii) Explain how earthquakes are a result of plate tectonics. [5]

- (b) Study Fig. 2 (Insert), which shows spreading centre along divergent plate boundaries.

Use Fig. 2 to help you explain the formation of oceanic ridges and subsequently the island of Iceland. [5]

- (c) Study Fig. 3 (Insert) which shows East African Rift Valley System.

With the help of Fig. 3, explain the formation of East African Rift Valley System. [4]

- (d) 'Short-term measures are more effective in managing the impacts of earthquakes than long-term measures.'

To what extent do you agree with the statement? Explain your answers with relevant examples. [8]

- 2 (a) Study Fig. 4, which gives information about selected earthquakes.

Information about selected earthquakes

location	magnitude (Richter scale)	duration (seconds)	deaths	buildings destroyed	damage (billion US\$)
Izmit (Turkey)	6.9	48 s	17 118	35 054	6.5
Kobe (Japan)	6.8	20 s	5 502	100 362	150.0
Northridge (USA)	6.7	15 s	57	7 271	44.0
Tangshan (China)	7.0	15 s	240 000	180 439	5.6

Fig. 4

(i) Use Fig. 4, assess the extent to which the magnitude and duration of earthquakes affect the number of deaths and amount of damage. [5]

(ii) Besides the factors shown in Fig. 4, suggest and explain two other factors that will affect the number of deaths and amount of damage. [4]

(b) Study Fig. 5, which shows the temperatures of cities in the United States of America in January.

Temperature of cities in United States of America

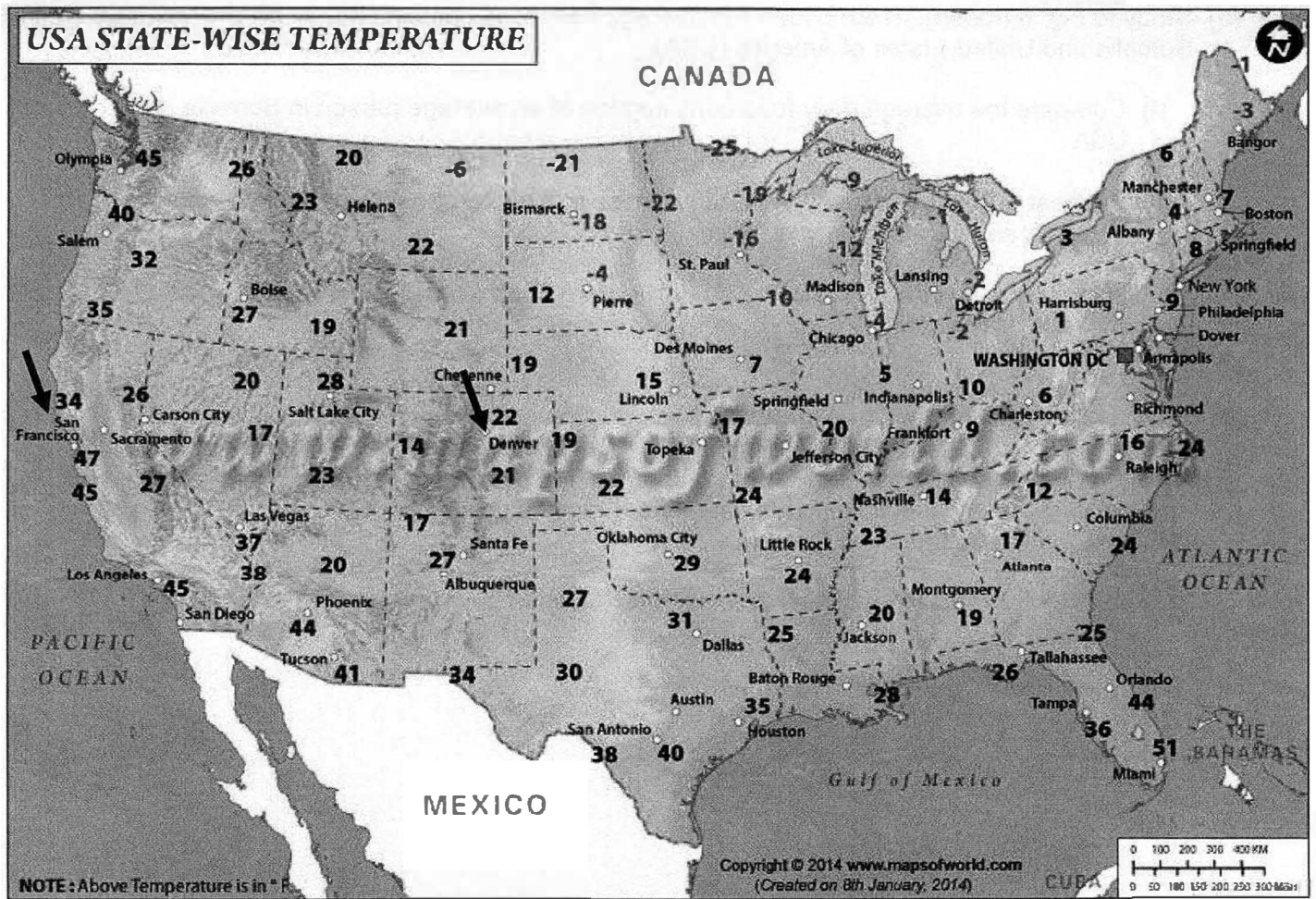


Fig. 5

- (i) Refer to Fig. 5, explain the main reason for the difference in temperature between San Francisco and Denver. [4]
- (ii) Besides the reason given in (i), explain one other reason for the difference in temperature between the cities in the United States of America. [4]
- (c) Compare the effectiveness of measures taken to overcome the problems caused by earthquakes in LDCs with measures taken in DCs. [8]

[Turn over

Section B

Answer **one** question from this section.

