Chapter 25 The Arctic or Polar Climate

Distribution

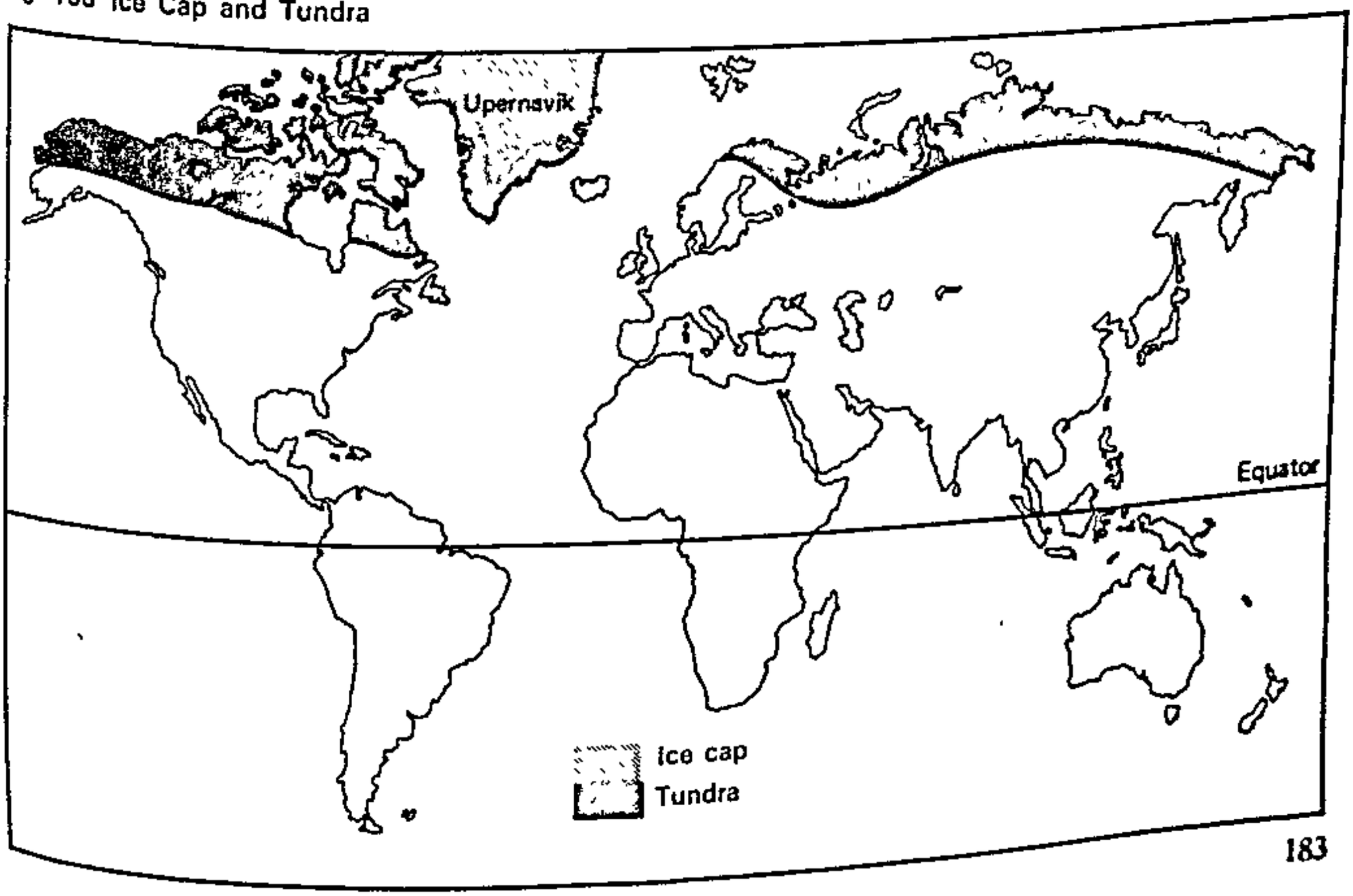
The polar type of climate and vegetation is found mainly north of the Arctic Circle in the northern hemisphere. The ice-caps are confined to Greenland and to the highlands of these high-latitude regions, where the ground is permanently snow-covered. The lowlands, with a few months ice-free, have tundra vegetation. They include the coastal strip of Greenland, the barren grounds of northern Canada and Alaska and the Arctic seaboard of Eurasia. (Fig. 156). In the southern hemisphere, the virtually uninhabited continent of Antarctica is the greatest single stretch of ice-cap where the layers of permanent ice are as thick as 10,000 feet.

