Solar Radiation, Heat Balance and Temperature

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Write full answers in Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Incoming solar radiation is called:
   (a) albedo **(b)** advection
   (c) terrestrial radiation **(d)** insolation

2. What is meant by “terrestrial radiation”?
   (a) long-wave heat radiated by the earth
   (b) cold air flowing downslope into valleys at night
   (c) energy to raise one gram of a substance by 1 °C
   (d) the share of radiation reflected back to space

3. What is the effect of altitude on temperature?
   (a) it raises the temperature of coasts it flows past
   (b) it lowers the temperature where it passes
   (c) insolation and temperature fall towards the poles
   (d) temperature falls 6.5 °C per 1,000 m

4. It is 24 °C at sea level. Using the normal lapse rate of 6.5 °C per 1,000 m, what is the temperature at 400 m?
   (a) 21.4 °C **(b)** 26.6 °C **(c)** 14.9 °C **(d)** 22.7 °C

5. Two places at the same latitude differ in temperature by 19.5 °C because of height alone. Using 6.5 °C per 1,000 m, how many metres higher is the colder place?
   (a) 3,000 m **(b)** 4,000 m **(c)** 1,500 m **(d)** 30,000 m

6. Of every 100 units of insolation, 34 are absorbed by the atmosphere from the earth’s radiation. Suppose 1,400 units arrived in the same proportions. How many units would that be?
   (a) 4,760 units **(b)** 34 units **(c)** 924 units **(d)** 476 units

7. A place has a mean January temperature of −25 °C and a mean July temperature of 27 °C. What is its annual range of temperature?
   (a) 52 °C **(b)** 27 °C **(c)** 2 °C **(d)** 62 °C

8. Which of these causes variations in the insolation received?
   (a) the angle of the sun’s rays **(b)** the salinity of the sea
   (c) the Coriolis force on winds **(d)** the number of rivers

Section B — Short answer — 8 × 2 = 16 marks

9. Name the factors that cause variations in insolation.

10. What is meant by each? (a) inversion of temperature (b) convection

11. What is the effect of each on temperature? (a) a warm ocean current (b) a cold air mass

12. At sea level it is 18 °C. Using 6.5 °C per 1,000 m, find the temperature at (a) 2,400 m (b) 4,000 m.

13. In the heat budget, of 100 units of insolation 48 are radiated to space by the atmosphere and 51 are absorbed by the earth's surface. Suppose 1,800 units arrived in the same proportions: how many units would each be?

14. Find the annual range of temperature: (a) January 0 °C, July 39 °C (b) January 10 °C, July 43 °C. Which place shows more continentality?

15. On a clear winter morning it is 11 °C at a valley floor and 15 °C at 200 m up the slope. Is this a normal lapse rate or an inversion of temperature? Give a reason.

16. Places A (2,000 m) and B (3,600 m) are at the same latitude; at sea level nearby it is 38 °C. Using 6.5 °C per 1,000 m, find each temperature. Which is warmer?

Section C — Longer answers — 4 × 4 = 16 marks

17. Explain how the earth maintains its heat budget, using the 100-unit model.

18. Match each with its meaning: (a) advection (b) conduction (c) albedo. Choose from: heat passing between bodies in contact; the share of radiation reflected back to space; horizontal transfer of heat by moving air.

19. A climber starts at sea level, where it is 30 °C, and reaches 6,400 m. Using 6.5 °C per 1,000 m: (a) What is the temperature at 2,000 m? (b) At the top? (c) Why does temperature fall with height?

20. Suppose 2,300 units of insolation reach the top of the atmosphere, divided as in the 100-unit heat budget. (a) How many units are reflected (35%)? (b) Absorbed by the surface (51%)? (c) Radiated to space by the earth (17%) and by the atmosphere (48%)? (d) Show that the budget balances.

Want another sheet on this chapter? In the Ambiful Worksheets app every sheet is new, with its answer key, and your child never gets the same question twice.

Scan the code to get the free app, or open **worksheets.ambiful.com/get**

Answer key

Solar Radiation, Heat Balance and Temperature · AW-11SS-GSR-2026-V1 · For parents — fold back or tear off before handing the sheet to your child.

Q	Answer	Working
1	**(d) insolation**	—
2	**(a) long-wave heat radiated by the earth**	—
3	**(d) temperature falls 6.5 °C per 1,000 m**	—
4	**(a) 21.4 °C**	400 ÷ 1,000 × 6.5 = 2.6; 24 − 2.6
5	**(a) 3,000 m**	19.5 ÷ 6.5 × 1,000
6	**(d) 476 units**	34% of 1,400
7	**(a) 52 °C**	27 − (−25)
8	**(a) the angle of the sun's rays**	—
9	**The earth's rotation, the angle of the sun's rays, the length of the day, the transparency of the atmosphere and the aspect of the land.**	—
10	**(a) temperature rising with height (b) vertical heating of the air by rising currents**	—
11	**(a) it raises the temperature of coasts it flows past (b) it lowers the temperature where it passes**	—
12	**(a) 2.4 °C (b) −8 °C**	18 − 1.3 × 12; 18 − 1.3 × 20
13	**864 and 918 units**	48% and 51% of 1,800
14	**(a) 39 °C (b) 33 °C; place (a)**	July − January
15	**An inversion: temperature rises with height, as cold air has drained into the valley.**	warmer higher up
16	**A 25 °C, B 14.6 °C; A, being lower**	38 − 1.3 × 10; 38 − 1.3 × 18
17	**35 units are reflected; 65 are absorbed (14 by the atmosphere, 51 by the surface); the surface radiates 51 (17 to space, 34 to the atmosphere); the atmosphere radiates 48; 17 + 48 = 65 balances the income.**	—
18	**(a) horizontal transfer of heat by moving air (b) heat passing between bodies in contact (c) the share of radiation reflected back to space**	—
19	**(a) 17 °C (b) −11.6 °C (c) The air is heated from below by terrestrial**	30 − 2,000 × 6.5 ÷ 1,000; 30 − 6,400 × 6.5 ÷ 1,000

Q	Answer	Working
	radiation and is thinner higher up.	
20	**(a) 805 (b) 1,173 (c) 391 and 1,104 (d) 391 + 1,104 = 1,495, equal to the 1,495 absorbed (2,300 − 805).**	35%, 51%, 17%, 48% and 65% of the total

Ambiful Worksheets · worksheets.ambiful.com · Not affiliated with CBSE / NCERT