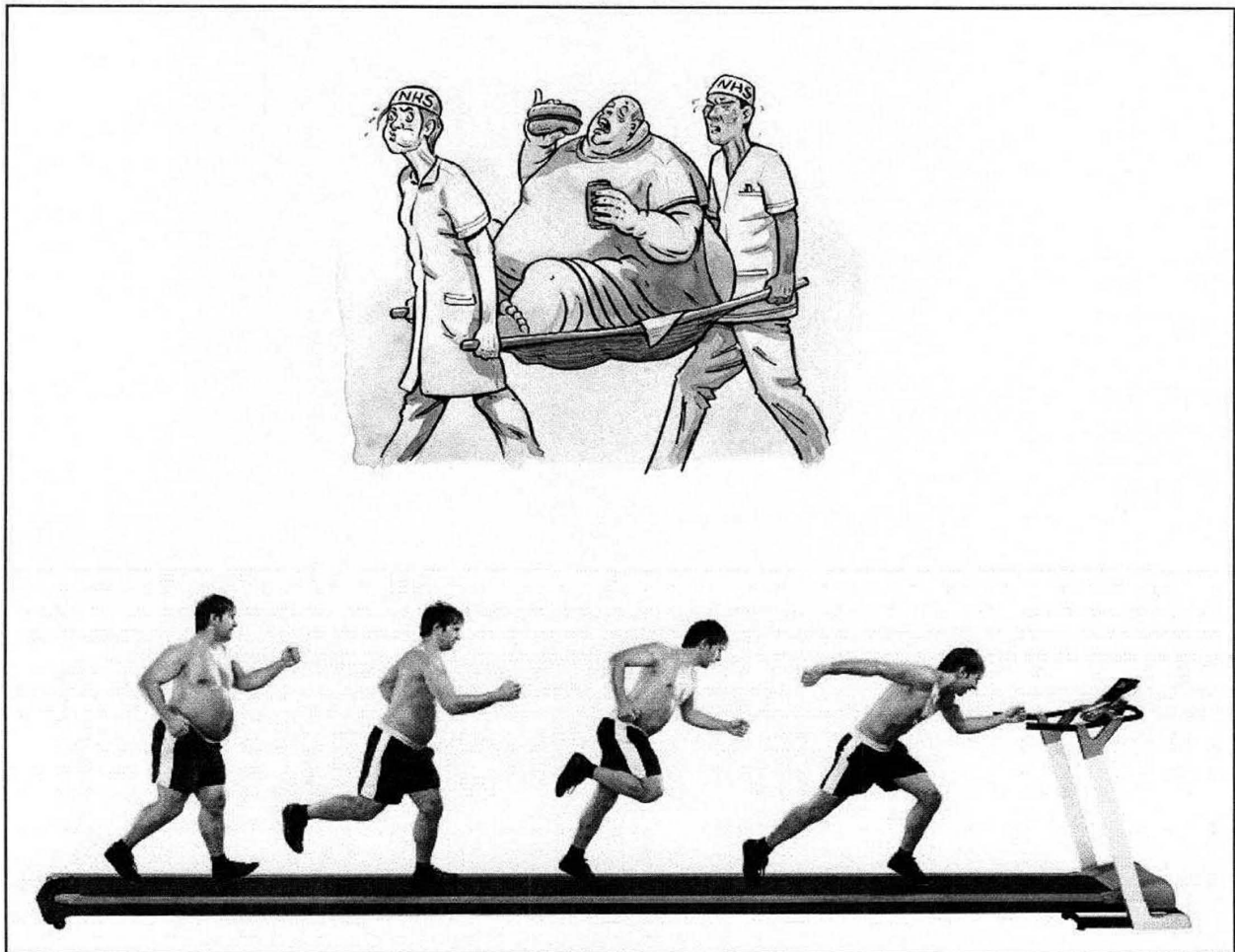
- 3 (a)** Study to Fig. 6 (Insert), which shows the average daily food consumption of an average person in Somalia and United States of America (USA).
- (i)** Compare the average daily food consumption of an average person in Somalia and USA. [4]
 - (ii)** Suggest possible reasons for the differences in the average daily food consumption between an average person in Somalia and USA. [5]
 - (iii)** Explain how the daily food consumption pattern of an average Somalian may affect Somalia as a whole. [4]
- (b)** Explain how social factors may reduce food production in the long run. [4]
- (c)** 'High yielding variety seeds is the most important factor in green revolution that brings about an increase in food production.'
- To what extent do you agree with this statement? Support your answer with examples. [8]

4 (a) Explain how physical factors play a part in food production.

[4]

(b) Study Fig. 7, which shows the impacts of overconsumption of food.

Impacts of overconsumption of food



Source: http://health.spectator.co.uk/content/uploads/2015/10/nhs-cover_se.jpg

Source: http://images.medicaldaily.com/sites/medicaldaily.com/files/styles/embedded_full/public/2015/02/15/diet-and-exercise-obese.jpg

Fig. 7

Assess the impacts of overconsumption of food.

[4]

(c) Study Fig. 7 (Insert), which is a world map on the spread of Zika virus.

(i) Describe the spread of Zika virus from 1960 to 2016.

[5]

(ii) With reference to Fig. 7 and other information, explain the challenges in managing the spread of infectious diseases.

[4]

(d) Many people in both developed countries as well as in less developing countries still hold inaccurate beliefs about HIV/AIDS.

Evaluate the roles of individuals as well as the communities in managing the spread of HIV/AIDS.

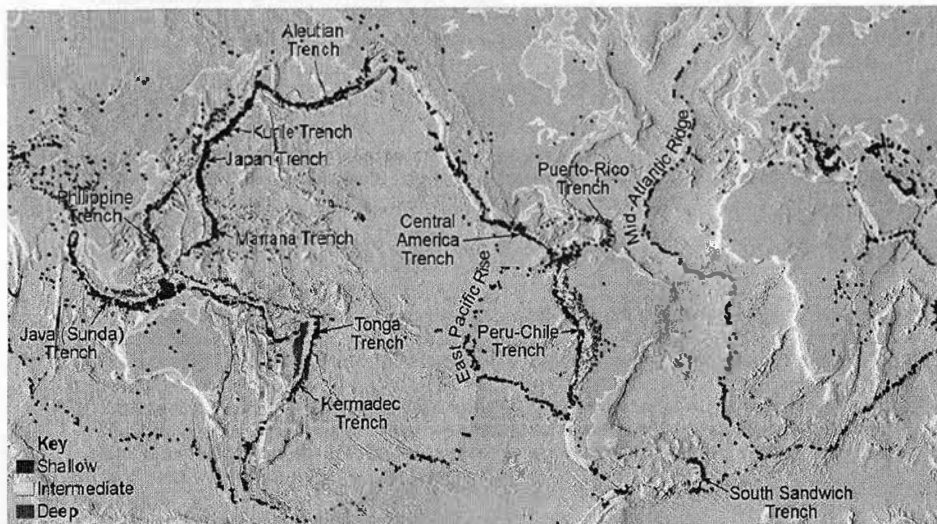
[8]

End of paper.

