Answers
Test 1 – Hazards and Their Context

1. a. 4 marks
Allow any suitable locations for each event, such as in tectonically active areas for volcanoes and earthquakes (do allow hotspots too), tropical storms in regions between 5° and 30° latitude (north and south), and wildfires in locations such as the USA, savannas and grasslands of Africa and South America, Australia, etc.

   b. 4 marks
   - Tectonic activity and volcanoes usually occur at plate margins (1 mark), where the plates move past each other allowing friction to build (1 mark), magma wells up where plates move apart (1 mark), if rock is destroyed where plates collide (1 mark).
   - Tropical storms occur between 5° and 30° latitude (north and south) (1 mark), where warm seas create enough moisture (1 mark) and the Coriolis force is sufficient (1 mark).
   - Wildfires often occur in hot and arid grasslands (1 mark), but also occur in forests, where fuel is abundant, and lightning strikes can set the trees ablaze (1 mark).

2. 3 marks
Natural hazards endanger people's life and property (1 mark).

Characteristics include (1 mark each):
- Usually difficult to predict, or give little warning.
- Impacts are predictable and characteristic of the type.
- Many of the deaths and effects are secondary.
- Most people don't choose to live in areas affected by the hazard.
- Any other valid point(s).

3. 6 marks
Allow any six points, or three developed points.
- Cultural beliefs may be different between countries, e.g. acceptance (or even within a country between different socioeconomic groups).
- Different levels of forecasting, protection and preparation types.
- Resilience may be higher in developed countries.
- Some people may have fewer choices of where they are located within some countries.
- Residents in developing countries may feel as if they have less control.
- Levels of fear and fatalism are likely to differ between developed and developing countries.
- Any other suitable point(s).

4. 4 marks
Fatalism is the notion that events cannot be controlled (1 mark), and, therefore, only safety measures for the occurrence of an event may be implemented (1 mark), rather than adaptation – where events are planned for (1 mark), and help protect against the effects of a hazard (1 mark).

5. 2 marks
- Education of the public
- Shelters
- Evacuation plans
- Sufficient supplies, food, water, sanitation, etc.
- Any other valid example(s)

6. 4 marks
Allow one mark per point, or two marks for explained points.
- Education of the public so that residents understand the effects and can successfully prepare for and cope with the events.
- Shelters and evacuation centres allow residents shelter should the hazard occur, allowing for safe places to stay, which have supplies of essential goods for healthy life, including food, water, blankets, sanitation, etc.
- Plans and rehearsals in preparation allow organisers to highlight any problems which can be resolved, allowing smoother action during a time of crisis.
- Communities may be better suited to prepare than national-scale incentives, for they are likely to have a better understanding and knowledge of their local population and area.

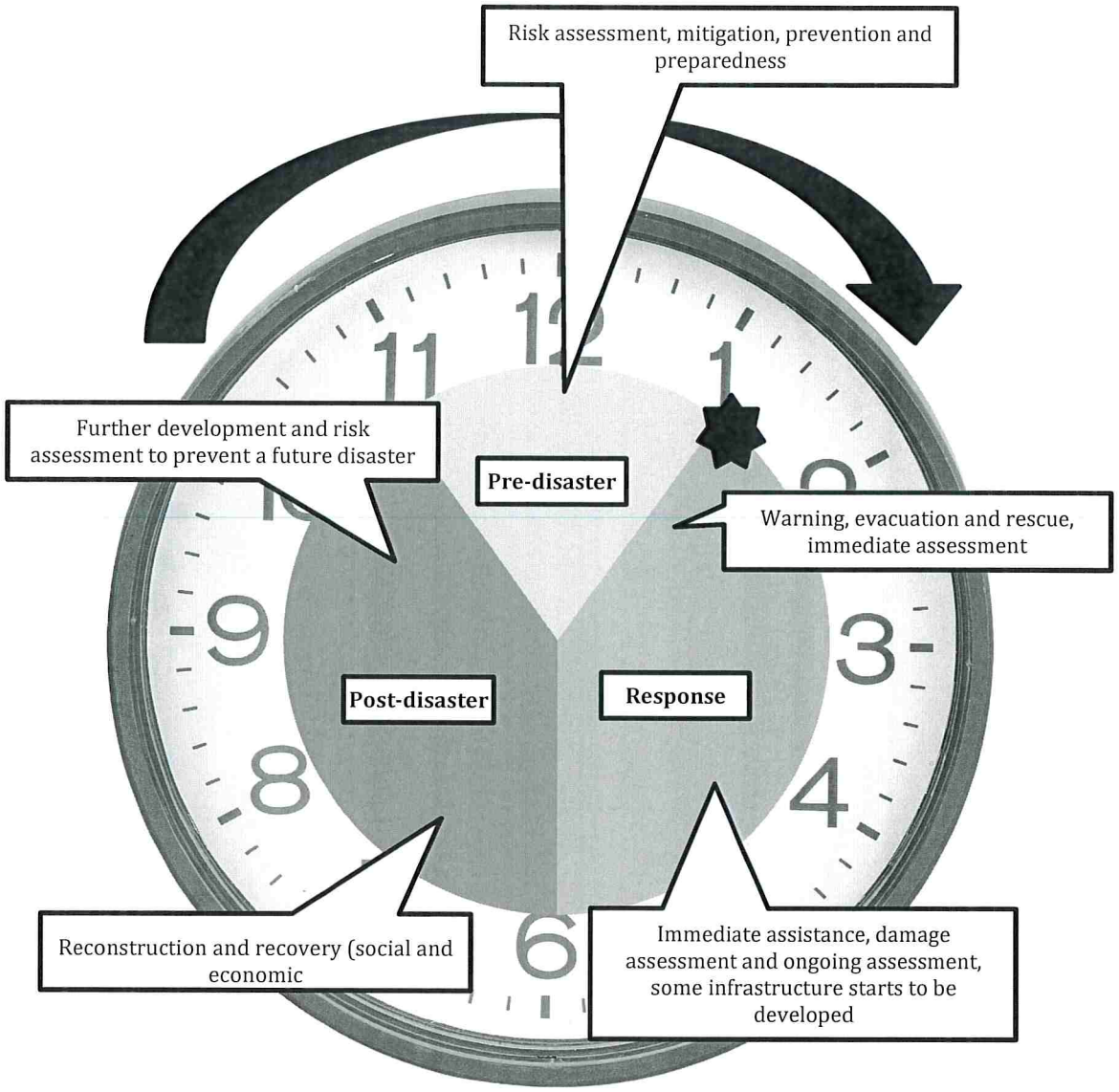
7. 2 marks
   Allow any two from the following: (1 mark each)
   - Individuals
   - Local community
   - Local government
   - National government
   - International community, such as governments and charities

