



Class 9 Science Chapter 13 – Important MCQs

Earth as a System: Energy, Matter, and Life

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The chapter covers **Earth's spheres, solar radiation, insolation, albedo, atmosphere, winds, ocean currents, greenhouse effect, ozone layer, water/carbon/nitrogen/oxygen cycles, eutrophication, human impacts and sustainable actions.**



SECTION A – EARTH AS A SYSTEM

1. The main source of energy for most processes on Earth is:

- A. Moon
- B. Sun
- C. Earth's core
- D. Oceans

 **Answer: B. Sun**

2. Earth can be understood as a system made up of interacting:

- A. Rocks only
- B. Spheres
- C. Animals only
- D. Oceans only

 **Answer: B. Spheres**

3. Which sphere includes solid rocks, soil, landforms and Earth's interior?

- A. Hydrosphere
- B. Geosphere
- C. Biosphere
- D. Atmosphere

 **Answer: B. Geosphere**

4. The hydrosphere includes:

- A. Only glaciers
- B. Oceans, rivers, lakes and groundwater
- C. Only rocks
- D. Living organisms

 **Answer: B**

5. The cryosphere refers to:

- A. Liquid water
- B. Solid water such as ice and snow
- C. Atmospheric gases
- D. Living organisms

 **Answer: B. Solid water such as ice and snow**

6. The atmosphere is:

- A. The layer of air surrounding Earth
- B. All water on Earth
- C. Earth's solid interior
- D. All living organisms

 **Answer: A**

7. The biosphere includes:

- A. Only forests
- B. All living organisms and their habitats

- C. Only oceans
- D. Only soil

✓ **Answer: B**

8. A disturbance in one Earth sphere can:

- A. Never affect other spheres
- B. Lead to changes in other spheres
- C. Affect only rocks
- D. Stop all energy flow

✓ **Answer: B**

The textbook emphasises that Earth's spheres interact continuously rather than functioning independently.



SECTION B – SOLAR RADIATION

9. Solar radiation reaches Earth mainly as:

- A. Sound waves
- B. Electromagnetic waves
- C. Water waves
- D. Seismic waves

✓ **Answer: B. Electromagnetic waves**

10. The speed of electromagnetic waves in vacuum is approximately:

- A. 3×10^8 m/s
- B. 3×10^6 m/s
- C. 3×10^4 m/s
- D. 9.8 m/s

✓ **Answer: A. 3×10^8 m/s**

11. Most of the Sun's energy reaching Earth is concentrated mainly in:

- A. Gamma rays, X-rays and radio waves
- B. Ultraviolet, visible and infrared regions
- C. Microwaves only
- D. X-rays only

 **Answer: B**

12. Visible sunlight reaching Earth's surface provides energy for:

- A. Photosynthesis
- B. Earthquakes
- C. Volcanic eruptions
- D. Tides only

 **Answer: A. Photosynthesis**

13. The amount of solar energy received by Earth is affected by:

- A. Latitude
- B. Earth's shape
- C. Angle of incoming radiation
- D. All of these

 **Answer: D**



SECTION C – INSOLATION & ALBEDO

14. The solar radiation received by Earth's surface is called:

- A. Insolation
- B. Condensation
- C. Convection
- D. Evaporation

 **Answer: A. Insolation**

15. The fraction of solar radiation reflected by a surface is called:

- A. Humidity
- B. Albedo
- C. Insolation
- D. Pressure

 **Answer: B. Albedo**

16. A surface with high albedo generally:

- A. Absorbs more solar radiation
- B. Reflects more solar radiation
- C. Always becomes hotter
- D. Produces more greenhouse gases

 **Answer: B**

17. Snow and ice generally have:

- A. High albedo
- B. Very low albedo
- C. Zero albedo
- D. No reflective property

 **Answer: A. High albedo**

18. A dark surface generally has:

- A. Higher albedo than snow
- B. Lower albedo and greater absorption of solar energy
- C. No absorption
- D. Zero temperature

 **Answer: B**

19. If Earth's surface reflects more solar radiation, the amount of solar energy absorbed by the surface generally:

- A. Increases
- B. Decreases
- C. Remains exactly the same
- D. Becomes infinite

