Energy From the Sun

Exercise Pg. 18

Q. 1. Have you been to places that have a different climate than where you live? Describe it in the class.

Answer : Climatic conditions vary greatly across places because of the location. The location of a place in a region of the
Earth is important in determining the temperature and atmospheric conditions.

Students can form groups and have a detailed discussion with reference to various places they have visited. They can then compile and analyse the difference in temperature as well as the plantation and vegetation that vary across regions.

Q. 2. You know that the Sun is the source of heat on the Earth. But why do you think the heat varies from morning to night or from season to season and from place to place?

We are listing some variations here. Try to think a reason for it and discuss in the class before you proceed to read this chapter.
1. Cool in the early morning and warmer in the afternoon.
2. Warm in summer and cool in winter.
3. Cool on hill tops and warm in the plains.
4. Warm in equatorial region and cool in Polar Region.

Answer : The heat of the sun varies from morning to night, season to season and from place to place because of the curvature of the Earth's surface. Due to the curvature, the same amount of solar energy falls on an area on the equator and on a larger area as we move north or south of it. Thus, it will get warmer on the equator than near the poles.

Students can further discuss each aspect in detail in class.

Exercise Pg. 19

Q. 1. Can you point out the difference between insolation and radiation?

Answer : Insolation refers to the solar radiation received on the surface of the Earth.

Radiation refers to the solar energy emitted by the sun in the form of light and heat.

Q. 2. What will happen if the atmosphere gets more polluted with smoke and dust?

Answer : If the atmosphere gets more polluted with smoke and dust, it will eventually increase the level of harmful gases such as carbon dioxide in the Earth's atmosphere. This rise in carbon dioxide would further result in a rise in global temperatures, thus, leading to global warming.

Exercise Pg. 21

Q. 1. Can you tell why there is a difference in heating of land and water?

Answer : Land is considered to be a good conductor of heat, whereas water bodies are different in nature. They take time to heat up and cool down, in contrast to the land which is much faster.

Exercise Pg. 24

Q. 1. Which temperature is higher: 5°C or -5°C?

Answer : 5°C is a higher temperature.

Q. 2. At which of these temperatures will we feel colder?

Answer : We will feel colder at -5°C among both these temperatures because the negative symbol before 5 shows the lowering of temperature and the lower the temperature, the colder it gets.

Q. 3. How many degrees difference is there between -5°C and 5°C?

Answer : The difference between -5°C and 5°C = 9°C.

Q. 4. Write in short form each of the following temperatures-

1. 88 degrees below zero, Celsius
2. 38 degrees above freezing, Celsius
3. 32 degrees below freezing, Celsius

Answer : 1.-88°C

2. 38°C

3. -32°C

Please note that the freezing point is at 0°C.

Q. 5. The temperature of a normal human body is 37°C. How much hotter than normal body temperature is 50°C?

Answer : Temperature of a normal human body = 37°C

Hotter temperature mentioned = 50°C

Difference between the hotter temperature and the temperature of a normal human body = 50°C - 37°C

= 13°C

Q. 6. How much colder than the normal body temperature is -5°C?

Answer : The normal body temperature is 37°C. However, body temperature at -5°C is 42°C colder.

Q. 7. Arrange the following temperatures from the highest to the lowest: 12°C, -16°C, 29°C, 0°C, -4°C

Answer : Highest to the lowest order –

29°C, 12°C, 0°C, -4°C, -16°C

Q. 8. At which of the above temperatures will we feel the hottest?

Answer : We will feel the hottest at 29°C.

Q. 9. At which of the above temperatures will we feel the coldest?

Answer : We will feel the coldest at -16°C.

Exercise Pg. 25

Q. 1. How cold does it usually get in November in Hyderabad?

Answer : The minimum temperature i.e. the lowest temperature in Hyderabad in November is 17°C as per the mentioned data.

Q. 2. Which month has the highest maximum temperature in Hyderabad?

Answer : The month of May has the highest maximum temperature in Hyderabad which stands at 39°C.

Q. 3. What is the difference between the highest maximum temperature and the lowest maximum temperature in the year?

Answer : The difference between the highest maximum temperature and the lowest maximum temperature = 39°C-26°C

= 13°C

Q. 4. Which three months are the hottest in Hyderabad?

Answer : The months of March, April and May are the hottest with 35°C, 38°C and 39°C respectively.

Q. 5. Which three months are the coldest?

Answer : The months of November, December and January are the coldest with 17°, 15°C and 16°C respectively.

Q. 6. What is the average maximum temperature in January in Hyderabad?

Answer : The average maximum temperature in January in Hyderabad is 28°C.