ST ANDREW'S SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2016
SECONDARY 4 EXPRESS/ 5 NORMAL ACADEMIC
GEOGRAPHY 2236/02

Section A: Answer one question from this section.

- 1(a) Study Fig. 1 (Insert), which is a world map showing the worldwide distribution of earthquake depth.
 (i) Describe the location of areas with intermediate- to deep-focus earthquakes. [4]



Distribution of shallow-, intermediate-, and deep-focus earthquakes. (Data from NOAA)

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Intermediate (2m):

- Along boundaries of Eurasian Plate where Indonesia is
- Between the boundaries of Eurasian Plate and Philippines Plates where the Philippines, Taiwan and Japan are
- Along the entire boundary of the Philippines Plate
- Between Australian Plate and Pacific Plate where Papua New Guinea, Solomon Islands, Vanuatu and New Zealand are
- Between the plate boundaries of Nazca Plate and South American Plate where Peru and Chile are

Deep (2m):

- Along the island of Java, Indonesia, the Philippines and off the North western coast of Japan.
- Along the western part of South American where Peru and Chile are

- (ii) Explain how earthquakes are a result of plate tectonics. [5]

- The earth's tectonic plates are always moving due to the convection currents and slab-pull force working together to cause plate movement. [R1]
- Material in the mantle is heated by the core, causing the mantle material to expand, rise and spread out beneath the plates
- This causes plates to be dragged along and to move away from each other and then the hot mantle material cools slightly and sinks, pulling the plates along
- Slab-pull force occurs when the dense, sinking oceanic plate at subduction zones pulls the rest of the plate behind it.

- The subduction or sinking plate drives the downward-moving portion of convection currents while the material which is found away from where the plates subduct drives the rising portion of convection currents.
- Earthquakes occur when there is plate movement along plate boundaries.
- The plate movements cause the slow build-up of stress in the rocks found on either side of the fault. [R1]
- When the rocks can no longer withstand the increasing stress, they can suddenly slip many metres, causing a vibration in the earth's crust known as earthquake. [R1]

R1 – Reserve mark

- (b) Study Fig. 2 (Insert), which shows spreading centres along divergent plate boundaries. Use Fig. 2 to help you explain the formation of oceanic ridges and subsequently the island of Iceland. [5]

- When two oceanic plates diverge, fractures are formed at the plate boundary.
- Magma rises at the zone of divergence to create a ridge of new oceanic floor known as a mid-oceanic ridge.
- At various points along the mid-oceanic ridge, magma builds up and solidifies to form undersea volcanoes.
- When these volcanoes eventually grow above the sea level, they are known as volcanic islands.
- Iceland lies along the mid-Atlantic ridge in the middle of Atlantic Ocean which was formed when the North American Plate and the Eurasian Plate moved away from each other.

- (c) Study Fig. 3 (Insert) which shows East African Rift Valley System. With the help of Fig. 3 to explain the formation of East African Rift Valley. [4]

- Diverging plate movement can cause land masses to break up
- When plates diverge or move apart, they are stretched, causing fractures to form on the continental crust African plate
- As the crust continues to be pulled apart, a rift valley is formed
- The East African Rift Valley involves the Nubian boundary of the African Plate moving away from the Somali boundary of the African Plate.
- The system consists of a number rift valleys, with a number of active volcanoes and earthquake fractures

- (d) 'Short-term measures are more effective in managing the impacts of earthquakes than long-term measures.'

To what extent you agree with the statement? Explain your answers with relevant examples. [8]

Answers may include the following points:

Short Term measures:

Rescue and recovery: People trapped under collapsed buildings are quickly located and freed.

Success:

- Some survivors are found after being trapped for a couple of weeks without food.
- For example, after the earthquake in Tohoku, Japan, in 2011, sniffer dogs and heat sensors were deployed and successfully rescued many who were trapped

Limitations:

- Rescue workers only have a limited time of 72 hours, or three days, to find trapped survivors. Without food and water, trapped people are unlikely to survive after 3 days.
- For example. A rescue workers had a limited time of 3 days to rapidly search through two towns after the earthquakes in Tohoku in 2011.

Emergency, food and medical supplies: The injured are treated and clean drinking water is provided to survivors to prevent dehydration and the spread of diseases.

Success: The provision of immediate aid helps survivors continue with their lives

- For example, after the earthquake in Afyon in 2002, the Turkish Red Crescent Society immediately responded by delivering 20,000 tents, 50,000 blankets and 3,000 heaters to the region.

Limitation:

- Medical supplies, food and water may not be sufficient and this may cause social unrest
- For example, After the earthquake in Haiti in 2010, looting and fighting broke out as people fought for food and medical supplies.

Long Term measures:

Rebuilding of infrastructure: Infrastructure and amenities are rebuilt and improved upon after a disaster

Success:

- Authorities often develop stricter building codes to ensure infrastructure is restored at a higher level than before
- For example, after the earthquake in Kobe, Japan, in 1995, Japan spent billions developing technology to build more earthquake-resistant buildings.

Limitation:

- Reinforced buildings, which are built to protect against earthquakes, are not necessarily protected against tsunamis. Additional protection could be in the form of coastal protection structures such as breakwaters.
- For example, although many of Chile's buildings are earthquake-resistant, the coastal areas suffered massive damage from a tsunami when an earthquake struck in 2010.

Provision of health care: Health options such as long-term counselling are provided. The loss of loved ones, homes or jobs after earthquakes cause long-lasting trauma

Success:

- Problems can be identified and addressed early
- For example, a year after the earthquake in Christchurch, New Zealand, in 2011, significant problems of anxiety and depression were identified amongst all age groups of the affected population. This resulted in a greater number of health workers being deployed in the area.

Limitation:

- Improving health options, such as restoring the resilience of people after an earthquake, can be very challenging.
- For example, many survivors such as those in Haiti after the earthquake in 2010, continue to lack access to basic necessities.

Level of Descriptors

Level 1 (0- 3 marks)

- At this level, answers lack detail of specific explanation and details.
- There may be no or little attempt at explaining both successes and limitations
- No example or simple example given e.g. in Japan.

