Carbon Cycle, Hydrosphere and Energy Types

Carbon Cycle Questions

1. Which of the following is a consequence of the increase in greenhouse gas emissions?

A) The permafrost will become thicker.
B) The surface area of the pack ice (ice floes) will decrease.
C) The proportion of oxygen in the atmosphere will increase.
D) The number of extreme weather events on Earth will decrease.

2. In nature, carbon follows a cycle and moves through the Earth's different spheres, namely the atmosphere, the biosphere, the hydrosphere and the lithosphere. Which of the following human activities has the least influence on the carbon cycle?

A) Intensive tree cutting
B) Raising dairy cows
C) Burning fossil fuels
D) Operating a nuclear power plant

3. It is said that using wood to build houses helps in the fight against climate change because trees store some of the atmospheric carbon. Through what carbon cycle process do trees store atmospheric carbon?

A) Photosynthesis
B) Cellular respiration
C) Plant decomposition
D) Fossil fuel combustion

4. Which of the following does not contribute to the formation of greenhouse gases?

A) Decomposition of waste in landfills
B) Burning of fossil fuels
C) Melting of the permafrost
D) Photosynthesis in plants

5. In general, permafrost is ground that...

A) Is always frozen
B) Rarely freezes
C) Only freezes during winter
D) Is located mainly in high altitude

6. Which of the following is not a consequence of the warming of the permafrost?

A) Landslides
B) Unstable infrastructure (buildings and roads)
C) A decrease in the amount of vegetation
D) The release of greenhouse gases

7. Which of the following statements about the Greenhouse effect is true?

A) An increase in greenhouse gases in the atmosphere leads to an increase in the amount of heat that escapes into space.
B) An increase in greenhouse gases in the atmosphere leads to an increase in the amount of solar radiation that will enter the atmosphere.
C) A decrease in greenhouse gases in the atmosphere leads to an increase in the amount of solar radiation that will enter the atmosphere.
D) A decrease in greenhouse gases in the atmosphere leads to an increase in the amount of heat that escapes into space.

8. Five human activities are listed below:

1- Riding a bike
2- Driving a car
3- Using a natural gas fire place
4- Cutting down a forest
5- Swimming in a lake

Which of the above activities contribute to the greenhouse effect?

A) 2 and 3 B) 1, 2 and 3 C) 2, 4 and 5 D) 2, 3 and 4

9. The following statements are related to permafrost.

Statement 1- Permafrost is frozen ground found only in certain regions near the poles
Statement 2- When the upper layer of the permafrost thaws, landslides can occur and some buildings can suffer cracking or be destroyed.

Which of the following is correct?

A) Statement 1
B) Statements 1 and 2
C) Statement 2
D) Neither statement

10. What effect will fewer plants and trees have on the environment?

A) There will be an equilibrium of gases in the atmosphere
B) There will be an increase in animal respiration
C) There will a reduction in photosynthesis
D) There will be less greenhouse gases in the atmosphere

11. The carbon cycle describes the movement of carbon throughout the biosphere. Some human activities can have an impact on the carbon cycle through either the production of excess carbon dioxide gas, CO_2, or through decrease in the production of carbon dioxide. Which of the following human activities will increase the amount of CO_2 in the atmosphere? Explain your answer.

a) A tree-planting initiative in the Boreal forest.
b) Deforestation by a logging company

less trees to take in CO_2 + cut trees will release CO_2 in atmosphere that it had stored.