Climate

Temperature. The polar climate is characterized by a very low mean annual temperature and its warmest month in June seldom rises to more than 50°F. In mid-winter (January) temperatures are as low as −35°F. and much colder in the interior Normally not more than four months have temperatures above freezing-point! Winters are long and very severe; summers are cool and brief. Within the Arctic and Antarctic Circles, there are weeks of continuous darkness. At the North Pole, there are six months without light in winter. Despite the long duration of sunshine in summer, when the sun does not set, temperatures remain low because the sun is low in the sky and much of the warmth of its faint rays is either reflected by the ground snow, or used up in melting the ice. It has little power left to raise the air temperature. Water in the soil is frozen to great depths and the summer heat can only thaw the upper six inches of the soil. The ground remains solidly frozen for all but four months, inaccessible to plants. Frost occurs at any time and blizzards, reaching a velocity of 130 miles an hour are not infrequent. They can be very hazardous for the polar inhabitants. In coastal districts, where warmer water meets cold land thick fogs may develop. They last for days, and in many instances it is not possible to see for more than a few feet.

Precipitation. Precipitation is mainly in the form of snow, falling in winter and being drifted about

Fig 156 Ice Cap and Tundra



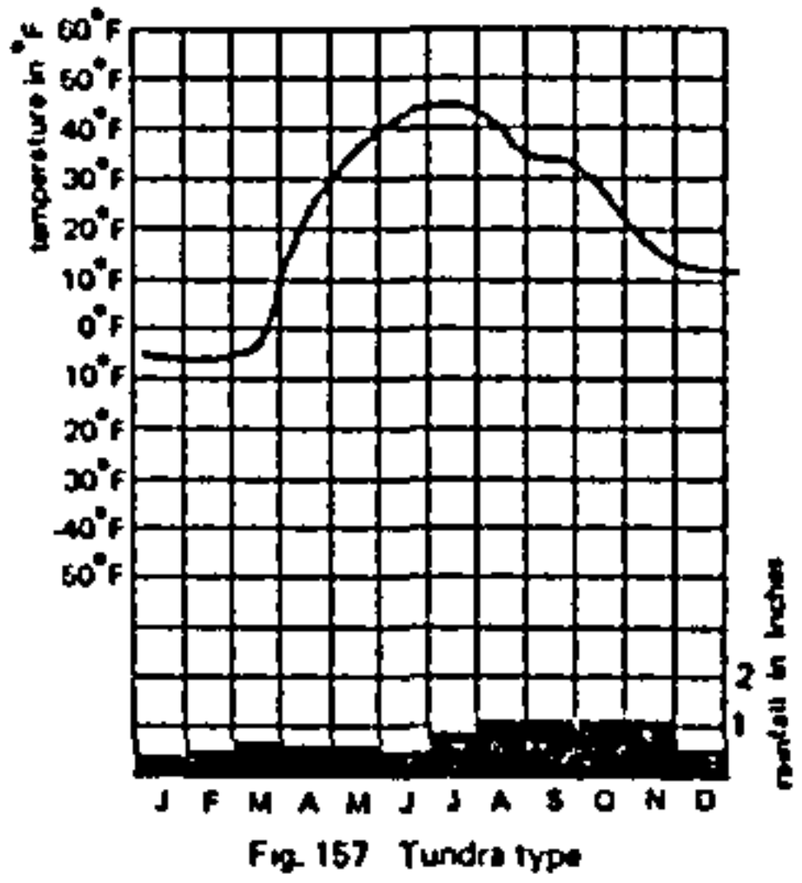


Fig. 157 Tundra type

Upernavik	J	F	M	A	M	J	J	A	S	O	N	D	Range/Total
Temperature	-8	-8	-6	26	36	41	41	34	34	26	14	1	49°F
Precipitation	4	3	7	7	8	8	8	11	11	11	11	3	91 mm.