8. 4 marks
   Allow a compassion between the developed and developing world – such as the availability of funds for preparation, and the level of technology available. For example, forecasting in some developing countries may be less advanced than a developed country, and spreading word of a developing hazard may be difficult if communication networks are poor, or the country has a low uptake of televisions, phones, Internet and social media, etc.

9. 1 mark – The Park Model
   Plus any 5 further marks:
   - Disasters quickly reduce the quality of life (1 mark), as services are unavailable, residents' property is damaged and injuries and fatalities occur (1 mark each).
   - Disasters cause a reduction in economic activity (1 mark) – as workplaces are damaged, communications and transport capability are reduced, and the workforce may be unable to travel to work (1 mark each).
   - Immediately after the disaster, relief efforts take place (1 mark) to rescue trapped people, provide immediate aid, healthcare, etc. (1 mark each).
   - Later comes the rehabilitation, after the quality of life, etc. has reached its lowest point (1 mark). Once rehabilitation takes place, quality of life and economic output increase once again (1 mark).
   - Rebuilding to normal (or sometimes as an improvement from before – build it back better schemes, lessons learned, etc. (1 mark) takes a long time – sometimes years to fully recover from large events (1 mark).

10. 3 marks
    The level of recovery is of course dependent on the socioeconomic status of the country, the level of preparation and the type of event. However:
    - Rapid onset events may lead to a small reduction in quality of life, but improve life quality after the recovery.
    - Slow onset events may have the largest impact on quality of life, and recovery may be limited.
    - Onset speed in between the two may reduce quality of life to a medium degree, and it may return to normal afterwards.

11. 8 marks



Allow any two points from the list below (1 mark each):

- Sometimes, media coverage could start before the event – such as the increased seismic or volcanic activity, covering warning, preparation and evacuation, etc.
- Most of the coverage occurs immediately after the event.
- Coverage trails off in the weeks after the event.
- There may be some coverage on the anniversary of the event – e.g. 6 months, 1 year, 10 years, etc., especially if the event is particularly significant.

Extension Question

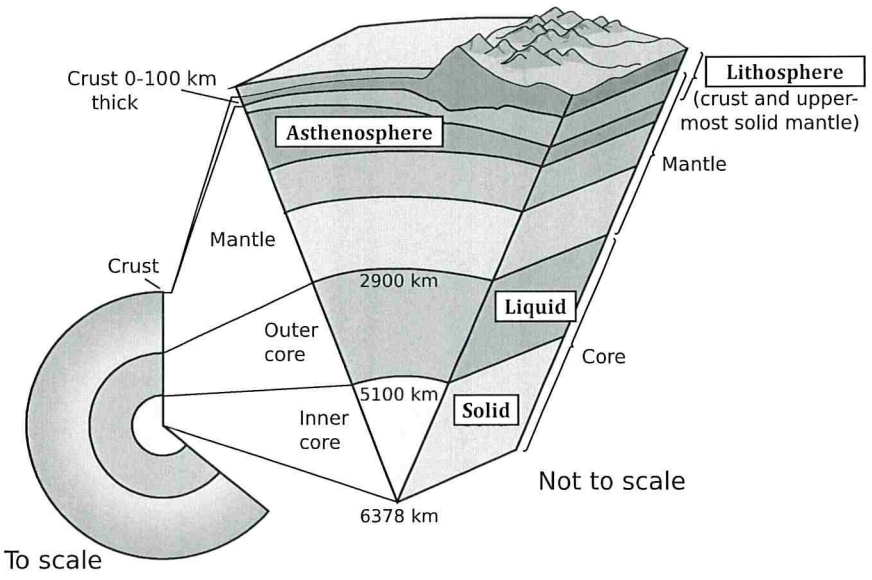
12. 9 marks

Allow any suitable conclusion, supported by a detailed discussion, based on:

- The level of economic development in countries, communications.
- The level of domestic expertise, or the reliance on the international community.
- Level of communication between departments.
- The amount of money that is available to spend on shelters and the stockpiling of relief supplies.
- The quality of housing and infrastructure before the event.
- Any other valid suggestion(s).

Test 2 – Plate Tectonics

1. 2 marks
Allow one mark per each two correct answers.