✓ **Answer: B**

20. Which surface would generally have the highest albedo?

- A. Black soil
- B. Dense forest
- C. Fresh snow
- D. Dark ocean water

✓ **Answer: C. Fresh snow**



SECTION D – ATMOSPHERE

21. Most weather phenomena such as rainfall occur in the:

- A. Troposphere
- B. Thermosphere
- C. Exosphere
- D. Mesosphere

✓ **Answer: A. Troposphere**

22. The ozone layer is mainly located in the:

- A. Troposphere
- B. Stratosphere
- C. Mesosphere
- D. Exosphere

✓ **Answer: B. Stratosphere**

23. The ozone layer is important because it:

- A. Absorbs harmful ultraviolet radiation
- B. Produces all atmospheric oxygen
- C. Causes earthquakes
- D. Prevents all rainfall

 **Answer: A**

24. The layer of atmosphere closest to Earth's surface is:

- A. Stratosphere
- B. Troposphere
- C. Mesosphere
- D. Thermosphere

 **Answer: B. Troposphere**

25. Which atmospheric layer contains most of the weather-related activity?

- A. Troposphere
- B. Stratosphere
- C. Thermosphere
- D. Exosphere

 **Answer: A**



SECTION E – GREENHOUSE EFFECT

26. Greenhouse gases help keep Earth warm by:

- A. Blocking all sunlight
- B. Trapping a portion of outgoing heat
- C. Reflecting all visible light
- D. Stopping evaporation

✓ Answer: B

27. Which of the following is a greenhouse gas?

- A. Carbon dioxide
- B. Helium only
- C. Neon only
- D. Hydrogen only

✓ Answer: A. Carbon dioxide

28. The greenhouse effect is:

- A. Completely harmful under all conditions
- B. A natural process that helps maintain Earth's temperature
- C. Caused only by oceans
- D. The absence of an atmosphere

✓ Answer: B

29. Excessive increase in greenhouse gases can lead to:

- A. Global warming
- B. Complete freezing of Earth
- C. No change in climate
- D. Decrease in atmospheric gases

✓ Answer: A. Global warming

30. Which statement correctly describes Earth's warming?

- A. Earth's surface absorbs solar radiation and re-radiates energy, some of which is trapped by greenhouse gases.
- B. Carbon dioxide absorbs all incoming sunlight directly.
- C. Clouds provide all of Earth's heat.
- D. Only reflected sunlight warms Earth.

✓ Answer: A

This is directly aligned with the textbook's end-of-chapter conceptual question on Earth's warming.

SECTION F – WINDS

31. Wind is the movement of air from:

- A. Low pressure to high pressure
- B. High pressure to low pressure
- C. Equal pressure to equal pressure
- D. No pressure to high pressure

 **Answer: B**

32. Uneven heating of Earth's surface is mainly responsible for:

- A. Winds and ocean currents
- B. Earthquakes only
- C. Volcanoes only
- D. Tides only

 **Answer: A**

33. During the day in a mountainous region, warm air rises over heated slopes and cooler air moves upward from the valley. This is called:

- A. Mountain breeze
- B. Valley breeze
- C. Sea breeze
- D. Polar wind

 **Answer: B. Valley breeze**

34. After sunset, cooler and denser air flows down mountain slopes into the valley. This is called:

- A. Valley breeze
- B. Mountain breeze
- C. Land breeze
- D. Equatorial wind

✓ **Answer: B. Mountain breeze**

35. Planetary winds are produced mainly because of:

- A. Uneven heating between equator and poles
- B. Moonlight
- C. Earth's oceans alone
- D. Earth's magnetic field

✓ **Answer: A**

36. Winds help transfer:

- A. Heat and moisture
- B. Only rocks
- C. Only oxygen
- D. Only soil

✓ **Answer: A. Heat and moisture**



SECTION G – OCEAN CURRENTS

37. Ocean currents are:

- A. Large-scale movements of ocean water
- B. Movements of rocks
- C. Atmospheric gases
- D. Underground earthquakes