Fig 157 Tundra Climate

Place: Upernavik, Greenland (72°N., 56°W.)
Altitude: 65 feet
Total Annual precipitation: 9.1 inches
Annual temperature range: 49°F. (-8° -41°F.)

during blizzards. Snowfall varies with locality; it may fall either as ice crystals or large, amalgamated snow flakes. As it takes 10–12 inches of snow to make 1 inch of rain, precipitation in polar regions can be expected to be light, not more than 12 inches in a year. Convectional rainfall is generally absent because of the low rate of evaporation and the lack of moisture in the cold polar air. There is normally a summer maximum, and the precipitation is then in the form of rain or sleet.

In regions where winds blowing out from the large anticyclones developed over the ice-caps are prevalent, rain comes in summer, when more evaporation is possible. But in coastal areas, where cyclones are more strongly felt, the tendency is towards a winter maximum, for that is when cyclonic activity is greatest. In such regions the annual rainfall of 10 to 12 inches for the tundra may be exceeded. Much heavier rainfall has been recorded, especially in areas where the cyclones are most frequent e.g. Jan Mayen (71°N., 8°W.) has 15 inches, Vardo (70°N., 31°E.) has 26 inches and Angmagssalik (66°N, 38°W.) has over 37 inches!

Fig. 157 shows the rhythm of temperature and precipitation of a tundra region taken at Upernavik, Greenland (72°N., 56°W.). Its winter temperature is −8°F. while its warmest month in July is only 41°F., giving an annual range of 49°F. Precipitation is only 9.1 inches, falling mainly in the second half of the year, both as rain and snow.

Tundra vegetation

In such an adverse environment as the tundra, few plants survive. The greatest inhibiting factor is the region's deficiency in heat. With a growing season of less than three months and the warmest month not exceeding 50°F. (the tree-survival line), there are no trees in the tundra. Such an environment can support only the lowest form of vegetation, mosses, lichens and sedges. Drainage in the tundra is usually poor as the sub-soil is permanently frozen. Ponds and marshes and waterlogged areas are found in hollows.

In the more sheltered spots, stunted birches, dwarf willows and undersized alders struggle for a meagre existence. Climatic conditions along the coastal lowlands are a little more favourable. Here are found some hardy grasses and the *reindeer moss* which provide the only pasturage for the herbivorous animals like reindeer. In the brief summer, when the snows melt and the days are warmer and longer, berry-bearing bushes and Arctic flowers bloom. Though short-lived, they brighten the monotonous tundra landscape into 'Arctic prairies'. In the summer, the tundra is full of activities. Birds migrate north to prey on the numerous insects which emerge when the snow thaws. Mammals like the wolves, foxes, musk-ox, Arctic hare and lemmings also live in tundra regions.

Human Activities

Human activities of the tundra are largely confined to the coast. Where plateaux and mountains increase the altitude, it is uninhabitable, for these are permanently snow-covered. The few people who live in the tundra live a semi-nomadic life and have to adapt themselves to the harsh environment.

In Greenland, northern Canada and Alaska live the Eskimos, numbering less than 28,000 today. They used to live as hunters, fishers and food-gatherers but in recent years more and more of them are settling in permanent huts. The Polar Eskimos, living around Thule in north-west Greenland still lead an uncertain life, not very much different from their forefathers. The seasonal changes in climate necessitate a nomadic way of life. During winter they live in compact igloos and in summer when they move out to hunt they pitch portable tents of skins by the side of streams. Their food is derived from fish, seals, walruses and polar bears. Other Eskimos hunt caribou (the name given to reindeer in America) and other animals to secure a steady supply of their daily meat, milk, fat, skins and bones.

the Europeans, the way of life of the Eskimos has undergone tremendous changes. Coastal villages have permanent wooden houses complete with modern facilities; speed-boats are replacing frail *kayaks*. Deadly rifles instead of traditional harpoons are used to track down animals and seals Fur-bearing animals are being reared on a commercial scale and fishing, too, is being commercialized. In some more accessible parts of Canada and Alaska, schools have been established and the Eskimo children are being taught the skills which will allow them to fit into the modern way of life.