Level 2 (4- 6 marks)

- At this level, answers will contain some appropriate detail about the implementation and impacts.
- The content will lack some relevant details of success and limitations of the measures
- Simple examples are given to support answers in at least one place in the answer
- Not more than 1 ST and 1 LT measures given

Level 3 (7- 8 marks)

- At this level, answers will contain some specific details about the implementation and impacts.
- The content will have details of success and limitations of the measures
- Clear, specific examples are given to support answers in at least one place in the answer
- At least 1 ST and 1 LT measures

2(a) Study Fig. 4, which gives information about selected earthquakes.

Information about selected earthquakes

location	magnitude (Richter scale)	duration (seconds)	deaths	buildings destroyed	damage (billion US\$)
Izmit (Turkey)	6.9	48 s	17 118	35 054	6.5
Kobe (Japan)	6.8	20 s	5 502	100 362	150.0
Northridge (USA)	6.7	15 s	57	7 271	44.0
Tangshan (China)	7.0	15 s	240 000	180 439	5.6

Fig. 4

- (i) Use Fig. 4, assess the extent to which the magnitude and duration of earthquakes affect the number of deaths and amount of damage. [5]

The higher the magnitude, the higher the number of death [2m]:

- At Tangshan, China, magnitude of 7, the number of death is 240 000 which is the highest among the 4 locations.
- While Northridge, USA, magnitude of 6.7, the number of death is 57 which is the lowest among the 4 locations.

The longer the duration, the higher the number of death [2m]:

- At Izmit, Turkey, the duration is the longest at 48s which resulted in the second highest number of death at 17 118 while in Northridge, USA, the duration is only 15 s and the number of death is 57.
- However, at Tangshan, China, despite having a short duration of 15 s, the number of death is the highest at 240,000.
- This could be due to the number of collapsed building being the highest at 180 439. Thus many people could be killed by the collapsed buildings.

No direct conclusion about the magnitude and the amount of damage [1m]:

- At Tangshan, China, magnitude of 7, the amount of damage is at US\$ 5.6 billion which is the lowest among the 4 locations.
- While Kobe, Japan, magnitude of 6.8, the amount of damage is at US\$ 150 billion which is the highest among the 4 locations.

No direct conclusion about the duration and the amount of damage [1m]:

- At Tangshan, China, duration of 15s, the amount of damage is at US\$ 5.6 billion which is the lowest among the 4 locations.
- While Kobe, Japan, duration of 20s, the amount of damage is at US\$ 150 billion which is the highest among the 4 locations.

- (ii) Besides the factors shown in Fig. 4, suggest and explain two other factors that will affect the number of deaths and amount of damage. [4]

Population Density [1]:

- Tangshan and Izmit are likely to have high population density which may result in the high number of death during the earthquakes whereas
- The population density of Kobe and Northridge may be low which result in the lower number of death.

Level of preparedness [1]:

- The people in Tangshan and Izmit may not be prepared/warned which may result in the high number of death during the earthquakes whereas

- The people in Kobe and Northridge may be prepared or received warning which result in the lower number of death.
- Distance from epicentre [1]:
- The epicentre of the earthquake in Tangshan and Izmit may be near the city centre which may result in the high number of death during the earthquakes whereas
 - The epicentre of the earthquake in Kobe and Northridge may be further away from the city centre which result in the lower number of death.
- Time of occurrence [1]:
- The people in Tangshan and Izmit may not be prepared/warned which may result in the high number of death during the earthquakes whereas
 - The people in Kobe and Northridge may be prepared or received warning which result in the lower number of death.
- Type of soil [1]:
- Tangshan and Izmit may be built on softer soil which amplified the seismic waves which may result in the high number of death during the earthquakes whereas
 - Kobe and Northridge may be built upon harder rocks which absorb the seismic waves which result in the lower number of death.

(b) Study Fig. 5, which shows the temperatures of cities in the United States of America in January.

Temperature of cities in United States of America

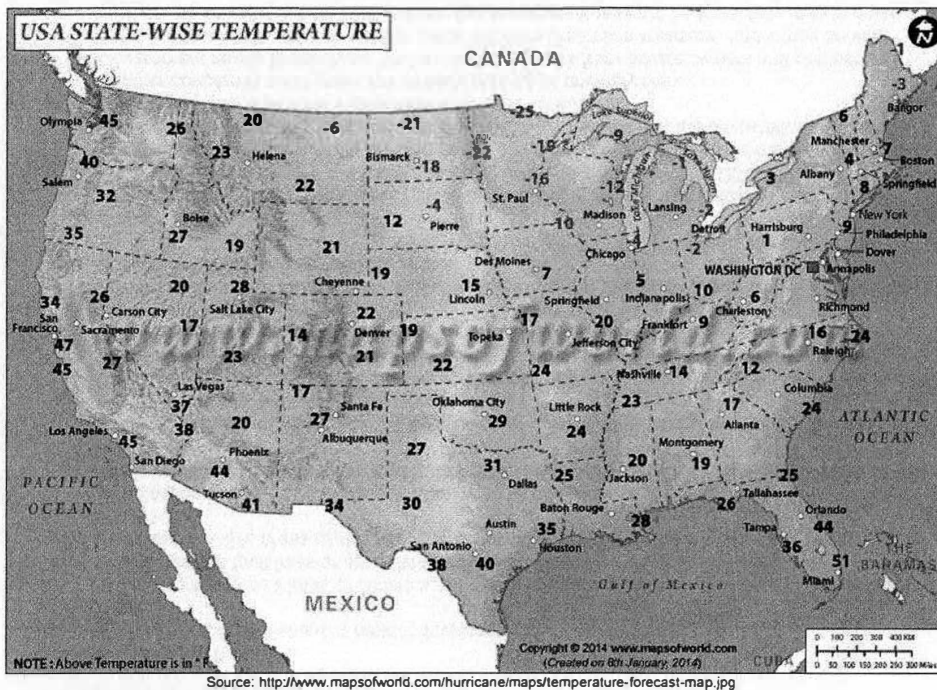


Fig. 5

(i) Refer to Fig. 5, explain the main reason for the difference in temperature between San Francisco and Denver.

