Questions

1 Define fetch and explain its geographical significance.

2 a Distinguish between prevailing and dominant winds.

b

Mean percentage frequency of winds in the British Isles											
N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
7	5	6	7	5	8	9	9	14	15	8	7

Draw a wind rose to show these percentages.

c Outline the effects of relative frequencies in wind direction upon coastal processes around the British Isles.

3 Figure 2.15 shows longshore drift and general directions of movement around Britain.
Explain what Figure 2.15 shows in relation to prevailing and dominant winds.

4 Why are tides considered to be less important than waves in the formation of coastal landforms?

5 a Outline the characteristics which distinguish destructive waves from other waves.

b Discuss the factors favourable for their formation.

6 Make notes for a case study of the storm surge in the southern North Sea in 1953.

a State the key facts in an organized manner (for example, when, where, spatial variations in size, physical effects and human impact).

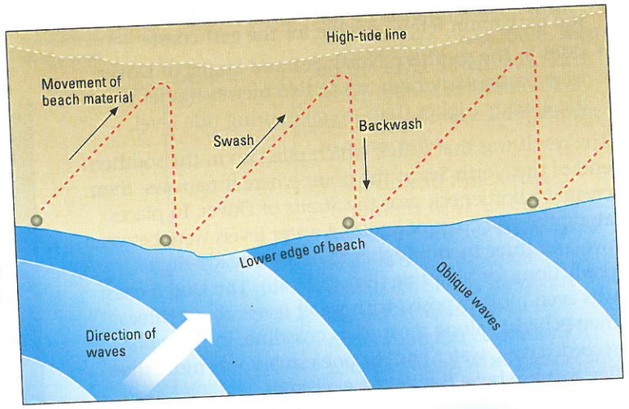
b Outline the permanent features of the southern North Sea which makes it more vulnerable to storm surges than most other coastal zones around the British Isles.

c Explain the immediate meteorological causes of the 1953 storm surge, illustrating your answer with a sketch map.

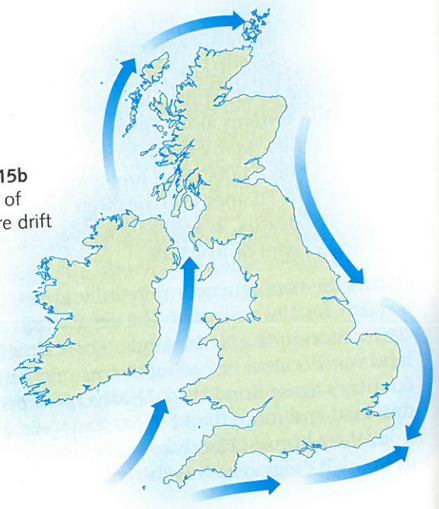
7 Why do extreme events, such as storm surges, only occur when a combination of factors favourable to their formation are present?

High and low energy coasts

High energy coasts are ones in which wave power is strong for a significant proportion of the year. The distribution of these coasts is largely controlled by the climate and the direction they face. Strong winds capable of generating the largest waves are more frequent in areas of the world with a Cool Temperate Western Maritime (CTWM) type of climate than with any other type of climate. High average wind speeds are associated with the frontal depressions which form over the oceans at the junction between warm tropical and cold polar air masses. They often deepen as they move eastwards driven by the prevailing circulation from west to east. Big pressure differences can develop between the centres of the low pressure systems and any intervening or blocking ridges of high pressure. Exposed coastlines experience gales often, storm force winds regularly and hurricane force winds from time to time. The storm wave environments found in areas with CTWM climates are shown in Figure 2.16. They occupy similar positions on the western side of continents between 45° and 65° north and south of the Equator. In the northern hemisphere they extend from Alaska to British Columbia in North America and from northern Norway to northern Spain in Europe. Atlantic islands such as Iceland are also included within this zone. Wave height, and therefore wave energy, are potentially greater in the southern hemisphere. Westerly winds, depressions and ocean currents (the Antarctic Drift) have largely uninterrupted passages around the globe because so little land extends south of 45°. Waves hitting southern Chile are driven by winds which have the world's longest fetches.



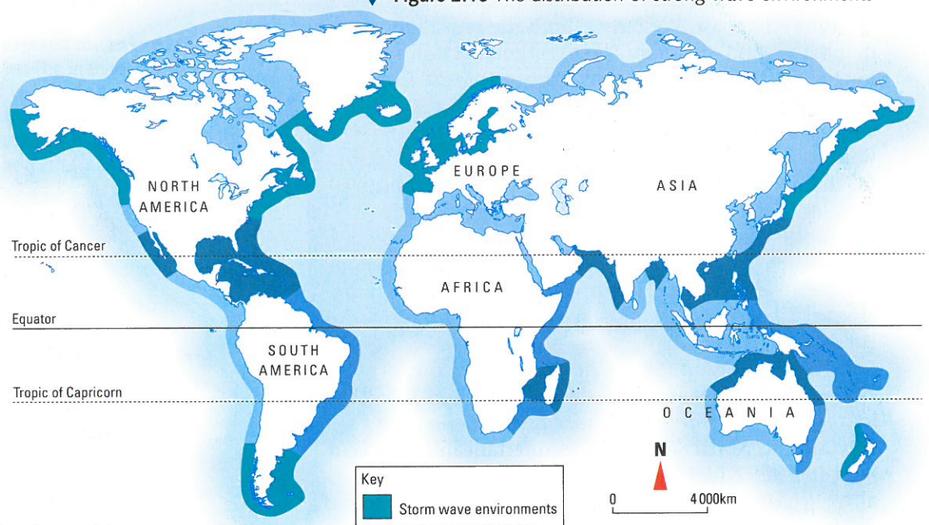
▲ **Figure 2.15a** Longshore drift



▶ **Figure 2.15b** Direction of Longshore drift

In tropical latitudes the position of the high energy environments switches to east-facing coasts of continents and islands reflecting the directions from which the prevailing trade winds blow, from the north east in the northern hemisphere and from the south east in the southern hemisphere. These winds have long been noted for their reliability, hence the name 'prevailing', which was given to them in the days of sailing ships. They blow persistently outwards from the high pressure horse latitudes and towards the thermal lows around the hot Equator. They are on average less strong and less subject to extremes than westerlies in temperate latitudes because they are not part of swirling low pressure systems. Along east-facing tropical coasts they are noted most for the size of the swell they create, although this is sufficient to create some rugged stretches of coast, especially where the fetch is long as on the eastern side of Easter Island in the middle of the Pacific Ocean. Harbour sites on tropical islands are more frequently located on sheltered western sides as a result. From time to time cyclones are responsible for very significant coastal change in the tropical zone, because they are capable of generating winds of a ferocity rarely recorded anywhere else on earth. A wall of water can be pushed onshore causing total destruction. One such cyclone devastated Orissa in India in 1997 (see **AS Level Geography**, pages 70–71).

▼ **Figure 2.16** The distribution of strong wave environments



▲ **Figure 2.17** Cape Horn. For sailors it is one of the world's best known and most feared natural landmarks. Few passages around the Cape are in seas as slight as the one shown. The waters off Cape Horn are notorious for mountainous seas in which waves can reach twice the height of the maximum recorded in Atlantic waters west of Britain.

◀ **Figure 2.18** The north-east corner of Easter Island. Lying 4000km away from the nearest inhabited land, this coast is exposed to trade winds with a long fetch.