Earth & Space Review Questions:

Name: SOLUTIONS

1) Which of the following statements correctly describes permafrost?

A) All the frozen water on the Earth's surface.

B) A layer of soil frozen for more than two years.

C) The snow which accumulates on the surface of glaciers.

D) The upper layer of water which freezes when in contact with cold air.

2) Which of the following is a consequence of melting permafrost?

A) Increased primary productivity

B) Decreased erosion

C) Decreased levels of greenhouse gases

D) Decreased decomposition of organic matter in soil

3) How does the melting of permafrost lead to higher average global temperatures?

melting permafrost releases methane gas → increases the Enhanced Greenhouse effect

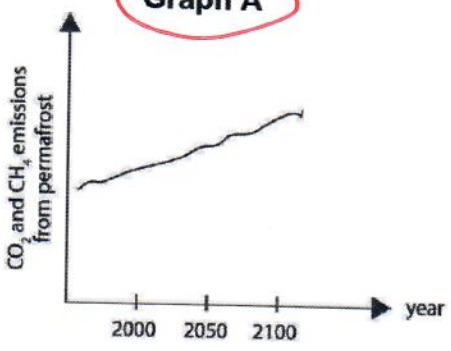
What impact does the melting permafrost have on human settlements?

Unstable buildings, Cracks in foundations, landslides.

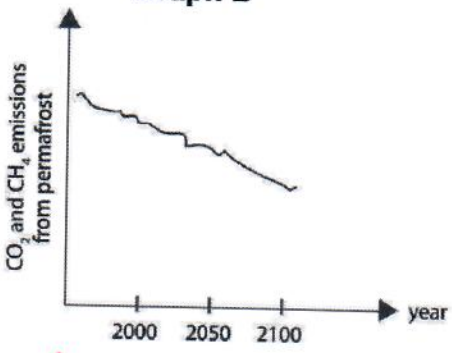
4) Global temperatures have been increasing at a steady rate. Ecologists have been hired to study the impact of increasing temperature s on a region in Northern Quebec.

Which graph below correctly shows the consequence of a rise of temperature in the region? Explain your answer.

Graph A



Graph B



As temp rises, permafrost melts releasing more CO_2 & CH_4 into Atm

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

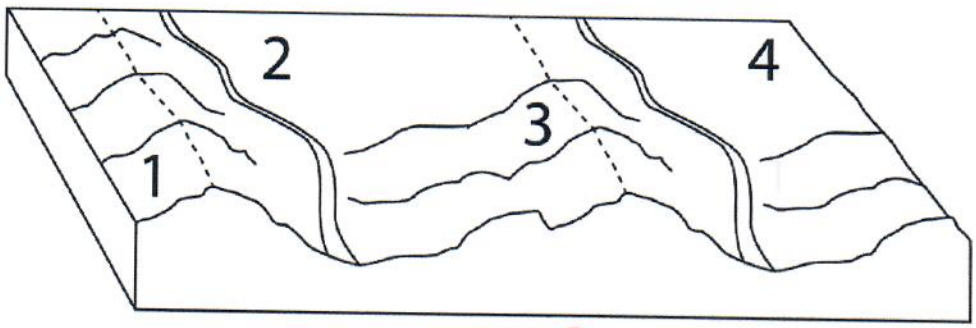
A) Depth and latitude of the water reservoir

B) Industrial and urban development

C) Shape and slope of the terrain

D) Density and diversity of the vegetation

6) Which location is in the same catchment area?



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

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

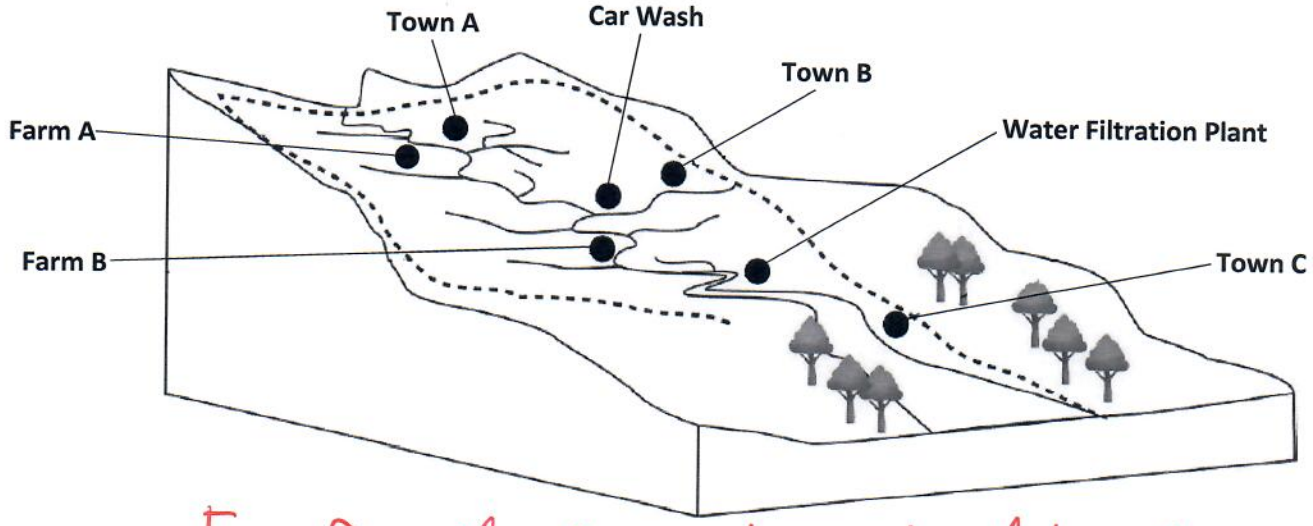
A) Filling up a child's swimming pool with 40 L of water.