Hydrosphere Questions

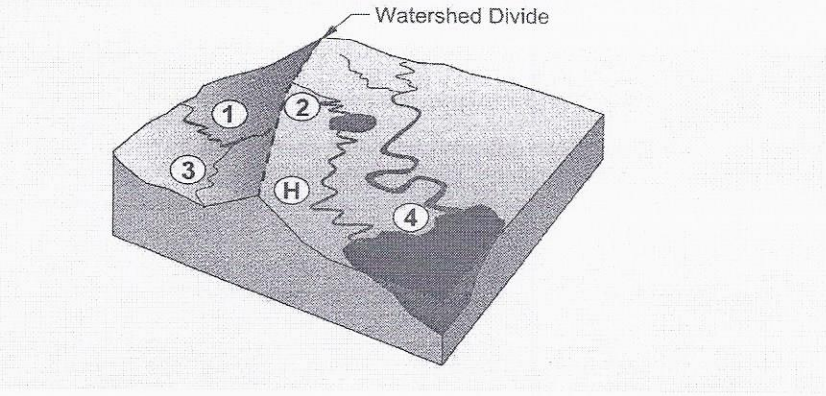
12. What is the role of thermohaline circulation?

A) It keeps the pH of oceans uniform.
B) It transports heat from the equator toward the poles.
C) It captures atmospheric CO_2
D) It controls the tidal cycle

13. Which of the statements below correctly identifies the effect of the increase in the melting of pack ice due to climate change?

A) Loss of habitat for arctic species
B) Rise in the sea level
C) Flooding of low lying areas
D) Increase in the number of icebergs

14. The diagram below shows a house (H) and four nearby farms (1, 2, 3amd 4). A well is located very close to the house.



When the well water was tested, the results showed that it was contaminated with pesticides. Which of the four farms shown (1, 2, 3 or 4) is responsible for contaminating the well water?

A) Farm 1, because it is located upstream.
B) Farm 2, because it is located in the same catchment area.
C) Farm 3, because it is located near the house.
D) Farm 4, because it is located downstream.

15. Which of the following activities has the greatest impact on the flow of water in a catchment area?

A) Filling up a child's swimming pool with 40 L of water.
B) Treating drinking water for a city in a municipal water treatment plant.
C) Rerouting rivers for the construction of a hydroelectric dam.
D) Repairing a bridge connecting Montreal's South Shore to the Island of Montreal.

16. Which of the following <u>does not</u> affect the flow of water into a catchment area?

A) Depth and latitude of the water reservoir
B) Industrial and urban development
C) Shape and slope of the terrain
D) Density and diversity of the vegetation

17. In which situation will water sink most rapidly to the ocean floor?

A) When it is cold and very salty
B) When it is warm and very salty
C) When it is cold and not very salty
D) When it is warm and not very salty

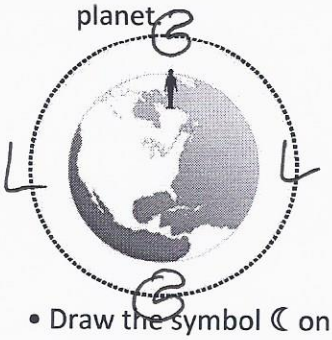
18. Different factors can affect the circulation of surface currents and deep currents in the ocean.

1. Temperature differences in the water
2. Air pressure differences in the atmosphere
3. Differences in the waters' salinity
4. The rotation of the Earth
5. The depth of the water

Which of the factors above only effect surface currents?

A) 1 and 3 only
B) 2 and 4 only
C) 1, 3 and 5
D) 2, 4 and 5

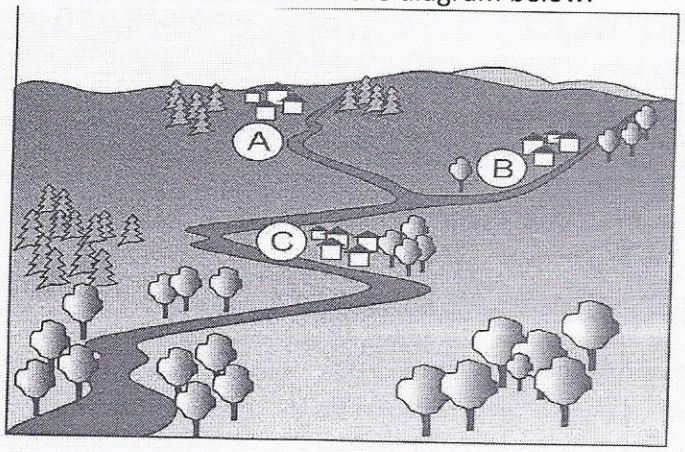
19. In Ungava Bay in northern Québec, the tidal range can reach more than 17 m. The diagram below shows the Earth along with a dotted circle representing the moon's orbit around the planet.