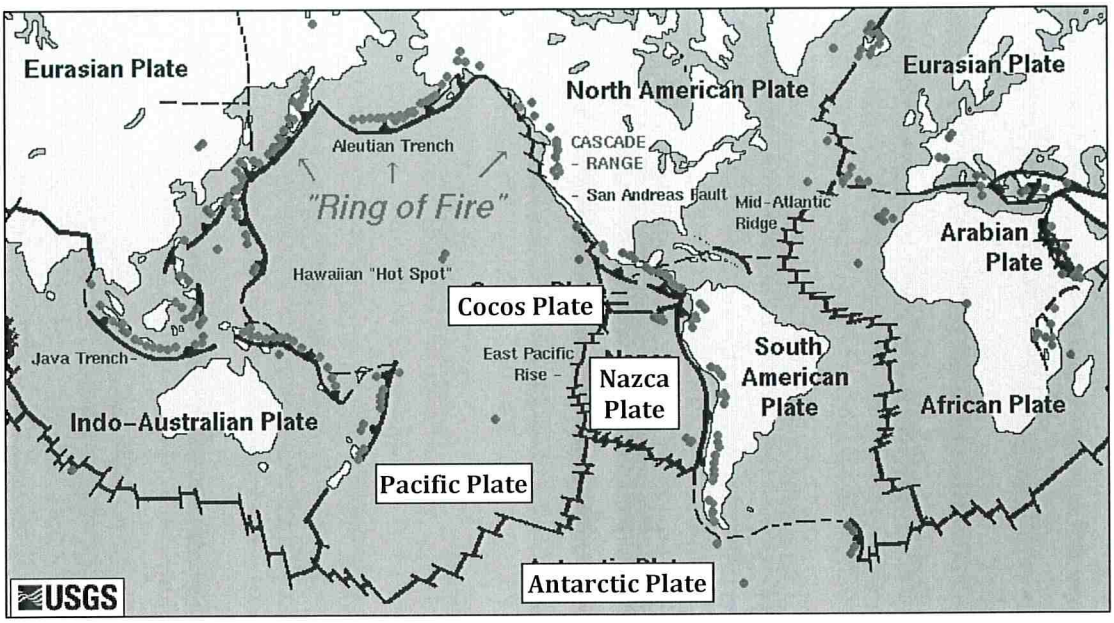


2. 5 marks

Crust	• Contains 'light' elements (e.g. aluminium, sodium, potassium, silicon and oxygen). • Thicker under continents, thinner for oceanic. • Made from igneous rock (e.g. basalt), but with younger sedimentary rock overlain.
Lithosphere	• Rigid. • Forms the tectonic plates. • Fairly cool.
Asthenosphere	• Partially molten. • Plates float above.
Mantle	• Some semi-molten, some molten. • Some lighter elements. • Silicate rock. • Convection currents can help move plates.
Core	• Made of iron and nickel. • Made of heavier elements which sank to the bottom. • The outer core is likely to cause the Earth's magnetic field.

3. 2 marks
- Heat left over from the Earth's formation.
- Radioactive decay of elements.
- Friction caused by the sinking of heavy elements.

4. 2 marks
Allow one mark per each two correct answers.



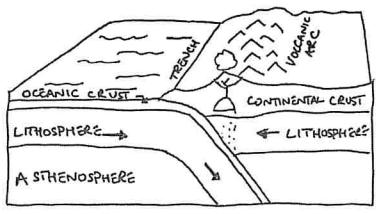
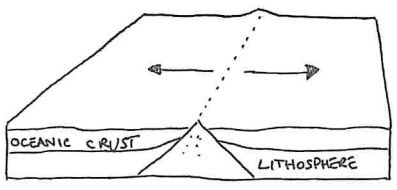
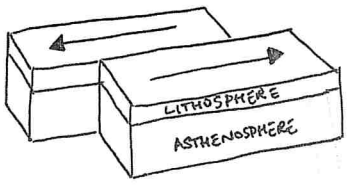
5. a. 1 mark
Alfred Wegener (accept Wegener).

b. 4 marks
The following geological and biological evidence at the time was (one mark each):
- Some of the continents appeared to fit together (allowing for deposition and erosion).
- Similar geology and rock formations are found between the continents.
- The same coal deposits have been found on different continents.
- Fossilised remains of the same organisms are found on different continents.
- Allow reference to named locations.
- Don't allow magnetic striping, as this was not yet discovered.

c. 4 marks
- The Earth's magnetic field switches polarity on a fairly regular basis.
- As plates diverge, new land is formed.
- As the lava cools, iron within the new crust aligns to the polarity of the day.
- Paired bands of alternating polarity move away from the ocean ridge.
- The further away the band is from the ridge, the older the rock.

d. 1 mark
(Although new land is created at constructive plate margins), the same amount of land is destroyed (subducted) at destructive plate margins.

6. 6 marks
The diagrams do not need to be as elaborate as the three shown here.
Award marks for the correct placement of arrows, corresponding to the correct label.

		
Convergent (destructive) boundary	**Divergent (constructive) boundary**	**Conservative boundary**

7. 10 marks

Feature	Type of Plate Boundary	Explanation
Young fold mountains	Collision	Two continental plates converge, but as both are the same density, land is elevated.
Rift valleys	Divergent (constructive)	Two continental plates pull apart, meaning that land drops downwards.
Ocean ridges	Divergent (constructive)	As the two oceanic plates move apart, lava erupts from the fissure, forming the ridge of new land.
Deep sea trenches	Convergent (destructive)	Upon collision of oceanic and continental plates, the denser oceanic crust is forced downwards.
Island arcs	Convergent (destructive)	As a plate is subducted, it melts and the less-dense magma rises to the surface.

8. 3 marks
   - Constructive – magma emerges to fill the void.
   - Destructive – melting plate increases the magma supply locally.
   - Conservative – no land is created or destroyed, there is no gap to fill or additional magma.