[4]

Distance from the sea – the sea heats up and cools down more quickly than the land. The difference in the rate of heating and cooling of the sea and land affects the temperature of coastal and inland areas. [R1]

- During winter in Jan, the air over the sea remains warmer than the air over the land because the sea cools more slowly than the land.
- The warmer air over the sea increases the temperature of coastal areas such as San Francisco being nearer the sea. This is known as the maritime effect [R1]
- Denver which is inland and much further away from the sea, the temperature of such areas are not influenced by the sea.
- Land loses heat much faster resulting in much cooler winters thus Denver has a lower temperature in Jan as compared to San Francisco. This is known as the continental effect. [R1]

(ii) Besides the reason given in (i), explain one other reason for the difference in temperature between the cities in the United States of America.

[4]

Latitude:

- Is the most important factor affecting temperature. The temperature differs between places at lower latitudes and higher latitudes because the sun's rays reach strike various parts of the world at different angles [1]
- Temperatures are lower at higher latitudes because the solar angle is lower, which means that rays strike at a lower angle and the solar energy is spread out over a wider area, [1] e.g. Bismarck at -18 °F [1]
- As the solar angle is high at the area between the Tropic of Cancer and the Equator, heat from the sun is concentrated on a small area. Temperatures are higher at lower latitudes such as San Antonio at 38 °F [1]

Accept other reasons such as altitude.

Reserved 1 m for reference to the cities and their temperatures as shown in Fig. 5

(c) Compare the effectiveness of measures taken to overcome the problems caused by earthquakes in LDCs with measures taken in DCs.

[8]

Level 1 (0-3 marks)

- At this level, answers lack detail.
- A basic answer that has little development e.g. One or two general statements about the strategies of coping with earthquakes by people living there
- There may be no or little attempt at assessment of strategies e.g. building modifications and early warning system
- Measures can be either before or after the earthquake \ not necessarily both. No assessment of how effective the measures are.
- No differentiation made between DCs and LDCs

Level 2 (4-6 marks)

- At this level, answers will contain some appropriate detail about the strategies of coping with earthquakes by people living in DCs and LDCs
- The content will lack balance and some relevant detail. This means that measures both before and after the earthquake are considered but support is patchy so that the answer is not full.
- Assessment may be given but may be general in nature eg. type of building modification – existing or new
- Differentiation of at least 2 strategies between DCs and LDCs
- Limited indication of how well people cope / how effective measures are eg. low rise buildings reduce damage / early warning and evacuation of people in danger zones
- An example will be presented to support answers in at least one place in the answer

Level 3 (7-8 marks)

- At this level, answers will be comprehensive and supported by sound knowledge e.g. good explanation about the strategies of coping with earthquakes by people living in DCs and LDCs

- There will be assessments of the extent to which strategies are successful
- There should be a balance / mention of measures before and after an earthquake.
- A good explanation of developed countries have greater ability / resources / awareness to reduce the impact than less developed countries
- Examples to support answers can be found in most places in the answer

Answer may include the following points

Land use regulations

- A set of rules implemented to restrict developments in certain areas.

Example

- In California, United States of America, a developed country, all new building developments are not built across fault lines or areas at risk of liquefaction.
- In Memphis, USA, areas at risk of major liquefaction are mapped out and help in the regulation of land use.
- Liquefaction occurs when vibrations from an earthquake cause saturated soil to flow like liquid
- The ground becomes unstable and buildings should not be constructed in these areas as it is unsafe
- Another land use regulation is the prohibition of constructing new buildings on low-lying land which are vulnerable to tsunamis
- Developments may be allowed only when protective barriers such as seawalls facing the ocean are constructed

Example:

- These regulations are commonly implemented along the coasts of Japan and North American where the Pacific Ring of Fire is located

Limitations:

- However, the impact of earthquakes and tsunamis are inevitably unpredictable especially in LDCs where they do not have access to advanced technology unlike in DCs.
- For instance, Japan's rigorous building codes and quake-resistant buildings may have limited the number of casualties from the 11th Mar 2011's earthquake but the devastation in coastal areas and a final death toll is predicted to exceed 10,000
- Another concern is such areas are already built-up or privately own.
- Government needs to purchase the land in these areas from private owners and compensate them to move out in order to put into place effective protection measure. And it may be very costly to do so especially in LDCs where the government may not be financially able to do so.
- These private owners may be reluctant to move as they often believe that another hazard would not happen

Other possible answers:

Planning the location of infrastructure:

- Local authorities of DCs will assess the locations where infrastructure is built before approval. This assessment is based on a set of guidelines. These guidelines would consider the following:
 - o Nature and extent of earthquake risks (level of expected ground shaking/ vulnerability to ground failures/ tsunamis)
 - o Population distribution
 - o Type of building construction
 - o Technological hazards
- Unfortunately, these assessment may not be carried out in LDCs due to financial difficulty, lack of manpower or lack of technological know-how.

Limitations:

- In Kamaishi, Iwate, Japan, the 4 metre waves surmounted the seawall — the world's largest, erected a few years ago in the city's harbour at a depth of 209 feet, a length of 1.2 miles and a cost of \$1.5 billion — and eventually submerged the city centre.

- The planning failed to consider the vulnerability to earthquakes and tsunamis where industrial activities are located, ie. the nuclear generation plants near the coastal areas. If the seawall was supposed to protect the nuclear generation plants from tsunamis, then the height and energy of the waves are underestimated.

Earthquake monitoring:

- In earthquake prone areas, sensitive instruments such as the seismometer and computers, are used to measure movements of the Earth's surface. The information produced by these instruments is evaluated to determine if an earthquake is likely to occur.
- For eg, scientists look out for signs such as an increase in the tremors of the Earth or changes in water levels of seas and oceans.
- The authorities will inform the people living in the affected areas to evacuate the area and move to safer grounds.
- Such a planned system of detecting earthquakes and preparing people can help prevent deaths and reduce the damage caused in the event of an earthquake.
- Eg, The Pacific Tsunami Warning Centre in Hawaii monitors earthquakes and possible tsunamis occurring in the Pacific Ocean through a network of underwater sensors.
- Evidence of its usefulness – it saved many lives when the earthquake took place in Haicheng, China in 1975.
- Limitation: its effectiveness is limited as authorities may choose to ignore the warnings to avoid disruption to business and tourism. This is because the predictions of the scientists are not always accurate and may turn out to be false alarms.