✓ **Answer: A**

38. Ocean currents help redistribute:

- A. Heat
- B. Only salt
- C. Only oxygen
- D. Only sand

☒ **Answer: A. Heat**

39. Ocean currents influence:

- A. Climate
- B. Weather patterns
- C. Marine ecosystems
- D. All of these

☒ **Answer: D**

40. Uneven heating of Earth contributes to:

- A. Winds and ocean currents
- B. Only earthquakes
- C. Only volcanic eruptions
- D. Only eclipses

☒ **Answer: A**



SECTION H – WATER CYCLE

41. The continuous movement of water between Earth's surface, atmosphere and living organisms is called:

- A. Carbon cycle
- B. Water cycle
- C. Nitrogen cycle
- D. Oxygen cycle

☒ **Answer: B. Water cycle**

42. Conversion of liquid water into water vapour is:

- A. Condensation
- B. Evaporation
- C. Precipitation
- D. Freezing

 **Answer: B. Evaporation**

43. Conversion of water vapour into liquid water is:

- A. Evaporation
- B. Condensation
- C. Sublimation
- D. Melting

 **Answer: B. Condensation**

44. Rainfall, snowfall and hail are forms of:

- A. Evaporation
- B. Precipitation
- C. Condensation
- D. Transpiration

 **Answer: B. Precipitation**

45. Water released by plants into the atmosphere through their leaves is:

- A. Respiration
- B. Transpiration
- C. Condensation
- D. Infiltration

 **Answer: B. Transpiration**

46. Which energy source drives much of the water cycle?

- A. Sun
- B. Moon
- C. Earth's magnetic field
- D. Stars

✓ **Answer: A. Sun**



SECTION I – BIOGEOCHEMICAL CYCLES

47. Biogeochemical cycles involve the movement of substances between:

- A. Only living organisms
- B. Biotic and abiotic components
- C. Only rocks
- D. Only oceans

✓ **Answer: B**

48. The major biogeochemical cycles discussed in the chapter include:

- A. Water, carbon, nitrogen and oxygen cycles
- B. Gold, silver and copper cycles
- C. Sodium and potassium cycles only
- D. Iron cycle only

✓ **Answer: A**

49. Biogeochemical cycles help to:

- A. Recycle essential nutrients and sustain life
- B. Stop nutrient movement
- C. Create new elements
- D. Remove all natural variation

 **Answer: A**

The textbook identifies recycling of essential nutrients between biotic and abiotic components as the key role of biogeochemical cycles.

SECTION J – CARBON CYCLE

50. Plants obtain carbon dioxide from:

- A. Soil only
- B. Atmosphere
- C. Rocks only
- D. Oceans only

 **Answer: B. Atmosphere**

51. Plants use carbon dioxide during:

- A. Photosynthesis
- B. Respiration
- C. Digestion
- D. Excretion

 **Answer: A. Photosynthesis**

52. Carbon returns to the atmosphere through:

- A. Respiration
- B. Decomposition
- C. Combustion
- D. All of these

 **Answer: D**

53. Burning fossil fuels generally:

- A. Removes carbon dioxide from the atmosphere
- B. Adds carbon dioxide to the atmosphere
- C. Stops the carbon cycle
- D. Produces only oxygen

✓ Answer: B

54. Excess carbon dioxide in the atmosphere is undesirable mainly because it:

- A. Increases the greenhouse effect
- B. Stops photosynthesis completely
- C. Removes all oxygen immediately
- D. Prevents rainfall entirely

✓ Answer: A



SECTION K – NITROGEN CYCLE

55. Nitrogen is important for making:

- A. Proteins and nucleic acids
- B. Only fats
- C. Only water
- D. Only oxygen

✓ Answer: A

56. Most atmospheric nitrogen exists as:

- A. N_2
- B. O_2
- C. CO_2
- D. NH_3

✓ Answer: A. N_2

57. Most organisms cannot directly use atmospheric nitrogen in its:

- A. Molecular form
- B. Solid form
- C. Liquid form
- D. Dissolved form

✓ **Answer: A**

58. Nitrogen-fixing bacteria help convert atmospheric nitrogen into:

- A. Forms that can enter biological cycles
- B. Oxygen
- C. Carbon dioxide
- D. Water