Extension Questions

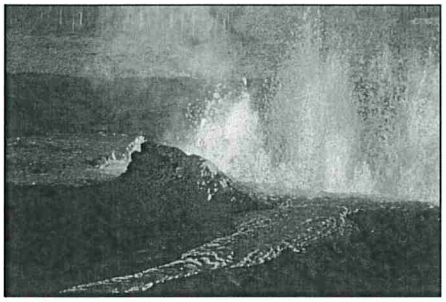
9. 6 marks
   While it was initially believed that convection currents were responsible for plate movement (1 mark), there are now additional proposed ideas of what occurs at plate boundaries (1 mark). These include slab pull (1 mark) and ridge push (gravitational sliding) (1 mark).

   Convection currents occur because hotter material at depth is less dense and, therefore, rises (1 mark). The hot magma, therefore, exerts a force on the plates, causing them to move (1 mark). The magma cools near the surface (1 mark) and sinks once again (1 mark). Heat from the core warms the magma once again and the cycle is repeated (1 mark).

10. 4 marks
    Allow a well-supported theory, such as a discussion of the types and characteristics of features at each type of margin. For example, volcanoes are likely to be more explosive at destructive margins, and earthquakes more severe than at constructive margins.

Test 3 – Volcanic Hazards

1. 10 marks



Type of plate boundary	Divergent (constructive)	Convergent (destructive)
Eruption type	Effusive (accept gentle)	Explosive (accept violent)
Types of risk (two per photo)	Lava flows Projected incandescent material Volcanic gases	Ash fall Pyroclastic flows Mud flows (lahars) Volcanic gases
Eruption frequency	Frequent	Infrequent
More or less hazardous?	Less	More

2. 2 marks
Allow one mark each:
- (Andesitic) lava from melted crust is less viscous than basic lava from within the mantle.
- Greater pressure can build than at constructive margins
- Water can be subducted along with crust, which generates steam.

3. 5 marks
Both are caused by underwater plate margins (1 mark).

Oceanic ridges are found at constructive margins (1 mark) as upwelling magma pushes the plates upwards, creating new land (1 mark).

Island arcs are found near destructive margins (1 mark), caused by underwater volcanic eruptions as plutons reach the surface (1 mark)

4. 4 marks
Rift valleys are created where continental crust moves apart (1 mark); in the case of the East African Rift Valley, this refers to the Nubian and Somalian plates (1 mark). The crust fractures and falls (1 mark). This thinner crust allows magma to rise to the surface (1 mark), allowing the formation of volcanoes.

5. 4 marks
The newest island is Hawaii, on the bottom right of the map (1 mark).

The islands are formed away from plate margins at an area called a hotspot (1 mark).

A plume of hot magma rises to the surface and melts through the overlying crust, forming a volcano, which reaches the surface to form an island (1 mark). The plume remains in the same position (1 mark), but the plate above moves (1 mark), forming a line of islands as old islands become dormant as their magma source is removed (1 mark).

6. 2 marks
Primary hazards are caused by the eruption itself (1 mark), while secondary hazards are a result of the primary hazards (1 mark).

7. 2 marks
Nuées ardentes (1 mark) because these are clouds of superheated ash and gases produced during the eruption (1 mark) (as opposed to the others which are caused by water mixing with ash, or as a result of rising magma).

8. 2 marks
Allow any two of the following (1 mark each):
- Respiratory effects
- Roof collapse
- Damage to crops and livestock (famine or malnutrition)
- Damages transport / blocks roads / grounds aircraft
- Component in pyroclastic flows and lahars also can be volcanic bombs.
- Can cause temporary darkness.

9. 2 marks
- Temporary cooling effect (1 mark) from dust and sulfur ejected high into the stratosphere reflecting sunlight (1 mark).
- Some CO_2 produced (1 mark), a greenhouse gas (1 mark) (warming), but only a small amount and offset by cooling effect.
- Do not credit reference to acid rain.

10. 2 marks
Allow two marks for an explained example:
- Effective monitoring and warning systems to allow evacuation.
- Planning and land-use zoning, to prevent residents from living in particularly hazardous zones.
- Diversion of the lava flow away from settlement, such as by cooling the lava with water, using mounds of material, digging trenches, or using explosives.
- Dams can be used to hold material from lahars, so that settlements are not reached.

11. 6 marks
Indicative content includes:
- Size of the eruption (Volcanic Explosivity Index, VEI).
- Many of the effects, such as lava flows, earth tremors, and volcanic gases, are felt in close proximity to the volcano.
- Pattern of ash fall, which is heaviest near the crater.
- Large-scale events can affect the whole globe, such as cooling and crop failure from ash (e.g. the 1816 effects of the eruption of Mount Tambora), or tsunami induced by volcanic eruption, or the danger to transport from large-scale ash eruptions (Eyjafjallajökull, Iceland, 2010).
- Discussion of the transition from primary to secondary effects and timing.
- Discussion of active, dormant and extinct volcanoes.
- Discussion of risk and the attractiveness of farming on the rich volcanic soils.

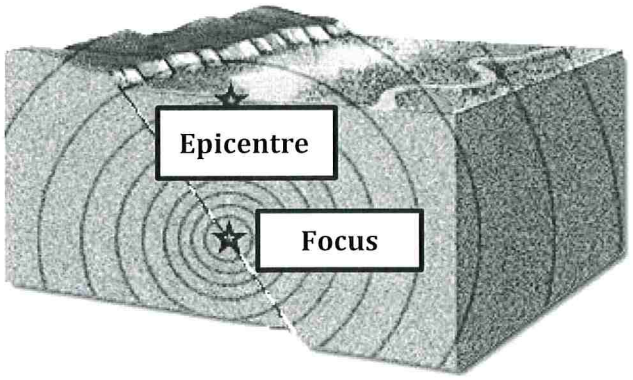
Extension Question

12. 9 marks
- Allow a detailed discussion on any of the techniques used in the diagram, and warning and evacuation methods.
- Discussion of the primary and secondary effects, social, economic and environmental effects.
- Discussion of the effects between the developed and developing world.
- Discussion of eruption cycles as pressure builds, volcanoes that are due to erupt, yet a fixed date cannot be determined.
- Discussion of unpredictability.
- Use of exemplar material.
- Allow any suitable well-supported conclusion.

