CLASS IX – SCIENCE PRACTICE PAPER (2026-27)

Chapter 13: Earth as a System – Energy, Matter, and Life

Max. Marks: 40 **Time Allowed: 1 hour 30 minutes**

General Instructions:

(i) This question paper consists of **20 questions** in **5 sections (A to E)**. All questions are compulsory. Internal choice is given in some questions.

(ii) **Section A** has 10 questions of 1 mark each: Q1–8 are Multiple Choice Questions and Q9–10 are Assertion–Reason questions.

(iii) **Section B** has 4 Very Short Answer questions of 2 marks each (about 30–40 words).

(iv) **Section C** has 3 Short Answer questions of 3 marks each (about 50–60 words).

(v) **Section D** has 2 Case-Based questions of 4 marks each.

(vi) **Section E** has 1 Long Answer question of 5 marks with an internal choice.

(vii) Questions are competency-based and application-oriented. Show the formula and units in numerical questions.

(viii) **Questions 2, 6, 12, 16, 19 and 20 are figure-based** and refer to Fig. 1 to Fig. 6.

SECTION A – Objective Questions (10 × 1 = 10 marks)

1 What is the role of biogeochemical cycles in an ecosystem? **1**

(A) To provide food directly to all organisms

(B) To recycle essential nutrients between biotic and abiotic components

(C) To create new elements for living things

(D) To remove all pollutants from organisms

2 **[Figure-based]** Fig. 1 shows four layers P, Q, R and S of the atmosphere (not to scale). The layer that contains the ozone layer is: **1**

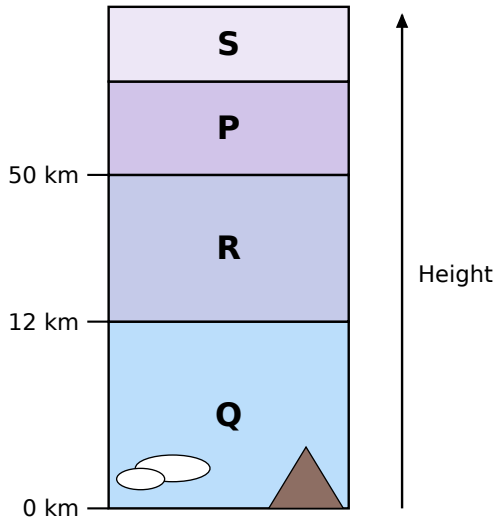


Fig. 1: Layers of the atmosphere

(A) P

(B) Q

(C) R

(D) S

3 Which of the following surfaces has the *highest* albedo? **1**

(A) Black soil

(B) Ocean water

(C) Crushed rock

(D) Fresh snow

4 The harmful part of solar radiation that is mostly absorbed by the ozone layer is: **1**

(A) ultraviolet rays
(B) visible light
(C) infrared rays
(D) microwaves

5 *Rhizobium* bacteria in the root nodules of legumes convert atmospheric nitrogen (N_2) into: **1**

(A) nitrate
(B) nitrite
(C) ammonia
(D) carbon dioxide

6 **[Figure-based]** Fig. 2 shows the flow of air in a valley during the day, when the slopes are heated by the Sun. The arrows show warm air moving up the slopes. This wind is called a: **1**

