Chapter 11: World Climate and Climate Change

Exercises — Exercises

Q1 1(i). Which one of the following is suitable for Koeppen's "A" type of climate? (a) High rainfall in all the months (b) Mean monthly temperature of the coldest month more than freezing point (c) Mean monthly temperature of all the months more than 18°C (d) Average temperature for all the months below 10°C

(c) Mean monthly temperature of all the months more than 18°C. In Koeppen's scheme, group A (tropical) has the coldest month averaging 18°C or higher, so every month is above 18°C. Option (d) describes group E, and high rainfall in all months is not the defining criterion.

Q2 1(ii). Koeppen's system of classification of climates can be termed as: (a) Applied (b) Systematic (c) Genetic (d) Empirical

(d) Empirical. Koeppen's scheme is based on observed data, namely mean annual and mean monthly temperature and precipitation, which he related to the distribution of vegetation. It is not based on causes (genetic) or a specific purpose (applied).

Q3 1(iii). Most of the Indian Peninsula will be grouped according to Koeppen's system under: (a) "Af" (b) "BSh" (c) "Cfb" (d) "Am"

(d) "Am". The tropical monsoon climate (Am) is found over the Indian sub-continent, with heavy rainfall mostly in summer and a dry winter. Af is the equatorial wet type, BSh a dry steppe type and Cfb a marine west coast type.

Q4 1(iv). Which one of the following years is supposed to have recorded the warmest temperature the world over? (a) 1990 (b) 1998 (c) 1885 (d) 1950

(b) 1998. The chapter notes that 1998 was the warmest year, probably not only of the 20th century but of the whole millennium, and that the seven warmest years during 1856-2000 fell in the last decade of that period.

Q5 1(v). Which one of the following groups of four climates represents humid conditions? (a) A-B-C-E (b) A-C-D-E (c) B-C-D-E (d) A-C-D-F

(b) A-C-D-E. Koeppen's capital letters A, C, D and E delineate humid climates, while B stands for dry climates. Option (d) is wrong as there is no group F, and options (a) and (c) include B.

Q6 2(i). Which two climatic variables are used by Koeppen for classification of the climate?

Koeppen used temperature and precipitation. He selected certain values of mean annual and mean monthly temperature and precipitation, related them to the distribution of natural vegetation, and used them to define climatic groups and types, designated by capital and small letters.

Q7 2(ii). How is the "genetic" system of classification different from the "empirical" one?

Genetic classification organises climates according to their causes, such as air masses and pressure systems. Empirical classification rests on observed data, particularly temperature and precipitation, as in Koeppen's scheme, and does not consider why the climate occurs.

Q8 2(iii). Which types of climates have very low range of temperature?

The tropical humid climates (group A: Af, Am, Aw) have a very low annual range of temperature, as the sun is overhead throughout the year. In the tropical wet climate (Af) near the equator the range is negligible. Marine west coast (Cfb) and humid subtropical climates also show small ranges.

Q9 2(iv). What type of climatic conditions would prevail if the sun spots increase?

If sunspots increase, cooler and wetter weather with greater storminess is expected, according to some meteorologists. A decrease in sunspots is associated with warm and drier conditions. The chapter adds that these findings are not statistically significant.

Q10 3(i). Make a comparison of the climatic conditions between the "A" and "B" types of climate.

Group A (tropical humid) lies between the Tropics of Cancer and Capricorn. The coldest month averages 18°C or higher, the sun is overhead through the year and the ITCZ keeps the climate hot and humid. The annual temperature range is very low and annual rainfall is high. It has three types: Af (wet, no dry season), Am (monsoon) and Aw (wet and dry, with a dry winter). Group B (dry climates) is defined by potential evaporation exceeding precipitation. Rainfall is very low and inadequate for plants. It extends widely over 15-60 degrees north and south, in subtropical high pressure areas, western continental margins near cold currents and continental interiors shut off from humid winds. It splits into steppe (BS) and desert (BW), and into subtropical (BSh, BWh) and mid-latitude (BSk, BWk) types. Rainfall is highly variable and temperature ranges, annual and diurnal, are large. Deserts can record extreme heat, such as 58°C at Al Aziziyah.

Q11 3(ii). What type of vegetation would you find in the "C" and "A" type(s) of climate?

In group A, vegetation depends on the type. The tropical wet climate (Af) has tropical evergreen forests with dense canopy and large biodiversity, thanks to rain in every month and uniformly high temperature. The tropical wet and dry climate (Aw) has deciduous forests and tree-shredded grasslands, since its dry season is longer and drought more severe. In group C (warm temperate), the Mediterranean climate (Cs) has hot dry summers and mild rainy winters, which suit drought-resistant vegetation. The humid subtropical (Cfa) and marine west coast (Cfb) types receive rain through the year, which supports luxuriant growth.

Q12 3(iii). What do you understand by the term "Greenhouse Gases"? Make a list of greenhouse gases.

The atmosphere transmits incoming short wave solar radiation but absorbs most of the long wave radiation emitted by the earth's surface, much like the glass of a greenhouse. The gases that absorb this long wave radiation are called greenhouse gases (GHGs), and the warming they cause is the greenhouse effect. The primary GHGs of concern are carbon dioxide (CO_2), chlorofluorocarbons (CFCs), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3). Gases such as nitric oxide (NO) and carbon monoxide (CO) react easily with GHGs and affect their concentration. The effectiveness of a GHG depends on the increase in its concentration, its life time in the atmosphere and the wavelength of radiation it absorbs. CO_2 has the largest concentration, coming mainly from burning fossil fuels, while CFCs are highly effective and also destroy stratospheric ozone.