Use of technology to predict and monitor tectonic activities

- **Estimate earthquake probabilities** through studying history of large earthquakes and measuring rate of strain accumulation in rock & time required to develop into an earthquake.
- **Use more seismic instruments** to monitor **frequency of Earth's vibration** and detect development of tsunamis.
- Help people evacuate before disaster strikes.
- **Efforts to monitor & forewarn people effective to certain extent.**
- The Pacific Tsunami Warning Centre has been set up in Hawaii.
- The **Indian Ocean earthquake in 2004** detected and warning issued 15 minutes later by Pacific Tsunami Warning Centre.
- However, **officials in Jakarta lacked basic equipment e.g. telephone lines to relay warning signals on time.**
- This resulted in **immense destruction to lives, crops & properties in seaside villages of Sumatra** swallowed by gigantic tsunami waves.
- **Effectiveness of above constrained by shortage of funds & technology** in developing countries.

Building Designs

Construction of earthquake-resistant buildings

- construction of such buildings **expensive & not easily affordable**
- due to **corruption** in certain countries, **required standards not met.**
 - o For eg in **May 2008, 7.8 magnitude Sichuan Earthquake in**
 - o China, many building esp schools collapsed burying several
 - o hundred thousand lives. This could be due to
 - o **corruption, shoddy work** on part of officials & contractors & **non-affordability** to
 - o use expensive building materials
- However, in more developed countries high-rise buildings use **flexible steel frames** while smaller buildings use **concrete frames with reinforcing bars** to absorb impact of earthquakes.
- Tall buildings to be built **on solid bedrock.**
- **Fire-resistant materials** to be used.
- Construction of earthquake-resistant buildings **effective** esp in developed countries like USA & Japan

- Eg **1989, magnitude 7.1 San Francisco Bay Earthquake** struck, the **48-storey-high Transamerica Pyramid Building** shook for about a minute but **undamaged** and no serious injuries occurred.

Use of technology to prevent fire hazards

- Electronic systems to cut off electricity & gas supplies automatically during earthquakes to prevent fires caused by 'live' wires or bursting gas pipes.
- Above **measure possible & effective in developed earthquake-prone countries** like USA & Japan.
- Eg in **1995 7.2 magnitude Kobe Earthquake** in Japan, although thousands were buried under collapsed buildings, **no record of deaths due to fire**.
- However, **2003 6.6 magnitude Bam Earthquake in Iran**, thousands not only buried but burnt to death. Bam was like war zone with smoke rising from collapsed buildings.
- Developing countries **lack technological expertise & financial resources** to conquer fire hazards

Education

- **Earthquake drills** to be taught & carried out in schools, offices & homes on regular basis.
- This may be effective in developed countries which have **proper planning & management skills**. Besides, good infrastructure provides access to people who being literate have awareness & positive attitude towards drills.
- Example, annual nation-wide drills are often conducted in Japan.
- In 2004, more than a million Japanese took part in drills during the Anti-Disaster Week.
- Japan is hence well prepared to enforce earthquake emergency plans & relief coordination.
- However, in **developing Indonesia, poor infrastructure hampers access** to people living in scattered remote villages.
- Besides, government officials may **lack proper planning & management** required in conducting drills while **people lack awareness** of significance of drills.

Section B: Answer one question from this section.

- 3(a) Study to Fig. 6 (Insert), which shows the average daily food consumption of an average person in Somalia and United States of America (USA).

- (i) Compare the average daily food consumption of an average person in Somalia and USA. [4]

Somalian	America	
Daily calories: 1965	Daily calories 3641	[1]
Largest food type: Grains, 38%	Largest food type: Sugar & Fats, 37%	[1]
Second largest food type: Sugar & Fats, 25%	Second largest food type: Grains, 22%	[1]
Dairy & eggs, 25%	Dairy & eggs, 14%	
Smallest food type: Meat, 7%	Smallest food type: Meat, 13%	[1]
Produce, 4%	Produce, 8%	
Others, 1%	Others, 6%	

- (ii) Suggest possible reasons for the differences in the average daily food consumption between an average person in Somalia and USA. [5]

- People in DCs **generally earn higher incomes** and hence they have more disposable income (more purchasing power) as compared to people in LDCs. This will mean that the people in DCs can afford a larger quantity and larger variety of food (beyond the staple food) as compared to LDCs.
- Other than disposable income, another reason that can account for the variation in types of food consumed is the **accessibility of food**. Generally there are greater accessibility of food in DCs due to the more developed transportation networks there as compared to LDCs where the transportation networks are less developed. Thus food is more readily available in DCs.

- **Food supply in DCs are also more stable** as compared to LDCs. Food security is more prevalent in DCs due to technology, government and the resources available. For example, DCs such as America can increase food production easily using higher technology or import from other countries whereas LDCs such as Congo, Ethiopia do not have the means to ensure food supply.

- **Globalisation** has also explained the larger variety of food in many developed countries and rapidly developing countries whereas some LDCs such as North Korea do not welcome foreign investments and hence the variety of food is lesser.

- (iii) Explain how the daily food consumption pattern of an average Somalian may affect Somalia as a whole. [4]

- Low food consumption may leads to high infant mortality rate – less population in workforce later – contribute less money to the economy
- Physical and mental development in toddlers – more medical expenses – higher demand for medical services which country has to provide
- Learning difficulty in children – lack of talents to contribute to country's development
- Adults – illness – cannot work – contribute less to economy – dependent on welfare by the government
- Lack of food and medical – people are generally weak and hence less productive in their work and slow down the economy

- (b) Explain how social factors may reduce food production in the long run. [4]

Land fragmentation:

- Involves a father dividing his land among his children as inheritance
- Over many generations, the resultant plots may become very small and there is limited output.
- Unprofitable to use expensive machines on small plots of land → productivity and hence output lower.

- (c) 'High yielding variety seeds is the most important factor in green revolution in bringing about an increase food production.'