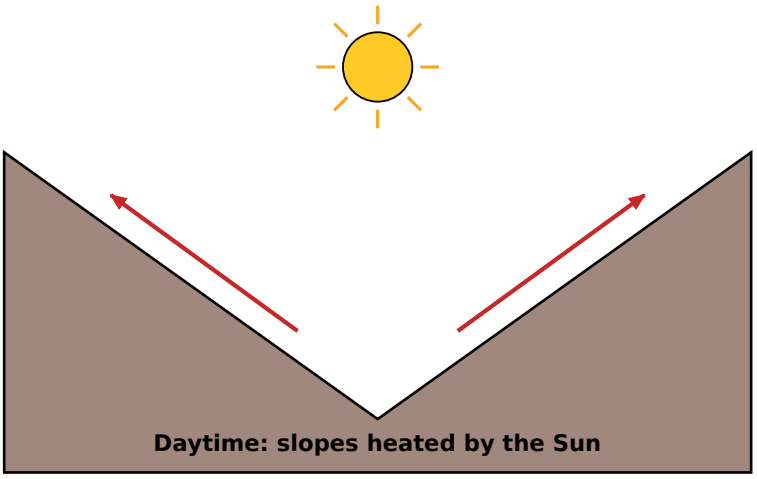


Fig. 2: Air movement in a valley in the daytime

(A) mountain breeze
(B) sea breeze
(C) land breeze
(D) valley breeze

7 In the troposphere, temperature decreases by about 6.5 °C for every kilometre of height. If the temperature at the ground is 30 °C, the temperature at a height of 4 km is about: **1**

(A) 56 °C
(B) 4 °C
(C) 36.5 °C
(D) 24 °C

8 Due to the rotation of the Earth, planetary winds in the Northern Hemisphere are deflected: **1**

(A) towards the right
(B) towards the left
(C) towards the equator
(D) not at all

Questions 9 and 10 consist of two statements: Assertion (A) and Reason (R). Choose the correct option:
(A) Both A and R are true, and R is the correct explanation of A.
(B) Both A and R are true, and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

9 **Assertion (A):** Dark coloured roads heat up faster than light coloured surfaces in sunlight. **1**

Reason (R): Dark surfaces have a low albedo and absorb more sunlight.

10 **Assertion (A):** Greenhouse gases are necessary for life on the Earth. **1**

Reason (R): Greenhouse gases reflect all the incoming solar radiation back into space.

SECTION B – Very Short Answer Questions (4 × 2 = 8 marks)

11 (a) What is the solar constant? (1) **2**

(b) Write its approximate value with the unit. (1)

12 **[Figure-based]** Fig. 3 shows the circulation of air between the equator (0°) and 30° N and 30° S latitudes. **2**

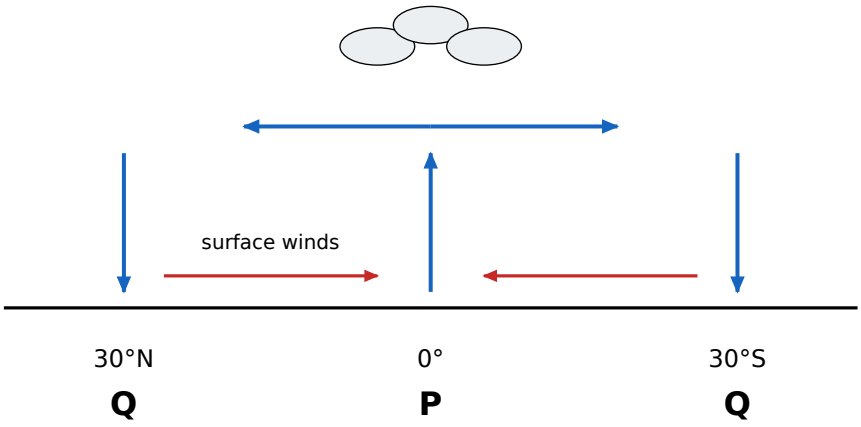


Fig. 3: Air circulation between 0° and 30° latitudes

(a) Name the pressure belts P and Q. (1)

(b) Why does the air rise at P? (1)

13 The insolation on a clear day is 1 kW m^{-2}. Calculate the solar energy received by an area of 2 m^2 in 30 minutes. (2) **2**

14 *Attempt either option A or B.* **2**

A. Why are the polar regions much colder than the equatorial regions? Give two reasons. (1 + 1)

OR

B. Define albedo. Why do snow-covered regions stay cool? (1 + 1)

SECTION C – Short Answer Questions (3 × 3 = 9 marks)

15 (i) What are CFCs, and what harm did they cause to the atmosphere? (1) **3**

(ii) Why is the damage to the ozone layer dangerous for living organisms? (1)

(iii) Which international agreement reduced the use of CFCs? (1)

16 **[Figure-based]** Fig. 4 shows the movement of carbon between the atmosphere, living organisms and fossil fuels. **3**