Test 4 – Seismic Hazards

1. 2 marks
The sudden shaking of the ground (1 mark) as built-up pressure subsides (1 mark).

2. 2 marks



3. 2 marks
Shallow earthquakes, which are closer to the Earth's surface (1 mark), are the most intense earthquakes (1 mark).

4. a. 4 marks
Allow two marks each:
Destructive: The subducting oceanic crust does not move at a constant rate – at times it gets stuck, allowing pressure to build (1 mark). Occasionally, the pressure is released; the plate shifts downwards in stages (1 mark) – causing the earthquake.

Conservative: The two plates move past each other either in opposite directions, or in the same direction but at different speeds (1 mark). Friction causes pressure to build, which can be released as shallow-focus earthquakes (1 mark).

b. 1 mark
The Pacific Ring of Fire

c. 3 marks
No – there are many earthquakes that occur away from plate boundaries (1 mark), such as on old fault lines (1 mark). It is also thought that human activity can be attributed to earthquakes, such as the result of dam building (1 mark).

5. a. 1 mark
The moment magnitude scale (MMS) (accept M_W or M)

b. 1 mark
The **energy** released by the earthquake.

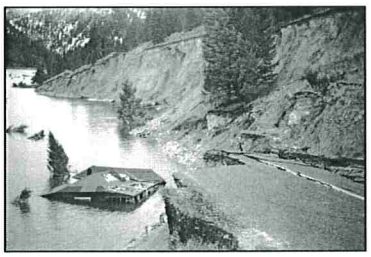
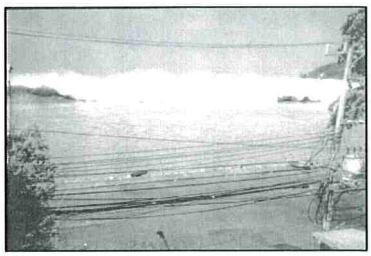
c. 1 mark
The energy released is proportional to magnitude.
Also accept comments such as 'The energy released by an earthquake gets very large, very quickly', etc.

d. 1 mark
The (modified) Mercalli Scale.

6. 4 marks
An earthquake's **primary** effect is the shaking of the ground itself (1 mark), causing land to break apart, altering the surface level and the shape of the ground (1 mark each).

Secondary effects are a result of the shaking ground and primary effects (1 mark). This includes tsunamis (if the earthquake occurred underwater), landslides, liquefaction, damage to buildings and infrastructure, disease and fires. (1 mark each).

7. 6 marks

Effect	Liquefaction	Landslides	Tsunami
Caused by:	The ground loses its internal strength and acts as a liquid, and water is often displaced.	Ground shaking causes slope failure; material flows downhill under gravity.	An underwater earthquake displaces the water column; a wave travels outwards, gaining height in shallow coastal water. Debris can also fall into the sea from a land-based earthquake.

8. 4 marks

Allow any four points or two explained points from the list below:

- New buildings can be built to strict codes, with innovative features of earthquake resistance, such as cross bracing, shock-absorbing foundations, counterbalances, etc., or height can be limited.
- Warning systems can be put in place to inform the public to evacuate.
- Coastal cities can implement tsunami warning systems and defences.
- Existing buildings can be retrofitted with improvements to increase resistance.
- Cities can be zoned to prevent houses or types of buildings to be built in certain places.
- City-wide plans, evacuation centres and community-wide initiatives can be prepared.
- Schools and emergency services can practise responding to earthquakes, to reduce panic during a real event, practice the events, or to learn how to make improvements.
- Planned response of the emergency services to deal with trapped people, fires and the hazards from falling buildings.
- Any other valid suggestion(s).

9. 4 marks

Short-term responses take place in the minutes, hours and days after the earthquake (1 mark) and include search and rescue, providing emergency shelter and aid, burying the dead to stop the spread of disease, etc. (1 mark each).

Long-term responses take place in the weeks, months, and sometimes years after the earthquake (1 mark), and involve repairing and rebuilding homes, buildings and businesses, and economic recovery, etc. (1 mark each).

10. 6 marks

Indicative content could include:

- Exemplar content from examples studied in class or wider reading.
- Distribution of earthquakes.
- Predictability and randomness.
- Financial capability, scientific advancement and the ease to communicate with or warn the population.
- Capability and scope of emergency services.
- Quality and capability of the communication services.

Extension Question

11. 9 marks

Answers should discuss two contrasting examples, such as from the developed and developing world. A suitable conclusion should be drawn, such as the effects tend to be less in the developed world, with speedier recovery and greater domestic expertise.