To what extent do you agree with this statement? Support your answer with examples. [8]

- High Yielding Varieties (HYVs) are improved strains of crops, developed through cross breeding, such as rice, corn, wheat and other cereals that are **resistance to pest and diseases** or have the ability to grow in a shorter period of time, allowing **more crops to be grown in a year**.
- For example, **High-yielding varieties (HYVs)** such as IR8 were grown in **India**. From 1970 to 2010, rice production multiplied by more than two times, while wheat production multiplied by more than four time, increasing the income of local farmers.
- Chemical fertilizers are applied to the soil on farms to replace the nutrients that have been used up in growing crops. By applying fertilizers, farmers do not have to let farmland fallow to regain soil fertility naturally and more crops can be grown on the land in a year.
- For example, the use of fertilisers with HYV IR8 has increased the annual rice production in the **Philippines** from 3.7 to 7.7 million tonnes in two decades. The switch to IR8 rice made the Philippines a rice exporter for the first time in the 20th century.
- Large-scale crop production usually involves one type of crop over a large area. This makes the crop very vulnerable to pests. Pesticides are used to kill pests that may destroy crops that will decrease crop yields.
- For example, Chemicals such as fertilisers can also help to provide nutrients to the soil and pesticides can be used to kill insects and other animals that destroy crops. Eg The pesticide, Malathion, used in 1980s, can address a fruit fly problem in fruit orchards in California, USA.

- By supplying water to areas that are usually too dry for farming, irrigation has increased the amount of arable land worldwide. Also irrigation allows crops to be grown throughout the year in areas that experience seasonal rainfall.
- For example, irrigation has helped to increase the amount of arable land in Libya. The Great Man-made River is a network of underground pipes, canals, wells, reservoirs and tunnels that draw water from underground aquifers deep in the cities of Libya for agriculture. It has made growing of crops in Sahara Desert possible, increasing the income of local farmers.
- Mechanization speeds up the process involved in preparing the land, tending to crops and harvesting. This allows the crop to be harvested more quickly and efficiently, and enables farmers to harvest larger amounts.
- Use of computers in Singapore's high-tech farms allows fewer workers needed to grow crops on the farms.

Limitations

- Waterlogging
 - o Extensive irrigation can cause too much water to seep into the soil, causing it to be over-saturated
 - o Roots get deprived of air and die
- Salinisation
 - o Irrigated water that evaporates leaves salts behind in the soil
 - o Also when there is lack of proper drainage, groundwater rises to the surface, bringing up dissolved salts from the ground
 - o Soil that is too saline is bad for plants
 - o Eg Victoria, Australia, salinisation happens due to tree clearing and irrigation. Waterlogging and salinization are also observed in the Murray-Darling Basin in Victoria, Australia.
- Eutrophication
 - o Extensive use of fertilisers and pesticides causes concentration of chemicals in the soil
 - o Over time they seep into groundwater, and eventually water bodies, contaminating them
 - o Excess nutrients causes algae to grow on the surface of the water, forming algal bloom
 - o This depletes oxygen in the water and blocks out sunlight, eventually killing aquatic life

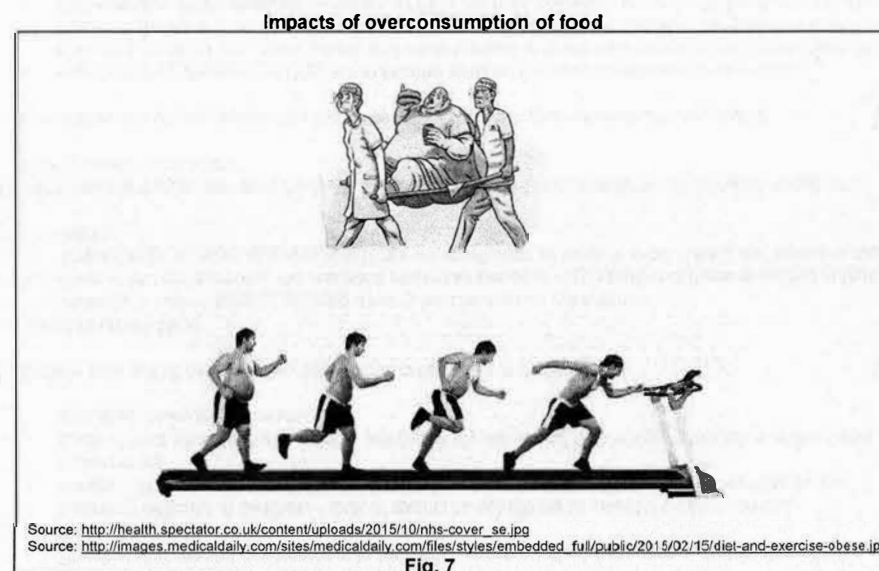
Level 1 (1-3 marks)	Level 2 (4-6 marks)	Level 3 (7-8 marks)
At this level, answers are generalized or have minimal support, if any stand was given at all. Reasoning is weak and expression may be unclear. Answers are basic with little development. Answers show no or little attempt at indicating the effectiveness of the responses.	The successes or limitations of each response are supported by appropriate detail. Alternatively, both successes or limitations are considered, but support is patchy and the answer is not complete. Good reasoning and logic in parts of the answer with good expression in places. Some attempt is made to explain the successes and limitations of the responses.	At this level answers are comprehensive and supported by sound knowledge. Both successes and limitations are considered and well supported. Reasoning is clear and logical with good expression of language. Examples or other evidence to support answers are extensive. There are detailed descriptions with comments on the successes and limitations of the responses.
1-2M: Incomplete with no examples, but with some evidence of elaborated points.	4-5M: 2 Examples with fairly good elaboration and explanation.	7M: 3-4 Examples with good and clear, detailed elaboration and explanation.
3M: Essay with elaboration/explanation but no examples.	6M: 3 Examples with fairly detailed elaboration and explanation.	8M: Includes a well constructed conclusion that links back to the question that summarises the big idea in the question.

4(a) Explain how physical factors play a part in food production.

[4]

- Small farms (less than 2ha)- lower productivity
- Unpredictable weather that will affect quality of crops
- Poor quality of soil (desertification, pollution, soil erosion)
- By supplying water to areas that are usually too dry for farming, irrigation has increased the amount of arable land worldwide. Also irrigation allows crops to be grown throughout the year in areas that experience seasonal rainfall.
- Climate change
 - For example, glaciers are expected to melt entirely by 2035. In the Himalayas, the melting of all glaciers would affect China and India as it provides water for the main rivers in these countries. These river basins provide water for irrigation.
- Extreme weather events
 - Cyclone Yasi has led to half of Australia's state crops to be destroyed in 2011.
- Pests
 - In Liberia, a state of emergency was declared in 2009 when tens of millions of caterpillars invaded the country and devoured all plants and food crops.

(b) Study Fig. 7, which shows the impacts of overconsumption of food.



Assess the impacts of overconsumption of food.