Q. 7. From June through December, the average minimum monthly temperature keeps falling in Hyderabad. Does the average maximum monthly temperature also keep falling?

Answer : Yes, average maximum monthly temperature also keeps falling Hyderabad. In June, it stands at 34°C and continues to fall at 28°C in December as per the mentioned data.

Q. 8. What is the difference between the maximum and the minimum temperature in May?

Answer : Maximum temperature in May = 39°C

Minimum temperature in May = 26°C

Difference between maximum and minimum temperature in May = 39°C-26°C

= 13°C

Q. 9. What is the difference between the maximum and the minimum temperature in August?

Answer : Maximum temperature in August = 30°C

Minimum temperature in August = 22°C

Difference between maximum and minimum temperature in August = 30°C-22°C

= 8°C

Exercise Pg. 26

Q. 1. Which month has the lowest minimum temperature in Panaji? How much is it?

Answer : The month of January has the lowest minimum temperature in Panaji. It is 19°C.

Q. 2. Which is the hottest month in Panaji? How much was the average maximum temperature for that month?

Answer : The months of April and May are the hottest in Panaji with 33°C during both the months.

Exercise Pg. 28

Q. 1. Can you think of any other reason for this kind of temperature?

Answer : Since the nights are longer and days are shorter during the winters, the duration of the amount of sun's rays which reach the land is less and therefore, the land tends to get cooler during the winter months.

Q. 2. What will happen if the inversion occurs?

Answer : Inversion would result in lower temperatures near the ground.

During inversion, the cooler temperatures near the ground level are due to less amount of insolation received due to the shorter days and excessive radiation due to the longer nights.

Q. 3. How many meters higher than Delhi is Shimla?

Answer : Delhi is at an elevation of about 200 meters from above the sea level whereas Shimla is at an elevation of about 2200 meters from above the sea level. Therefore, Shimla is at a much higher elevation of around 2000 meters than Delhi.

Q. 4. Based on the difference in elevation, calculate the likely difference in temperature between the two places.

Answer : Usually, for every 1000 meters increase in elevation, the temperature falls by about 6°C. Therefore, the difference in temperature between Delhi and Shimla is likely to be around 12°C to 13°C.

Q. 5. Which month has the highest maximum temperature in Shimla? How much is the temperature?

Answer : The highest maximum temperature in Shimla is during the month of May. The temperature is around 23°C.

Q. 6. Which month has the highest maximum temperature in Delhi? How much is the temperature?

Answer : The highest maximum temperature in Delhi is during the month of May. The temperature is around 41°C.

Q. 7. In September, the average maximum temperature in Shimla is _____°C, while in Delhi, it is _____°C.

Answer : In September, the average maximum temperature in Shimla is 17°C, while in Delhi, it is 34°C.

Q. 8. Which is colder: Delhi in January or Shimla in July?

Answer : Delhi in January is colder than Shimla in July with temperature at less than 10°C (i.e. around 8°C) and around 14°C respectively.

Exercise Pg. 29

Q. 1. Which of the three places in the graph is located nearest to the equator?

Answer : Singapore is nearest to the equator amongst all.

Q. 2. What is the average yearly temperature in that place?

Answer : The average yearly temperature in Singapore is 27.8°C.

Q. 3. Does it usually get much warmer in the summer than in the winter there?

Answer : Yes, it does get much warmer in the summer than in the winter there with temperature more than 30°C during the months of March and April.

Q. 4. Is summer in Vladivostok warmer than the winter in Singapore?

Answer : No, the summer in Vladivostok is not warmer than the winter in Singapore with temperature at around 23°C and 29°C respectively.

Q. 5. Does it usually get warmer in July in Singapore or in Shanghai?

Answer : It usually gets warmer in July in Shanghai with temperature at around 33°C as compared to Singapore in July at around 30°C.

Q. 6. Which of the three places on the graph has the most extreme climate?

Answer : Shanghai seems to experience most extreme climatic conditions with high temperatures during the summer months and low temperatures during the winter months.

Q. 7. Which is the warmest month in Shanghai?

Answer : The month of July or August is the warmest in Shanghai.

Q. 8. What is the average yearly temperature there?

Answer : The average yearly temperature in Shanghai 15.3°C.

Q. 9. Which month has the lowest average maximum temperature in this place?

Answer : The month of March has the lowest average maximum temperature in shanghai.

Exercise Pg. 30

Q. 1. In which of these six cities does the Sun rise first?

Answer : The sun rises first in the city of Kohima, Nagaland at 6:02 among the six cities mentioned in the data.