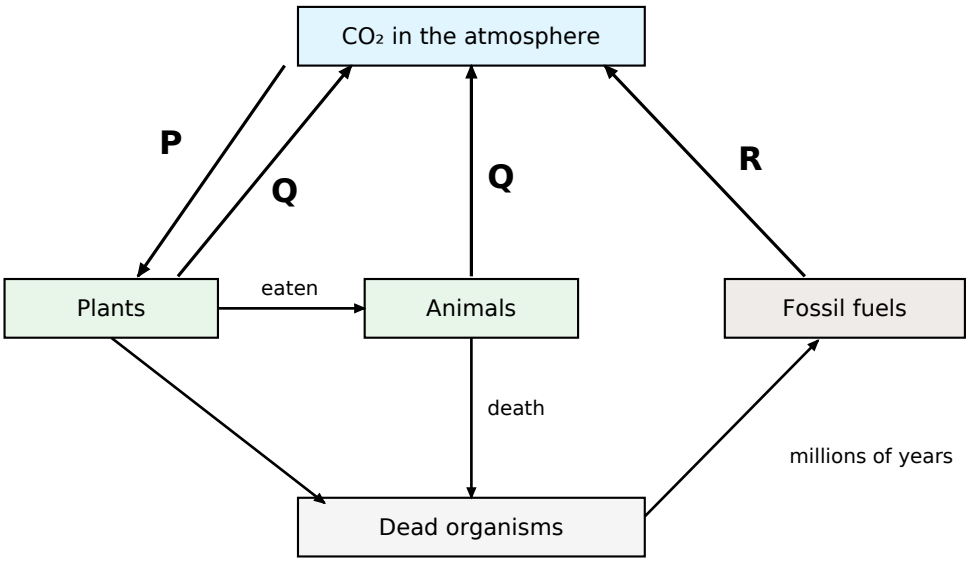


Fig. 4: Carbon cycle

(i) Name the processes P and Q. (1)

(ii) Name process R. Why is the formation of fossil fuels called part of the 'slow' carbon cycle? (1)

(iii) Name one human activity, other than R, that increases CO_2 in the atmosphere. (1)

17 *Attempt either option A or B.* **3**

A. How does climate change affect the water cycle? Give any three effects with examples. (3)

OR

B. Warmer water in the Arabian Sea affects the monsoon, glaciers and coastal cities. Explain how, linking the spheres of the Earth involved. (3)

SECTION D – Case-Based Questions (2 × 4 = 8 marks)

18 **Case Study: Albedo and Warming** **4**

A student studies how much sunlight different surfaces reflect. The fraction of solar radiation reflected by a surface is its albedo. Her data are given below.

Material	Albedo
Snow	0.80 – 0.90
Ice	0.50 – 0.70
Crushed rock	0.25 – 0.30

(i) Which material in the table has the highest albedo, and which would warm up fastest? (1)

(ii) Explain why polar regions stay cold, using the idea of albedo. (1)

(iii) The insolation is 1000 J s^{-1} m^{-2}. Taking the albedo of ice as 0.60, find the energy absorbed by 1 m^2 of ice in one second. (1)

(iv) Why are cities warmer than the surrounding rural areas, especially at night? (1)

19 **Case Study: The Rising Carbon Dioxide** **4**

[Figure-based] Scientists have measured the concentration of carbon dioxide in the atmosphere for decades. Fig. 5 shows approximate values, in parts per million (ppm), for selected years.