[4]

- Consumption of a high level of calories are accumulated in his body and stored as extra energy. This will likely result in weight gain in the long term and become obese in the long
- Can cause coronary heart disease if the blood vessels are clogged up by fat/cholesterol deposits.
- Increase spending on healthcare especially for the elderly
- Create an industry in weight loss and diet centres as well as books and workshop on losing weight
- Create jobs in weight loss industry such as gym membership and personal trainers.

(c) Study Fig. 7 (Insert), which is a world map on the spread of Zika virus.



(i) Describe the spread of Zika virus from 1960 to 2016.

[5]

- First appeared in Nigeria in human
- 10 years later, spread to Asia in countries such as Pakistan, India, Malaysia and Indonesia
- Became an epidemic in 2007 on island of Yap and Micronesia and in 2013 epidemic on French Polynesia
- 2014 – 16, appeared in Northern Brazil and spreads through the Americas
- The spread is expansion diffusion in specific region as it reached an epidemic level. [R1]
- Through relocation diffusion, Zika virus is spread from Africa to other parts of the world such as Asia, Central America and South America. [R1]

R1 – Reserve 1m

(ii) With reference to Fig. 7 and other information, explain the challenges in managing the spread of infectious diseases.

[4]

- 1) Education level – people are not aware of how the disease can be transmitted thus people become more vulnerable eg. Nigeria – sex is a private subject – not discussed – resulting in lack of sexual awareness
- 2) Social Stigma – is society severe disapproval of a person because of HIV/AIDs – which may lead to lost / lack of employment opportunities, refused access to health care facilities, rejection from families and community – due to such prejudice and ignorance about how HIV is transmitted, early intervention of the disease is hindered
- 3) Lifestyle choices – certain lifestyle choices may increase the risk of being infected with HIV – sharing of needles, drug injection, and refusal to use condoms
- 4) Lapses in medical practices
- 5) Mistakes, corruption and negligence associated with medical practices contributed to the spread of HIV – estimated that 5 to 10% of HIV infections were transmitted by blood transfusion tainted with

blood donated. – Many sub Saharan nations are very poor and medical facilities are inadequate, High cost of medical treatment

- 6) Economic factors – poverty, engagement in vice trades and mobility
 - 7) Vice trades – illegal drugs and commercial sexual activities – poor LDC – woman can only find employment in low pay and no job security – resort to commercial sex work due to lack of viable options – thus more vulnerable to HIV
 - 8) Mobility – certain jobs where man is separated from family – miners, truck driver or even an executive overseeing operations then to have more mobility or live in a foreign land. They could potentially lead to risk –taking behavior and put themselves at risk of getting infected with HIV
- (at least 3 points with elaboration, max 5 marks)

(d) Many people in both developed countries as well as in less developing countries still hold inaccurate beliefs about HIV/AIDS.

Evaluate the roles of individuals as well as the communities in managing the spread of HIV/AIDS.

[8]

Individual involvement

- Individuals can take action to help manage the spread of infectious diseases when they are aware of what these diseases are and the conditions which favour their spread. For example being aware about hand, foot and mouth disease (HFMD) outbreaks in a community could make individuals more mindful about their own hygiene. Individuals may also become more aware of the likely ways the disease can be transmitted.
- Individuals can exercise social responsibility. Examples of these include being constantly aware of unsanitary conditions or conditions which make it conducive for diseases to spread. This allows individuals to take precautionary measures against infectious diseases.

Points about human behaviour

- Lifestyle choices
 - Lapses in medical practices
 - Vice trades
 - Mobility of people
 - Increased globalisation
- Some infectious diseases are spread because of poor human decisions like sharing of drug needles and unsafe sexual practices
 - People choose to participate in vice trades or indulge in commercial sex workers while on the job (truck drivers etc) putting themselves at risk of contracting infectious diseases
 - People travel around on planes and thus act like vectors to transmit diseases between countries (SARS, MERS outbreaks etc)

Community involvement

- Communities can work together to control diseases by introducing possible disease control strategies
- Deciding when and where strategies will be implemented and by whom and
- Engaging health workers to train and monitor members
- Community groups have mobilised individuals of the local communities to take action themselves
 - o e.g. The AIDS Support Organisation (TASO), a service organisation providing HIV/AIDS health care services as well as emotional and medical support to HIV-positive Ugandans.
 - o Run by 16 volunteers who have been personally affected by HIV/AIDS

Conclusion:

In reality, individual responsibility is indeed the most important factor but also the most difficult goal to achieve, which results in why infectious diseases are so difficult to eradicate. Society is

simply too culturally diverse and different groups of people will respond differently to advice, education or to what their authorities advocate – making the idea of everyone being responsible for themselves almost impossible. Being humans in such a complex network, there will always be room for errors and irresponsible ways of living and thus the hopes of eradicating infectious diseases globally remain one of mankind's big challenges.

Level marking	Description
Level 1 1-3 marks	At this level, answers will be generalised or with minimal support if any stand were given at all. Reasoning rather weak and expression may be unclear. A basic answer that has little development. <i>Award 1-2 marks if students briefly describe the role of individuals or communities in management of diseases.</i> <i>Award a max of 3 marks if students are able to describe and explain the role of individuals and/or communities in management of diseases.</i>
Level 2 4-6 marks	At this level answers will contain some appropriate detail. The content will lack balance and some relevant detail. This means that only effectiveness or ineffectiveness are considered. Different roles are considered, but support is patchy so that the answer is not full. Assessment may be given but may be general in nature. <i>Award 4 marks if students are able to describe and explain the role of individuals and/or communities in management of diseases (with examples).</i> <i>Award 5 marks if students are able to describe and explain the role of individuals and communities in management of diseases (with examples).</i> <i>Award 5 marks if students are able to provide simple limitations (without examples).</i> <i>Award 6 marks if students are able to provide some limitations that are clearly explained (without examples).</i>
Level 3 7-8 marks	At this level answers will be comprehensive and supported by sound knowledge. There will be assessments of the extent to which efforts were effective, i.e. considering both effectiveness and ineffectiveness of international organisations. Examples will be explained in detailed in the answer. <i>Award 7 marks if students are able to provide of individuals AND communities that are clearly explained (with examples).</i> <i>Award 8 marks if students are able to hit L3/7m and provide a strong conclusion that shows whether individuals AND communities play the major role in management of diseases.</i>