Q. 2. In which of these six cities does the Sun set first?

Answer : The sun sets first in the city of Kohima, Nagaland at 4:40 among the six cities mentioned in the data.

Q. 3. How long is the daytime in each of these six cities?

Answer : The length of daytime in each of these cities is as follows-

Hyderabad – around 11 hours and 9 minutes

Agra – around 10 hours and 30 minutes

Madurai – around 12 hours

Nagpur – around 11 hours and 12 minutes

Vishakhapatnam – around 11 hours and 10 minutes

Kohima – around 10 hours and 10 minutes

Q. 4. Do the cities that are farther north have longer or shorter daytimes than the cities to the south?

Answer : The cities that are farther north have shorter daytimes as compared to the cities to the south.

Q. 5. Based on your answers above, can you think of why the north of India remains cooler than the south in winter?

Answer : The position of the Earth is titled by certain degrees on its path around the sun and this tilt is constantly towards one side only. This means that one hemisphere of the
Earth is more exposed to the sun as compared to the other half.

India is situated just above the equator line (towards the northern side) and the Southern region of India is much closer to the equator than the Northern half of India. Therefore, the south in winter is warmer than the cooler north of India.

Improve your learning

Q. 1. Correct the false statements –

a) If a place is closer to sea, irrespective of its distance from equator, it will always be cooler.
b) As you go up higher from the earth, it becomes warmer because sun is closer to you.
c) Sun heats the air first and then the earth.
d) Global warming is related to oxygen.

Answer : a) If a place is closer to the sea, irrespective of its distance from equator, it will always experience a moderate climate.

It is difficult for the Sun to heat up or cool down the surface of the sea. Since the sea doesn’t get too hot or cold, the air above the sea also doesn’t get too hot or cold.

Therefore, places near the sea usually have temperatures that remain fairly constant throughout the year, known to have a moderate climate. For example - Panaji

b) As you go up higher from the earth, it becomes cooler because sun's rays first heat the Earth's surface.

The air that surrounds us is not directly heated by the rays of the sun. In fact, it allows the rays to pass through without being heated by them. Therefore, the surface of the Earth gets heated first and that is why it is warmer near the surface as compared to places of high altitudes.

c) Sun heats the earth's surface first and then eventually heats up the atmosphere.

The air that surrounds us is not directly heated by the rays of the sun. In fact, it allows the rays to pass through without being heated by them. Therefore, the surface of the Earth gets heated first and that is why it is warmer near the surface as compared to places of high altitudes.

d) Global warming is related to increase in the proportion of carbon dioxide in the Earth's atmosphere.

The Earth radiates the heat it receives from the Sun. However, gases like carbon dioxide prevent radiation of heat from the Earth are increased in the air due to the use of petrol and diesel and cutting of trees etc. This increase in carbon dioxide, results in increasing global temperatures, leading to global warming.

Q. 2. What's the difference between the highest temperature in Table 2 and the lowest temperature in Table 1?

Answer : Highest temperature in table 2 = 33°C

Lowest temperature in table 1 = 15°C

Therefore, the difference between the highest temperature in table 2 and lowest temperature in table 1 = 33°C-15°C

=18°C

Thus, the difference is 18°C

Q. 3. Suppose, the temperature in Moscow was –8°C at 10 AM on 6 December.

Twenty-four hours later it was 12°C higher. What was the temperature at 10 AM on 7 December?

Answer : The temperature at 10 AM on 7 December in Moscow would be 4°C because the temperature went 12°C higher which can be calculated using the number line.

Q. 4. Delhi and Mumbai are both situated on plains and their height above sea level is less than 300 meters. Why is there so much difference in their monthly average temperatures? In which months are the average temperatures in these two cities most similar? Can you explain?

Answer : Although Delhi and Mumbai are both situated on plains and their height above sea levels is lee than 300 meters, there is contrasting difference in their monthly average temperatures because the Mumbai lies in the tropical region. Its coastal nature further ensures that temperature won't vary much throughout the year. On the other hand, climate of Delhi is influenced by its sub-tropical and semi-arid conditions, with high variation between summer and winter temperatures as well as precipitation.

However, July is the wettest month of the year in both Delhi and Mumbai.

Q. 5. Given below are the average monthly minimum and maximum temperatures of Jodhpur. Make a line graph of them. Which are the hottest and coldest months of the year?

Table: Average Monthly Maximum Temperatures in Jodhpur, Rajasthan (°C)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum-m	9	12	17	22	27	29	27	25	24	20	14	11
Maxim-um	25	28	33	38	42	40	36	33	35	36	31	27

Answer : A line graph is a mode of graphic representation wherein data can be presented to give a clear picture of a particular situation or trend or growth/pattern.