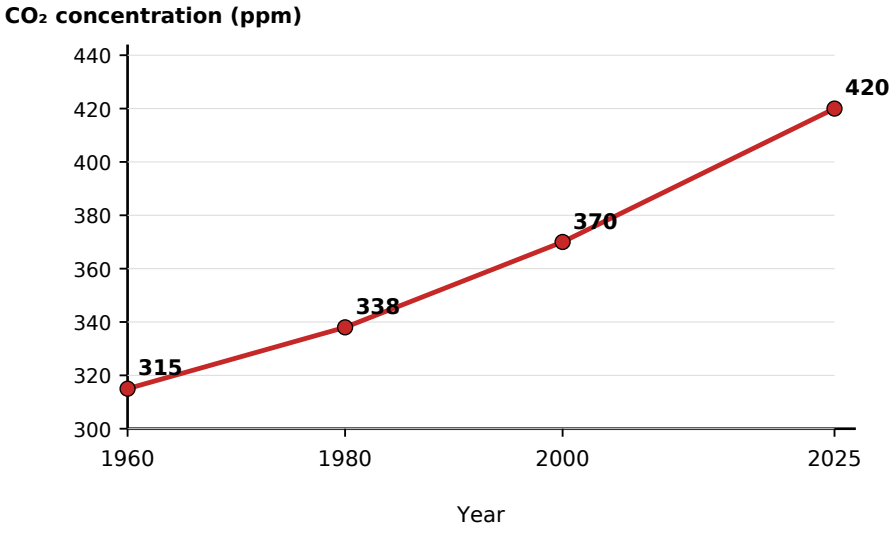


Fig. 5: Atmospheric CO_2 concentration (approximate values)

(i) By how many ppm did the CO_2 concentration rise from 1960 to 2025? (1)

(ii) In which interval, 1960–1980, 1980–2000 or 2000–2025, was the average yearly rise the greatest? Show your working. (1)

(iii) Name two human activities responsible for this rise. (1)

(iv) How does the extra CO_2 affect sea water and tiny marine organisms such as plankton? (1)

SECTION E – Long Answer Question (1 × 5 = 5 marks)

20 **[Figure-based]** Fig. 6 shows the nitrogen cycle. **5**
Attempt either option A or B.

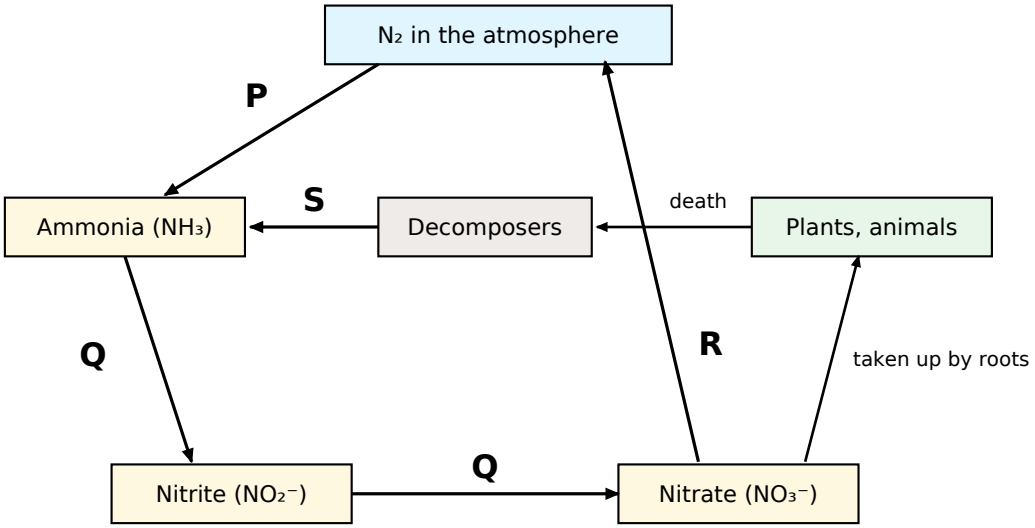


Fig. 6: Nitrogen cycle

A.

(i) Name the processes P, Q and R. (1)

(ii) Name one bacterium responsible for P and one responsible for R. (1)

(iii) Name process S and the organisms that carry it out. (1)

(iv) State one natural, non-biological way in which atmospheric nitrogen is fixed. (1)

(v) Why is nitrogen needed by living organisms, and why can plants not use N_2 directly? (1)

OR

B. Human activities disturb the cycles of matter on the Earth.

(i) What is eutrophication? (1)

(ii) How does the overuse of fertilisers cause it? (1)

(iii) Why do fish die in such water bodies? (1)

(iv) State two effects of clearing a large forest on the local area. (1)

(v) Suggest two actions that can help to restore the balance. (1)

***** END OF QUESTION PAPER *****