• Draw the symbol ☾ on the dotted circle to indicate the two (2) points in its orbit where the moon causes high tides in Ungava Bay. The position of this bay is denoted by the symbol: ⍰.
• Write the letter L on the Earth to indicate the two (2) points where the tides are low at the same time as the tide is high in Ungava Bay (⍰).

20. For each statement state whether it is an example of a surface current or a subsurface current.
    a- these currents are altered by density and salinity sub
    b- these currents are mostly controlled by wind surface
    c- these currents will allow cause you to swim off course in the ocean surface

21. Consider the watershed in the diagram below.



While major repairs are being carried out at its wastewater treatment plant, Town A, which is located next to the river, must empty its waste water into the river. Will the waste water emptied into the river affect Towns B and C? Explain your answer for each town.

B = No won't reach it water doesn't flow there

C = yes water flows to it.

22. The take below lists three human activities that can have an impact on the quality of the water in a drainage basin.

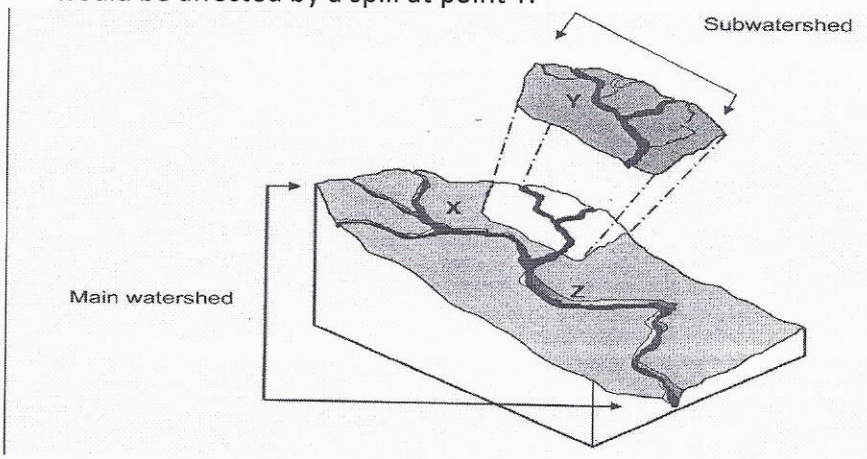
Human activities

1	Fertilizing farmland
2	Using jet skis and motor boats
3	Planting vegetation along the bank of a river or stream

Choose 2 of the 3 human activities and explain their positive or negative impact on the rivers and streams of a drainage basin.

1= fertilizer negatively affects rivers + lakes
2= release pollutants + harm aquatic life
3= provides natural barriers filter against pollutants

23. Using the following diagram, complete the table below by writing YES or NO to indicate whether points Y and Z would be affected by a spill at point X and whether points X and Z would be affected by a spill at point Y.