Suitable discussion topics could include:

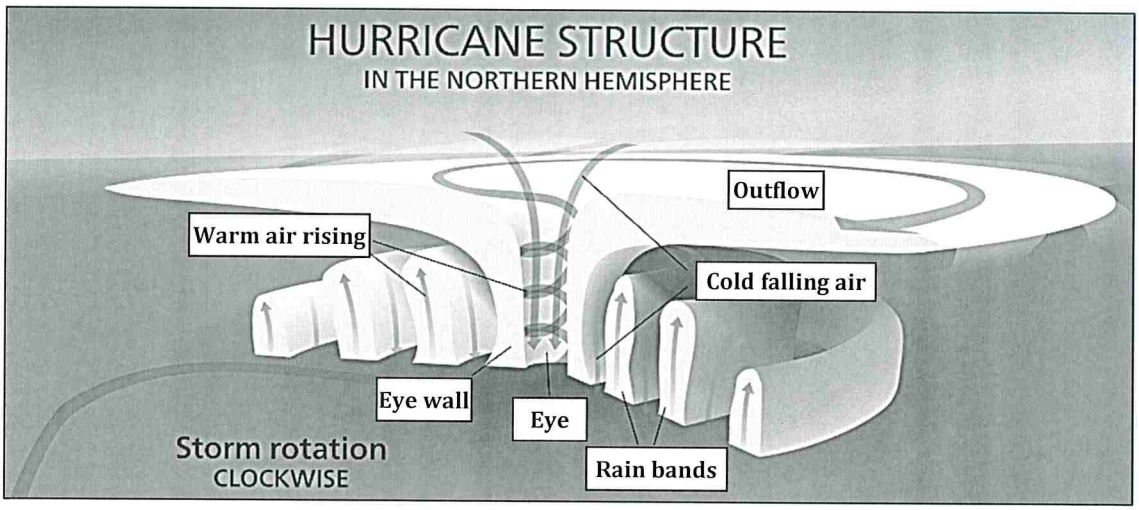
- Discussion of the social, economic and environmental effects.
- Level of preparedness, mitigation, lifestyle, etc.
- Relative damage.
- Reliance on the international community for aid, assistance and expertise rather than domestic capabilities.
- Quality of building stock.
- Population density, urban or rural population.
- Preparation, availability of shelters and supplies.
- The speed of the recovery process.
- The economic sectors most affected.
- Also allow discussion of how the frequency and magnitude of earthquakes can vary between parts of the world.

Test 5 – Storm Hazards

1. 5 marks

Location	Suitable for tropical storms?	Explanation
A	No	Ocean water far too cold – less than the 27 °C needed for hurricane formation, also more than 20° North.
B	Yes	Deep ocean of sufficiently high temperature, between 5 and 20° from the equator.
C	No	Too close to the equator, where Coriolis force is weak.
D	No	Cannot form over land; too little moisture or energy – can only form over deep water.

2. 3 marks
Allow one mark per two correct labels.

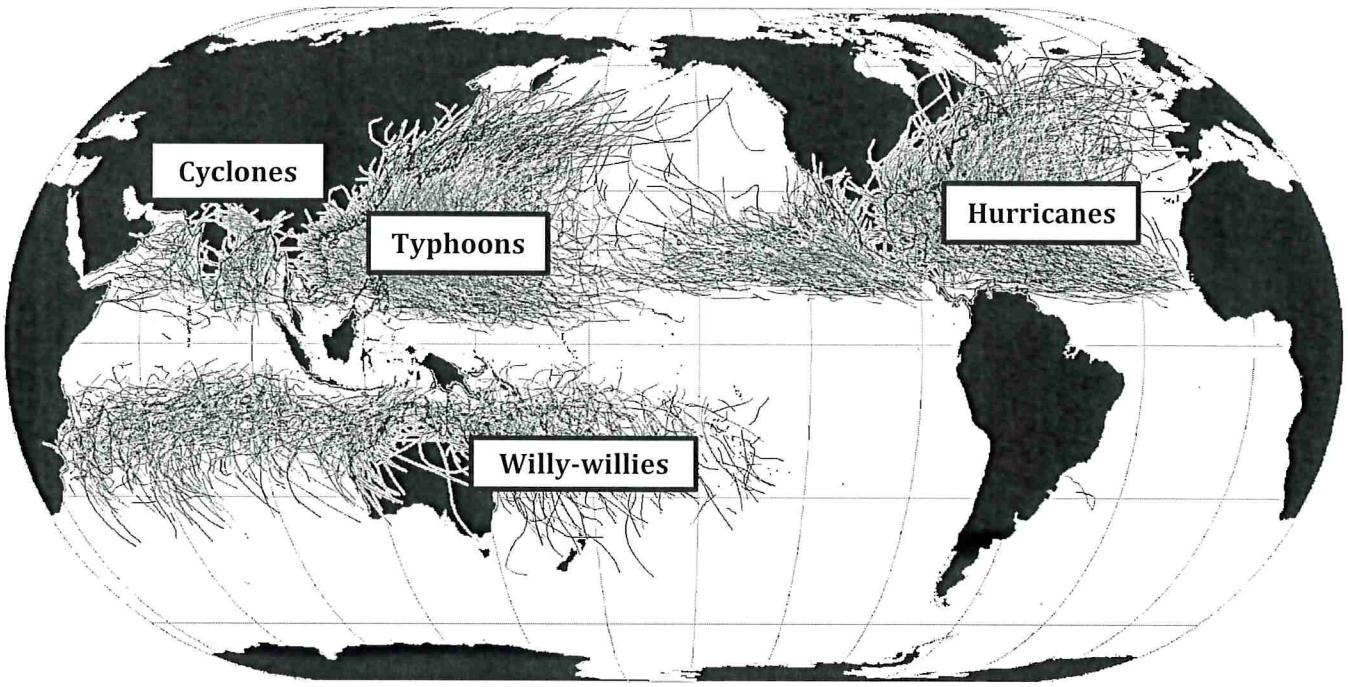


3. 6 marks
- Tropical storms start as atmospheric instability as warm, moist air rises (1 mark) and turn into major storms, hundreds of kilometres in diameter (1 mark).
- Storms gain their strength as they track away from the equator (1 mark) and dissipate far away over land (1 mark).
- Storms develop in the tropics, between 5 and 20° latitude (1 mark), and are powered by warm, moist air rising from deep (70 m), warm (27 °C) oceans (1 mark each), and rotate due to the Coriolis force (1 mark).
- Tropical storms are low pressure weather systems, drawing in warm air at their base (1 mark), which rises where the clouds are seen (1 mark), and descends in the clear areas, including in the eye (1 mark), and spreads out aloft (1 mark).
- Clouds form because the moist air cools and condenses at higher altitude (1 mark).