✓ **Answer: A**

59. Nitrogen cycling is important because nitrogen is required for:

- A. Proteins
- B. DNA and RNA
- C. Plant growth
- D. All of these

✓ **Answer: D**



SECTION L – OXYGEN CYCLE

60. Atmospheric oxygen is used in:

- A. Respiration, combustion and oxide formation
- B. Photosynthesis only
- C. Evaporation only
- D. Condensation only

✓ **Answer: A**

61. The process that mainly restores atmospheric oxygen is:

- A. Respiration
- B. Photosynthesis
- C. Combustion
- D. Weathering

 **Answer: B. Photosynthesis**

62. During photosynthesis, plants generally:

- A. Consume oxygen and release carbon dioxide
- B. Consume carbon dioxide and release oxygen
- C. Consume nitrogen and release oxygen
- D. Consume water only

 **Answer: B**



SECTION M – EUTROPHICATION

63. Eutrophication is mainly caused by excessive:

- A. Nutrients entering water bodies
- B. Oxygen entering water
- C. Sand entering rivers
- D. Sunlight entering lakes

 **Answer: A**

64. Excess nutrients in a water body can cause rapid growth of:

- A. Algae
- B. Fish
- C. Rocks
- D. Clouds

✓ Answer: A. Algae

65. Excessive algal growth can eventually:

- A. Reduce dissolved oxygen in water
- B. Increase all aquatic life
- C. Remove all nutrients
- D. Make water completely pure

✓ Answer: A



SECTION N – HUMAN IMPACT

66. Deforestation can affect:

- A. Carbon cycle
- B. Oxygen cycle
- C. Water cycle
- D. All of these

✓ Answer: D

67. Cutting large areas of forest can affect river flow by:

- A. Changing runoff and reducing water retention
- B. Stopping all rainfall
- C. Creating new rivers
- D. Increasing groundwater automatically

✓ Answer: A

68. Increasing atmospheric carbon dioxide can affect:

- A. Climate
- B. Ocean ecosystems

- C. Carbon cycle
- D. All of these

✓ Answer: D

69. Which human activity can increase greenhouse gas emissions?

- A. Burning fossil fuels
- B. Planting trees
- C. Rainwater harvesting
- D. Recycling waste

✓ Answer: A

70. Which action is most supportive of sustainable living?

- A. Wasting water
- B. Excessive use of fossil fuels
- C. Conserving resources
- D. Deforestation

✓ Answer: C. Conserving resources



SECTION O – HIGHER-ORDER MCQs

71. If a large forest is cleared, which combination of effects is most likely?

- A. Increased carbon dioxide + disturbed water cycle
- B. Increased oxygen + improved water retention
- C. No environmental effect
- D. Decreased runoff + increased forest cover

✓ Answer: A

72. If glaciers and polar ice melt rapidly, one likely consequence is:

- A. Sea level rise
- B. Decrease in all ocean water
- C. Immediate formation of more glaciers
- D. No effect on coastal areas

 **Answer: A. Sea level rise**

73. If Earth's surface had a much lower albedo, it would generally:

- A. Reflect more solar radiation
- B. Absorb more solar radiation
- C. Receive no sunlight
- D. Become completely frozen

 **Answer: B. Absorb more solar radiation**

74. If greenhouse gas concentration increases significantly, Earth's average temperature is likely to:

- A. Increase
- B. Decrease immediately to zero
- C. Remain unaffected
- D. Become exactly 0°C

 **Answer: A. Increase**

75. If photosynthesis stopped completely, atmospheric oxygen would eventually:

- A. Increase continuously
- B. Decrease because major oxygen production would stop
- C. Remain exactly unchanged
- D. Become carbon dioxide

 **Answer: B**

76. Which sequence correctly represents an important part of the carbon cycle?

- A. $\text{CO}_2 \rightarrow \text{photosynthesis} \rightarrow \text{plants} \rightarrow \text{respiration/decomposition} \rightarrow \text{CO}_2$
- B. $\text{CO}_2 \rightarrow \text{evaporation} \rightarrow \text{snow} \rightarrow \text{oxygen}$
- C. Nitrogen $\rightarrow \text{photosynthesis} \rightarrow \text{oxygen} \rightarrow \text{carbon}$
- D. Water $\rightarrow \text{combustion} \rightarrow \text{nitrogen} \rightarrow \text{CO}_2$

 **Answer: A**

77. Which statement best explains why Earth is called an interconnected system?

- A. Each sphere functions independently.
- B. Changes in one sphere can affect other spheres.
- C. Only the atmosphere affects Earth.
- D. Only living organisms interact with Earth.