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.

8) A local inspector has noticed that the wastewater from the local car wash has been flowing into a nearby stream. Knowing that the water filtration plant only serves Town C, which part(s) of the region shown below are in danger of being in contact with the dirty wastewater.



Answer(s): Farm B, all other parts are located upstream (except for town C, but town C gets its water from treatment plant)

9) From the statements below, choose two which will cause an increase in the salinity of ocean water.

1. increased erosion
2. ocean water redirected to a tidal energy plant
3. ice floes and glaciers melt
4. water evaporates at the equator

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

10) Samples of ocean water were collected from different depths and analyzed.

Sample	Mass of Salt	Volume of Sample
A	8.32 g	240 mL
B	7.65 g	0.225 L
C	4.20 g	115 mL

→ 34.7 g/L
→ 34.0 g/L
→ 36.5 g/L

B, A, C

Rank these samples in order of increasing salinity. Show your work.

11) Which of the following will increase the density of a solution?

1. Increasing the salinity
2. Decreasing the salinity
3. Adding water
4. Allowing water to evaporate

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

12) Does the density of the ocean water increase or decrease as glaciers and pack ice melt? Explain your answer.

Density of Ocean water decreases. Glaciers and Pack ice are made of freshwater, when they melt it decreases salinity.

13) 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

14) What are the characteristics of ocean water which has a tendency to sink?

A) Low temperature and low density

B) Low temperature and high density

C) High temperature and low density

D) High temperature and high density

15) On Monday, a high pressure system resides over the middle of the Atlantic Ocean; it is calm and sunny. On Thursday, several low pressure systems merge to create a powerful storm with strong winds and heavy rain.
Describe the differences in oceanic circulation in this area on Monday and Thursday.

On thursday more wind (storm) pushes on water surface, mixing water, more aggetation of waters (surface). Eventually it returns to normal

16) Which of the following statements concerning thermohaline circulation is true?

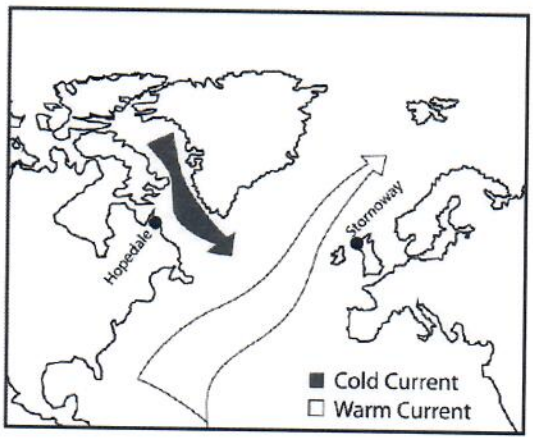
A) Thermohaline circulation allows for the heat accumulated in ocean water at the Polar Regions to circulate to the Equatorial Region.

B) Thermohaline circulation allows for the heat accumulated in ocean water at the Equatorial Region to circulate to the Polar Regions.

C) Thermohaline circulation can be compared to a conveyor belt which moves warm and cold air masses around the Earth.

D) Thermohaline circulation can be compared to a conveyor belt which moves warm and cold freshwater systems around the Earth.

17) The Labrador Current flows south along the coast of Newfoundland and Labrador. The water it carries is so cold that it keeps the most northern regions icebound in winter. The Labrador Current carries cold water towards the Atlantic Ocean where it will mix with the Gulf Stream. The Gulf Stream brings warm water up along the eastern coast of the U.S.A. and carries it towards Western.



Using your knowledge of ocean circulation explain why Stornoway has milder winters than Hopedale although they are roughly at similar latitudes.