4. 11 marks

Hazard	Cause (1 mark each)	Effects (2 marks each)
High winds		• Houses and buildings are damaged. • Pylons and phone lines downed, cutting off power and communications. • Trees downed. • Roads are blocked with debris and fallen trees, structures, etc. • Flying debris causes impact damage. • Any other valid point(s).
Coastal flooding and storm surges	Low pressure of the storm helps pick up ocean water so that it piles up as land is approached.	• Coastal areas are inundated, causing drowning and damage to property, land (e.g. crops) and infrastructure – e.g. electrical substations, transport systems, etc. • Any other valid point(s).
River flooding	Heavy rainfall and high overland flow causes rivers to quickly overtop.	• Danger to life and property in close proximity to the swollen rivers. • Damage from floodwater, and displacement of people from their houses. • Any other valid point(s).
Landslides	Saturated soil causes slope failure.	• Damage to houses. • Deaths from being trapped or crushed under debris. • Roads may be blocked and unpassable. • Any other valid point(s).

5. 4 marks
Award 1 mark for each correctly labelled marked up area.



6. 1 mark
Sustained wind speed.

7. 2 marks
Allow discussion of:
Warmer oceans allow more frequent (1 mark) and far larger storms (1 mark); however, larger storms cause greater upwelling of cold water, which could decrease the frequency of storms (1 mark).

8. 4 marks
The conditions needed for storms to develop are known (1 mark) and storms routinely affect certain regions (1 mark). However, the path of storms isn't always predictable (1 mark) – sometimes they can veer off their tracks and affect areas that they were not predicted to affect (1 mark). There is variation in the number and intensity of storms between years, based on ocean conditions (e.g. El Niño) (1 mark). We cannot be certain how storms will be affected in the future due to climate change (1 mark).

9. 6 marks
Indicative content could include:
- Discussion of how tropical storms can be predicted, the agencies involved and the countries with advanced monitoring programs.
- Discussion on planning and practice for storms, drills and evacuation, warning systems and their effectiveness between different parts of the world. The scales on which this can happen, e.g. national down to community wide.
- Discussion of the capital infrastructure that can be implemented, preparation such as shelters; level of wealth and domestic/international expertise.
- Discussion of insurance schemes and differences between different parts of the world.
- Use of exemplar material.
- Supported conclusion, with distinctions made.

Extension Questions

10. 9 marks
- Answers will need to use exemplar material based on two contrasting regions, such as examples based on the countries' level of development.
- A well-supported conclusion must be provided, based on the two or more examples used.
- Allow discussion on the relative and absolute damage between the examples.
- Allow discussion on the effects of the two storms, the speed of recovery and the reliance on the international community, types of aid needed, etc.

Test 6 – Fires in Nature (Wildfires)

1. 2 marks
   Surface fires burn across the ground (1 mark), while crown fires burn through the canopy of trees (1 mark).

2. 4 marks
   - Plentiful fuel supply – e.g. build-up of brushwood.
   - A breeze to help fan the flames.
   - Very dry material – tinder.
   - Thin material that can burn rapidly, or highly flammable material, such as oil-rich eucalyptus leaves.

3. 2 marks
   The fire starts at a small point (1 mark), but spreads outwards in a crescent-shaped ring (1 mark). Most of the flames are at the front, rather than the sides (1 mark), the fire extinguishes itself after all combustible material has been consumed (1 mark).

4. 4 marks
   - Drought-prone regions (1 mark) – such as parts of the United States, southern Europe and northern Australia (1 mark).
   - Rainforests (1 mark), such as in South America and Indonesia (1 mark each).
   - Scrub (1 mark) in the Mediterranean and northern Australia (1 mark).
   - Savanna grasslands and prairies (1 mark each), in parts of North America, Asia and southern Africa (1 mark each).

5. 4 marks
   Wildfires can be caused either naturally or by humans (both accidentally or deliberately set).
   (Allow credit for statements similar to the one above.)
   - Lightning strikes.
   - Controlled burning for conservation purposes.
   - Use by hunters in the savanna, or for agricultural purposes.
   - Out of control slash-and-burn fires in tropical rainforests.
   - Accidental fires from camping, dropped cigarettes, etc.
   - Arson.

6. 2 marks
   Higher temperatures (1 mark) and decreased rainfall (1 mark) are likely to increase the number of wildfires (1 mark) by increasing the availability of dry fuel (1 mark). There may be more electrical storms, increasing the ignition potential (1 mark).

7. 6 marks
   Allow one mark per valid point:
   - The first photo shows a light ground fire. The fire is not damaging the trees; instead, the fire is reducing the build-up of flammable material on the forest floor, preventing hot, damaging fires, which would damage the trees and the soil below, from taking place.
   - The second photo shows a charred pine tree sprouting after a hot fire, protected by the thick bark. Other trees may have fibrous, fire-resistant bark.
   - The third photo shows the tightly closed cones, which only open during the heat of a fire, allowing the seeds to germinate in the fertile ash, and on open ground where there is little shading.
   - Also allow discussion concerning other ecosystems such as shrubland and grasslands, using examples studied in class.