Students can use a graph sheet to locate the maximum and minimum temperatures as mentioned.

The month of May seems to be the hottest month of the year with temperature rising upto 42°C.

The month of January seems to be coldest month of the year with temperature lowering down to 9°C.

Q. 6. Given here are the average maximum temperatures of three places: A, B, and C. Make graphs of them. What can you guess about each place by looking at the Table and graphs?

place	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A	23	26	33	38	41	39	34	33	33	33	29	25
B	-3	1	6	12	17	21	25	24	21	14	8	2
C	31	32	33	32	32	29	29	29	30	30	30	31

Answer : Students can make graphs for the following representations using a graph paper for all the three places A, B and C.

The data about the average maximum temperatures of these three places indicates that -

1. Place A is the hottest of all with maximum temperature at 41°C in the month of May.

2. Place B is the coldest with temperature drastically dropping to as low as -3°C in the month of January.

3. Place C has a moderate climate throughout the year with temperatures remaining constant with very little variation in all the 12 months.

Q. 7. Give three possible explanations for the differences between the average temperatures in Thiruvananthapuram and Shimla in January (refer to your Atlas).

Answer : Temperature maps would be useful in giving explanation to such answers.

Students can highlight the important aspects of location which is the most important in explaining high levels of variation in climate in both these cities.

Located in northern region, in contrast to Thiruvananthapuram (which located extremely down south), both the regions experience extremely different weather conditions in the month of January i.e. January is the peak winter season in Shimla with temperature ranging from 0°C-20°C whereas the temperature in Thiruvananthapuram is around 30°C-33°C, described as the coolest months.

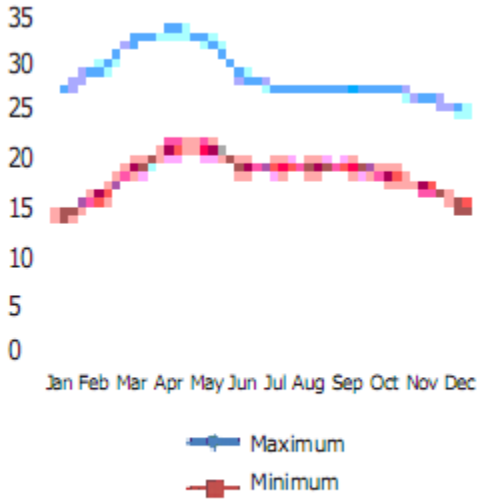
Q. 8. Between Bhopal, Delhi, Mumbai and Shimla, which two places show a similar temperature pattern? How can you explain the similarity between these two places?

Answer : Bhopal and Delhi are two places which show similar temperature pattern between the three places – Delhi, Bhopal and Shimla.

The similarity in terms of temperature and climate in these two places can be observed majorly through their location. The subtropical climate accompanied by humidity tends to show a similar temperature pattern. Additionally, both these cities experience the

peak of summer season in the month of May with high levels of temperature (exceeding 40°C) and the peak winter season during the month of January (as low as 16°C).

Q. 9. Look at the graph of Minimum-Maximum temperature on the right and answer the questions below:



Graph showing Temperature of Bangalore

a) What is the average highest temperature in July?
b) How warm does it usually get in December?
c) How cool does it usually get in June?
d) Is there a bigger difference between night and day temperature in May or in August?
e) When is summer?

Answer : a) The average highest temperature in July is 26°C.

b) A moderate variation in temperature to 24°C does not very much, supposing to be moderately warm.

c) The temperature standing between 15° and 20°C is the record presented in the above graph.

d) The difference between maximum and minimum temperature stand to be around 10-12°C.

e) The time period from March to September is the summer season in accordance with the data provided in the graph.

Q. 10. Nithin says thermal power is better to use, but Padmaja says that Solar Energy is better. Which of them do you support? Why?

Answer : Solar energy is better to use because coal-based power plants are the major cause of pollution, emitting high amounts of carbon dioxide in the atmosphere.

The Sun is the principal source of energy on the Earth's surface i.e. a powerhouse which generates and gives out energy in the form of light and heat. The heat the Earth receives from the Sun is radiated back by the Earth in different ways. The rays of the sun heat up the surface of the Earth's first, this in turn heats the atmosphere.

Some gases like carbon dioxide prevent radiation of heat from the Earth and if the proportion of carbon dioxide increases (due to use of petrol and diesel, cutting down of forests etc.), then less heat would be radiated thus causing an increase in global temperatures.

Therefore, the use of thermal power plants would contribute to increasing carbon dioxide emissions, thus contributing to global warming.