In the Eurasian tundra are other nomadic tribes such as the Lapps of northern Finland and Scandinavia, the Samoyeds of Siberia (from the Ural Mountains and the Yenisey basin), the Yakuts from the Lena basin, and the Koryaks and Chuckchi of north-eastern Asia. They wander with their herds of reindeer across the Eurasian tundra where there are pastures. Many of them have taken to a more settled life. In the U.S.S.R. large farms have been established for raising reindeer and for breeding fur-bearing animals.

The Importance and Recent Development of the Arctic Region

The Arctic region, once regarded as completely useless, is now of some economic importance. Apart from the efforts of the various governments in assisting the advancement of the Arctic inhabitants the Eskimos, Lapps, Samoyeds etc., new settlements have sprung up because of thediscovery of minerals. Gold is mined in Alaska, nickel near Petsamo, U.S.S.R., petroleum in the Kenai Peninsula, Alaska; and copper at the Rankin Inlet, Canada. Coal has been mined in Spitsbergen for a long time and also in Alaska. With the declining reserves of iron ore around Lake Superior, the Great Lakes industrial concerns are using more and more iron from large iron ore deposits in Labrador. New railway lines have been constructed to bring the ores to the St. Lawrence River for subsequent shipment to the major industrial districts. Rich deposits of iron ores at Kiruna and Gallivare in Sweden have made it possible for Sweden to enjoy a prosperous export trade in iron and steel and other metallurgical products.

With the establishment of ports on the Arctic seaboard of Eurasia, it is now possible to ship timber and fur from Siberia. Though the ports, such as Igarka at the mouth of the Yenisey, are not ice-free, modern ice-breakers keep the passage open most of the time On the Arctic lowlands where the growing season is lengthened by warm currents or higher temperatures, experiments have been carried out to devise varieties of hardy cereals for local needs. It may not be long before the tundra is brought under greater agricultural, especially pastoral, use. The healthy air and its preservative qualities (it is practically germ-free) are factors worth consideration for future colonization. Scientists, meteorologists and explorers have lived in the Arctic and Antarctica, making studies of their geology, weather conditions, plant and animal life, that will be of great significance in years to come.

The borderlands between the Taiga and the tundra *Elizabeth Meyer*

QUESTIONS AND EXERCISES

1. *Draw separate sketch maps to show the* area covered by each of the following:
   (a) tundra in Eurasia
   (b) savanna in South America
   (c) hot desert in Australia
   (d) equatorial forest in Africa

   For any *three* of them describe their characteristic features of natural vegetation and for any one of them explain how the features are related to the climate of the area.

2. Statistics of rainfall and temperature for three towns are given below. For any *two* of them.
   (a) State their season of maximum rainfall
   (b) Name the type of climate
   (c) Suggest a possible location of the town
   (d) Describe their climatic rhythm.

	J	F	M	A	M	J	J	A	S	O	N	D	Range/ Total
Town A	Altitude: 207 feet												
Temp. °F.	47	49	51	57	64	71	76	76	70	62	53	46	30
Rainfall in ins.	3.2	2.7	2.9	2.6	2 2	1.6	0.7	1.0	2.5	5.0	4.4	3.9	32.7
Town B	Altitude: 65 feet												
Temp °F.	–8	–9	–6	25	35	41	41	34	34	25	14	10	49
Rainfall in ins.	0.4	0.5	0.7	0.6	0.6	0.5	0.9	0.1	1.1	1.1	1.1	0.5	91
Town C	Altitude: 9,350 feet												
Temp. °F.	55	55	55	55	55	55	55	55	55	55	55	54	1.0
Rainfall in ins.	3.2	3.9	4.8	7.0	4.6	1.5	1.1	2.2	2:6	3.9	4.0	3.6	42 3

3. The following are representative of plants found in different climatic zones:
   spruce, olive, teak, reindeer moss, date, oak, eucalyptus and bamboo.

   For any *six* of them
   (a) Name the type of climate in which each of them thrives.
   (b) State the sort of natural vegetation with which they are associated.
   (c) Describe very briefly the role each of them plays in the economy of a named country in which they are found in abundance.

4. Explain briefly any *four* of the following terms connected with the Arctic climate and the tundra vegetation:
   blizzards, permafrost, midnight sun, ice-cap, snow-blindness, kayaks, international deep-freeze.