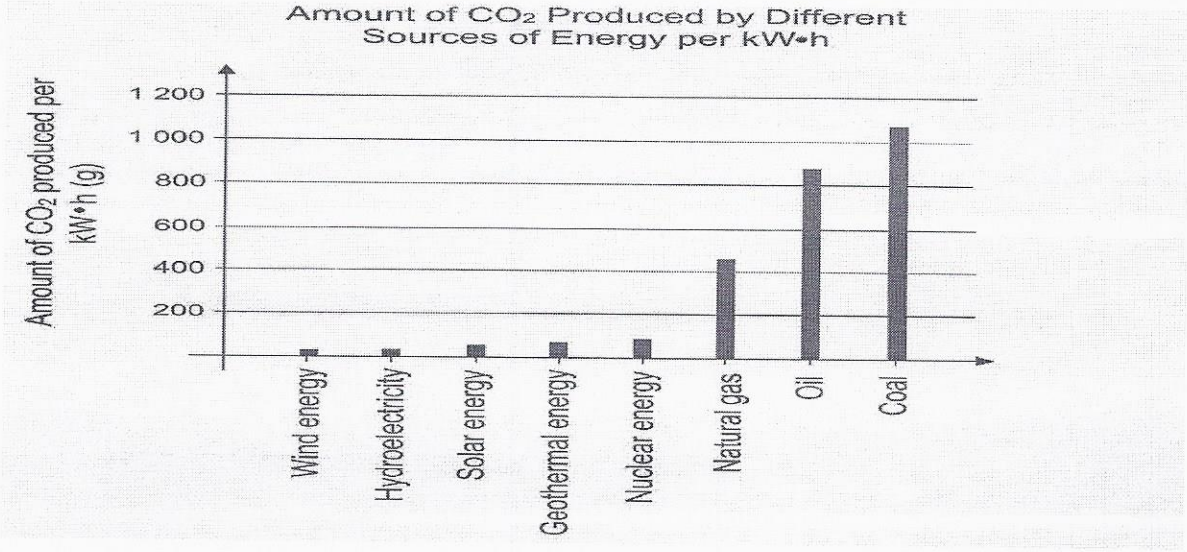
	Impact		
Location of the spill	At point X	At point Y	At point Z
X	YES	No	Yes
Y	No	YES	Yes

Explain your reasoning.

Water flows downwards

Energy Types Questions

24. The use of energy sources generates greenhouse gas emissions. The graph below shows the amount of greenhouse gas, CO_2, produced by different sources of energy per kilowatt-hour.



According to this graph, which of the following statements is true?

(A) Coal produces less greenhouse gas than all the other fossil fuels combined.

B) Only renewable energy sources produce less than 200 g of CO_2 per kilowatt-hour.

C) Each energy source from the lithosphere produces more than 400 g of CO_2 per kilowatt-hour.

D) Solar energy produces less greenhouse gas than the main energy source from the atmosphere.

25. Which of the following choices provides accurate information about one of the types of power plants listed?

	Type pf power plant	Renewable or non-renewable energy	Quantity of greenhouse gases produced
A	Geothermal	Non-renewable	Large amounts
(B)	Hydroelectric	Renewable	Little or none at all
C	Nuclear	Renewable	Large amounts
D	Tidal	Non-renewable	Little or none at all

26. Different types of electric power plants are listed in the table below.

Types of Power Plants
Wind, Geothermal, Hydroelectric and Tidal

Which statement is true about all these types of power plants?

(A) They produce few air pollutants.

B) They can be set up anywhere in Canada.

C) They all use water as the primary source of energy.

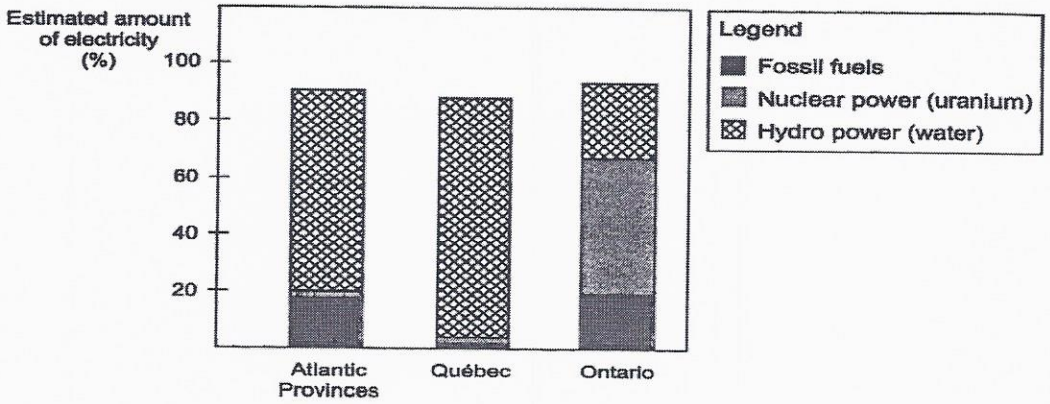
D) They use non-renewable resources.