8. 9 marks

Environmental	• While some ecosystems are adapted to fires, intense fires can be very damaging to vegetation. • Animals, reptiles and invertebrates are killed by fire if they cannot escape quickly enough. • Decrease in stored carbon from biomass, wetlands and soil, generating greenhouse gases. • Can damage soil structure and nutrient content. • Particulate air pollution from the smoke. • Increased risk of flooding from bare soil. • Any other valid point(s).
Social	• Health effects from the smoke. • Loss of life. • Damage to houses and property. • Inconvenience, such as evacuation from homes. • Any other valid point(s).
Economic	• Destruction of commercial property, including agriculture (crops, livestock). • Loss of timber. • Temporary reduction in tourist arrivals. • Replacement of infrastructure and services. • Any other valid point(s).

9. 4 marks
Primary effects are directly caused by the fire (1 mark), e.g. the destruction of property, forest, etc. (1 mark).
Secondary effects are caused as a result of the fire occurring (1 mark), e.g. increased flood risk due to interception loss (1 mark).

10. 6 marks
Allow a variety of suggestions, with exemplar material included from named examples.
Examples could include:
- Monitoring for fires (from the air or towers), warning and evacuation systems.
- Education and campaigns to raise awareness of accidental fires (e.g. the Smokey bear mascot in the United States).
- Community involvement.
- Reducing the risk or spread of fire, e.g. fire breaks, provision of fire beaters.

Extension Question

11. 9 marks
- Exemplar materials should be used, to discuss the environmental, social, economic and political impacts of fires.
- However, these issues should be contrasted to the benefits of fires to some habitats, such as the removal of pests and diseases, and the accumulation of flammable material.
- There may also be discussion of the differences between natural fires and those set by humans.
- Discussion could also include the detrimental effect of fire suppression on ecosystems that are adapted to fires, which prevents the reproduction of some species, or allows the build-up of flammable material.

Test 7 – Hazards

1. a. 2 marks
   Allow any two sensible suggestions such as:
   - Tilt meters and measurement of seismic activity.
   - Gas emissions.
   - Thermal imaging.
   - Changes to the ground surface, use of satellites and ground surveillance.
   - Eruption of material, generation of cinder cones, etc.
   - Any other valid suggestion(s).

   b. 6 marks
   Allow any suitable suggestions, such as:
   - Increase monitoring activities.
   - Keep the public informed through local news, print, online and social media, etc.
   - Prepare emergency shelters and stockpile supplies.
   - Implement plans.
   - Evacuate if/when necessary.
   - Ensure that personnel are readied, including law enforcement, medical, search and rescue, etc.
   - Ensure that looting of evacuated houses doesn't occur.
   - Any other suitable suggestion(s).

2. 4 marks
   One mark each:
   - World maps were first produced and the fit of continents was first noticed (e.g. Francis Bacon).
   - Alfred Wegener (in 1912) theorised the breakup of Pangaea.
   - Evidence included geological and biological similarities between the continents.
   - Later magnetic striping discovered in the 1940s, sea flood spreading discovered.
   - Any other valid point(s).

3. 2 marks
   Primary effects are directly caused by the hazard during the event (1 mark). Secondary effects are caused afterwards, as a consequence of the primary effects (1 mark).

4. 2 marks
   Mitigation reduces the likeliness of a hazard from occurring, or reduces the effects of a hazard, while adaptation entails coping with the effects of a hazard.

5. 4 marks
   Discussion could include:
   - The scale of a hazard – e.g. large-scale hazards are very difficult to control.
   - There is little that we can do to stop natural hazards such as earthquakes and volcanic eruptions.
   - Some hazards, such as wildfires can be extinguished, and measures put in place to reduce the risk – the removal of flammable material, safety precautions, public awareness, etc. However, the areas susceptible to wildfires are enormous, making the process difficult or expensive.
   - In the future, it is theorised that the track of tropical storms could be altered to avoid areas of high population (for example, by adding soot to the hurricane's cloud), but such actions would be subject to feasibility constraints and bring to light new ethical dilemmas.
   - Therefore, it may be best to reduce the effects of a disaster, rather than trying to stop it altogether.

6. 6 marks
   Discussion could include:
   - Different types of hazards, their characteristics and their effects.
   - Predictability and randomness.
   - The speed of onset, length of warning and, therefore, preparation – e.g. earthquakes often give little warning, while countries have time to prepare for approaching tropical storms.
   - The scale of different hazards; localisation (e.g. a fire, epicentre of an earthquake) or a countrywide scale (e.g. a large hurricane).
   - The differing primary and secondary effects.
   - The level of development within a country or countries affected.

7. 4 marks
Allow four points, or two explained points
- The advancement of forecasting and warning systems in an area.
- The level of preparation available for the storm – the number of shelters and supplies, etc.
- Proximity to the coast – tropical storms quickly lose strength over land and dissipate as their energy source is removed.
- The storms category – the more intense, the more damage can be wrought.
- The morphology of the coastal plain – height above the sea (coastal flooding), mountains, etc.
- The population density of affected areas.
- Prior conditions – e.g. saturated ground.
- The speed of the storm – dictates the length of time the storm persists over an area.

8. a. 4 marks
Both the number of hurricanes and major hurricanes has increased. There are some years where hurricanes are particularly frequent, such as in 2006.

Climate change could mean warmer oceans, more intense hurricanes and a longer hurricane season, affecting a larger area.

b. 1 mark
Wildfires

9. 6 marks
Allow discussion including topics such as:
- The type and scale of a hazard.
- Use of contrasting exemplar material.
- The economic development of the country.
- The reliance on the international community or domestic expertise.
- The speed of recovery.

Extension Question

10. 9 marks
Discussion could include:
- Use of exemplar material.
- Pull and push factors to living in an area (e.g. fertile soils, mineral wealth); cost–benefit analysis.
- Wealth, choice, inertia, culture, few alternatives.
- Fatalism and perception, reasons for different perceptions and feeling of vulnerability.
- The level of protection and adaptation against hazards and feeling of safety, community resilience/preparedness, advancement of prediction and warning systems.