5. Make a comparative study of the Polar Eskimos of Greenland and the Orang Asli (e g. Senois) under the following headings.
   (a) How they obtain their food.
   (b) How they shelter themselves.
   (c) What significant changes have taken place in their environment and their way of life.

SELECTED QUESTIONS FROM CAMBRIDGE OVERSEAS SCHOOL CERTIFICATE PAPERS

1. (a) With the aid of sketch maps to show *one* major region where each type is found, describe the main features of vegetation of tropical grassland (savanna) and coniferous forest.
   (b) For *either* tropical grassland (savanna) *or* coniferous forest, show how the main features of the vegetation are influenced by climate. (1966)
2. Answer *either* (a) *or* (b).
   (a) With the help of examples, show how the present distribution of tropical forests has been influenced by:
      i. climate.
      ii. the work of man.
   (b) i. Why is the coniferous forest only found in some parts of the world?
      ii. Name *four* types of coniferous trees.
      iii. What are the chief uses of the timber obtained from coniferous forests? (1965)
3. With the aid of separate sketch maps, locate examples *two* of the following:
      i. A region of savanna.
      ii. A region of coniferous forest.
      iii. A region of tropical desert scrubland.

For each of the *two* you have chosen, describe the chief features of the vegetation and show how they are related to the geographical characteristics of the region. (1962)

4. With the aid of sketch maps locate examples of *two* of the following:
   (a) An evergreen forest in a hot region.
   (b) A deciduous temperate forest.
   (c) A region of tundra.

For each *one* you choose, describe the chief features of the vegetation and show how these are related to the climate of the area. (1961)

5. (a) Draw a sketch map of *one* major land area, which extends in latitude from the equator to at least 35° North or 35° South. On the sketch map, mark distinctively and name *three* major areas of different natural vegetation.
   (b) Describe the important features of the natural vegetation in the areas marked on the sketch map. (1960)

6.

Mean Monthly Rainfall in Inches

Town	Lat.	Long.	J	F	M	A	M	J	J	A	S	O	N	D	Total
Darwin	12°S.	131°E.	15.2	12.3	10.0	3.8	0.6	0.1	0.0	0.2	0.5	2.0	4.7	9.4	58.7
Adelaide	35°S.	138°E.	0.8	0.7	1.0	1.8	2.7	3.0	2.6	2.6	2.1	1.7	1.1	1.0	21.1
Alice Springs	23°S.	133°E.	1.7	1.3	1.1	0.4	0.6	0.5	0.3	0.3	0.3	0.3	1.2	1.5	9.9

For each town:
   (a) Describe briefly the main features of its rainfall.
   (b) Suggest reasons for the amount and distribution of the rainfall. (1967)

7. Records of temperature and rainfall for *three* towns are given below. For each:
   (a) write a description of the temperature and rainfall.
   (b) name the type of climate, give reasons for your answer.
   (c) locate *one* area in the world where this type of climate occurs. (1963)

A. (Altitude 9,350 ft.)

	J	F	M	A	M	J	J	A	S	O	N	D
Temp. (°F.)	55	55	55	55	55	55	55	55	55	55	54	55
Rainfall (in.)	3.2	3.9	4.8	7.0	4.6	1.5	1.1	2.2	2.6	3.9	4.0	3.6

B. (Altitude 30 ft.)

Temp. (°F.)	44	44	45	48	52	57	59	59	57	52	48	46
Rainfall (in.)	5.5	5.2	4.5	3.7	3.2	3.2	3.8	4.8	4.1	5.6	5.5	6.6

C. (Altitude 30 ft.)

Temp. (°F.)	78	79	81	84	88	92	95	94	92	89	86	81
Rainfall (in.)	1.5	0.6	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.3	0.7	1.4

8. The following are brief descriptions of *three* different types of climate:
   i. A very large temperature range, with light summer rainfall.
   ii. Mild winters, hot summers, with heavy summer rainfall.
   iii. High uniform temperatures with heavy rain all the year.

For any *two* of them:
   (a) N

9.

   (a) the coastlands of northern Australia.
   (b) the Prairies of Canada.
   (c) the coastal area of Norway.
   (d) Peninsular Italy. (1961)

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