 **Answer: B**

78. A region experiences unusually warm ocean water. This can influence atmospheric circulation and rainfall because:

- A. Ocean and atmosphere interact
- B. Oceans are isolated from the atmosphere
- C. Water cannot transfer heat
- D. Wind is unrelated to temperature

 **Answer: A**

79. Which activity would help reduce pressure on Earth's natural systems?

- A. Excessive resource consumption
- B. Deforestation
- C. Resource conservation and sustainable practices
- D. Burning more fossil fuels

 **Answer: C**

80. Which statement is the best summary of Chapter 13?

- A. Earth consists only of rocks and water.
- B. Energy and matter continuously flow through interacting Earth systems.
- C. The atmosphere controls every process independently.
- D. Living organisms have no effect on Earth systems.

✓ Answer: B



QUICK ANSWER KEY

Q	Ans.	Q	Ans.	Q	Ans.	Q	Ans.
1	B	21	A	41	B	61	B
2	B	22	B	42	B	62	B
3	B	23	A	43	B	63	A
4	B	24	B	44	B	64	A
5	B	25	A	45	B	65	A
6	A	26	B	46	A	66	D
7	B	27	A	47	B	67	A
8	B	28	B	48	A	68	D
9	B	29	A	49	A	69	A
10	A	30	A	50	B	70	C
11	B	31	B	51	A	71	A
12	A	32	A	52	D	72	A
13	D	33	B	53	B	73	B
14	A	34	B	54	A	74	A
15	B	35	A	55	A	75	B

16	B	36	A	56	A	76	A
17	A	37	A	57	A	77	B
18	B	38	A	58	A	78	A
19	B	39	D	59	D	79	C
20	C	40	A	60	A	80	B

MUST-REMEMBER FOR EXAMS

Earth's Spheres

Geosphere → Rocks, soil, landforms & Earth's interior

Hydrosphere → Liquid water

Cryosphere → Ice & snow

Atmosphere → Air surrounding Earth

Biosphere → Living organisms & their habitats

Solar Energy

Sun → Main source of energy

Insolation → Solar radiation received by Earth

Albedo → Fraction of radiation reflected by a surface

Atmosphere

Troposphere → Most weather phenomena

Stratosphere → Ozone layer

Greenhouse Effect

Earth's surface absorbs solar energy → re-radiates heat → greenhouse gases trap some outgoing heat

Winds

Wind → Air moves from high pressure to low pressure

Valley breeze → Day

Mountain breeze → Night

Biogeochemical Cycles

Water cycle • Carbon cycle • Nitrogen cycle • Oxygen cycle

Carbon Cycle

Photosynthesis → CO₂ removed from atmosphere

Respiration + decomposition + combustion → CO₂ returned

Nitrogen Cycle

Nitrogen → essential for proteins and nucleic acids

Oxygen Cycle

Photosynthesis → major process restoring atmospheric oxygen

Eutrophication

Excess nutrients → algal growth → oxygen depletion → harm to aquatic life

Human Impact

Deforestation • Fossil-fuel burning • Pollution • Excess resource use • Climate change

TOP EXAM TOPICS

 Earth's five interacting spheres

 Solar radiation & electromagnetic spectrum

 Insolation & albedo

 Atmospheric layers

 Ozone layer

-  **Greenhouse effect**
-  **Local & planetary winds**
-  **Ocean currents**
-  **Water cycle**
-  **Carbon cycle**
-  **Nitrogen cycle**
-  **Oxygen cycle**
-  **Eutrophication**
-  **Human impact on Earth systems**
-  **Sustainable actions & Mission LiFE**

These topics correspond to the chapter's stated coverage and the textbook's end-of-chapter revision questions.