Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

any two: constructive: plates move apart; destructive: one plate sinks under another; constructive: runny lava and gentle volcanoes; destructive: explosive volcanoes; constructive: small earthquakes; destructive: large earthquakes and tsunamis

2.2

$32 \times 32 \approx$ **1,000** times; Haiti's buildings were weak and the capital was close to the epicentre; Japan has strict building codes, warnings and drills, so its vulnerability is lower

2.3

any two: poverty; weak buildings without building codes; no warning system or drills; a weak government or poor emergency services; living on steep slopes where landslides happen

2.4

the sinking plate melts and forms magma rich in silica (andesitic); this magma is sticky (viscous), so gas cannot escape easily; pressure builds until the gas escapes violently, an explosive eruption

2.5

any two, explained: strict building codes, e.g. deep foundations and shock absorbers, so buildings bend instead of collapsing; an earthquake early-warning system that stops trains and warns people seconds before strong shaking; drills in schools and workplaces every year, so people know what to do; sea walls and marked evacuation routes for tsunamis, so people can reach high ground

3.1

(a) any two: Haiti had weak buildings and no building code enforced, Japan strict codes; Haiti's capital was close to the epicentre; Japan had warnings and drills, Haiti did not; Japan's GDP per person was far higher, so it could afford preparation

(b) Japanese buildings are built to resist shaking, so few collapsed; the earthquake was under the sea at a destructive margin, so it pushed up the sea floor and made a tsunami; the tsunami was higher than many sea walls, so it flooded coastal towns; people had only minutes to escape, and some did not reach high ground

3.2

Mark with the markbands: [9-10] focused on the command term, detailed and accurate knowledge, well-developed explanation, specific named examples (places, dates, numbers), balanced evaluation and a supported conclusion; [7-8] mostly focused, good knowledge and examples, some evaluation; [5-6] relevant knowledge and examples, explanation

partly developed, little evaluation; [3-4] general knowledge, few examples, mostly description; [1-2] little that is relevant. Points that may be included: development matters: Haiti 2010 killed more than 100,000; Japan 2011 far fewer from the shaking, because of building codes and drills; rich countries can afford warning systems, strong buildings and quick rescue; poor countries often have informal housing and weak governments, which raise vulnerability; but the hazard itself matters: the Tōhoku tsunami killed about 18,000 even in a very developed country; exposure matters: a quake near a big city kills more than one in an empty area; time of day and type of hazard: night-time quakes catch people in bed; tsunamis and landslides kill differently from shaking; governance and corruption: building codes only help if enforced; developing countries can lower deaths cheaply, e.g. Bangladesh's cyclone warnings show low-cost preparation works; conclusion: development is very important because it shapes vulnerability, but the size and type of hazard and the exposure also decide the impact

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