27. Listed below are different facilities that use energy resources as well as negative consequences that may result from operating these facilities. Which choice correctly matches each facility with its consequence?

	Facilities	Negative consequences
A)	Coal-fired power plant	Noise produced
B)	Nuclear power plant	Greenhouse gas emissions
C)	Wind turbines	Greenhouse gas emissions
D)	Water turbines	Can negatively affect the migration patterns of aquatic species

28. The following graph shows different sources of electricity in three major regions in Canada.

Graph 1 -Proportion of Electricity Produced From Different Sources in Three Major Regions in Canada.



Given the information in this graph and your knowledge of energy resources, which conclusion is TRUE?

A) Electricity production has little impact on the environment in these three regions, since they all mainly use hydro power

B) Air pollution caused by electricity production is greater in Ontario than in Quebec, since Ontario has more thermal power plants.

C) Greenhouse gas emissions related to electricity production are greater in Ontario than in the Atlantic Provinces, since Ontario has more nuclear power plants.

D) Electricity production has a major impact on the environment in the three regions, since they use no renewable energy.

29. Which of the following choices (A, B, C or D) correctly indicates the location of the energy resource and one of its advantages?

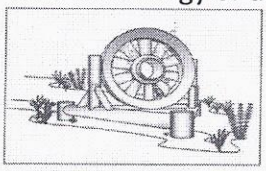
	Energy resources	Location of the resource	Advantage
A	Fossil energy	Lithosphere	Renewable energy
B	Geothermal energy	Hydrosphere	Clean energy
C	Tidal energy	Hydrosphere	Little or no greenhouse gas emissions
D	Nuclear energy	Lithosphere	Produces a small amount of energy

30. In Europe, a lot of electricity is produced by nuclear power plants, with uranium as the source of energy.

a) Where is this source of energy located? Atmosphere, hydrosphere or lithosphere

b) Is this a renewable or non-renewable energy source?

31. There are plans to put underwater turbines in the Gulf of the St. Lawrence. This technology uses the energy of deep currents to produce electricity.



a) Is the source located in the lithosphere, hydrosphere or atmosphere?

b) Give two advantages of producing electricity with underwater turbines rather than wind turbines.

- less noise
- no visual pollution
- currents are predictable

c) Indicate a possible negative consequence of using the underwater turbines.

- May endanger aquatic life
- change migration patterns.

32. The inhabitants of a remote island would like to replace gasoline-powered generators with devices that use renewable energy. The table below indicates certain characteristics of the island.

Population	583 inhabitants
Area	250 km^2
Climate	Summer: humid and sunny Winter: cold and sunny
Environment	Wildlife: seals, fish, aquatic birds Vegetation: diversified
Topography	Coasts: sandy beaches and small waves Igneous rock and volcanic activity constantly monitored
Economic activities	Tourism, sailing, deep sea fishing, excursions

Fill in the table below.

	Method of Producing Electrical Energy	Location of the Resource	Justification for Method Chosen Based on the Characteristics of this Island
1)	Solar panels	☑ Atmosphere	sunny
2)	Wind turbine	☐ Biosphere	has wind
3	Wave	☑ Hydrosphere	has waves for turbines
4	geothermal	☑ Lithosphere	Volcanoes = thermal source