Warm waters from Gulf Stream current moves past Stornoway bringing with it and relasing its heat to surrounding area. Cold waters from Labrador current have opposite effect cooling the surrounding regions (ocean waters influence climates).

18) Which of the following is true about glaciers and pack ice?

A) Both glaciers and pack ice are formed on land.

B) Both glaciers and pack ice are formed on the ocean's surface.

C) Both glaciers and pack ice contain freshwater.

D) Both glaciers and pack ice form icebergs.

19) Which of the following statements is true about pack ice?

A) The melting of pack ice affects the salinity of the ocean water.

B) The melting of pack ice does not affect the temperature of the ocean water.

C) The melting of pack ice affects sea levels.

D) The melting of pack ice does not affect oceans.

20) 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) Increase in the number of icebergs

D) Flooding of low lying areas

21) Global warming has caused the melting of pack ice at the North and South poles.

Explain how this affects the salinity and density of the water in those regions. How does this impact thermohaline circulation?

As pack ice melts it releases freshwater into oceans. This dilutes the salty water (less dense). Since the water is no longer as salty it does not sink as easily, slowing down thermohaline circulation.

22) Explain how a population living at sea level near the equator can be affected by global warming at the Poles.

As glaciers melt ocean levels rise at the poles, all oceans rise, even those located far away (at poles)

23) Why is flooding not a result of the increased melting of pack ice?

Pack ice is formed from ocean water already in the ocean, if it melts it isn't adding any new water to the ocean.

24) Which of the following gases do not contribute to the greenhouse effect?

A) CO_2 B) CH_4 C) NO_2 D) SO_2

25) 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) A decrease in greenhouse gases in the atmosphere leads to an increase in the amount of heat that escapes into space.

C) An increase 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 solar radiation that will enter the atmosphere.

26) Five human activities are listed below.

1. Raising cattle
2. Driving a gasoline powered car
3. Using a natural gas fireplace
4. Walking
5. Swimming in a lake

Which of the above activities could contribute to the greenhouse effect?

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

27) 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

28) The National Center for Policy Analysis released a newsletter in June 2009 highlighting "10 Cool Global Warming Policies". Two of the proposed policies for reducing the harm of global warming were:

Policy 1: Reduce forest wildfires through Alternative Forest Management Institutions

Policy 2: Subsidise the development of renewable energy resources

Explain how each policy could reduce global warming.

Policy 1: More forest (due to less fires) → more photosynthesis → more absorption of CO_2 by plants, less EGE

Policy 2: Renewable energy resources such as wind, solar, geothermal do not produce any harmful greenhouse gases

29) Which of the following technologies uses an energy source derived from the lithosphere?

A) Tidal barrage
B) Wind turbine
C) Photovoltaic cell
D) Coal-fired plant

30) The lithosphere and the hydrosphere provide us with many different resources that we can use to produce energy. Each resource has its advantages and disadvantages.
Complete the following table regarding the advantages and disadvantages of uranium and Hydroelectric energy:

Resource	*Advantages*	*Disadvantages*
Uranium	*1. small quantity of uranium will produce much energy* *2. does not produce and greenhouse gases*	*1. non-renewable form of energy* *2. produces radioactive waste that is toxic to all organisms*
Tidal Energy	*1. renewable source of energy* *2. tides are predictable; there are 2 high tides and 2 low tides a day*	*1. turbines can only be used in certain regions where tide height reaches a minimum of 5 meters.* *2. turbines are placed in harsh salt water conditions, often far from city centers.*

31) Wind farms are growing in importance in Quebec. In partnership with Hydro-Quebec, these farms require many years of planning and construction. The Gros-Morne wind park in the Gaspésie region will have over 140 wind turbines at the end of its construction. In order to begin construction of Phase I in the spring of 2010, deforestation work was performed in the fall of 2009.

What are the advantages and disadvantages of using wind energy?

Advantages *to using wind energy is that it is a renewable, clean (no greenhouse gases) form of energy.*

Disadvantages *to using wind energy are that the wind is not predictable and that the energy itself cannot be stored. Some would say that the wind turbines create both visual pollution, ruining the natural beauty of the environment and noise pollution. Deforestation also needs to take place before some wind parks are constructed.*

32) A community in Gaspé is researching the environmental impacts of different energy sources.

Below is a list of possible environmental impacts

1. Tidal barrages can disrupt marine life.
2. Tidal power plants and coal power plants release greenhouse gases.
3. Nuclear power plants create no harmful waste products.
4. Flooding is a concern in the building of hydroelectric dams.

Which of the above statements are true?

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

33) A community in Gaspé is researching the environmental impact of two different energy technologies: a tidal power plant and a coal power plant.

For each of the energy resources the community is considering, state:

- the energy source as renewable or non-renewable
- the main environmental impact for each type of energy

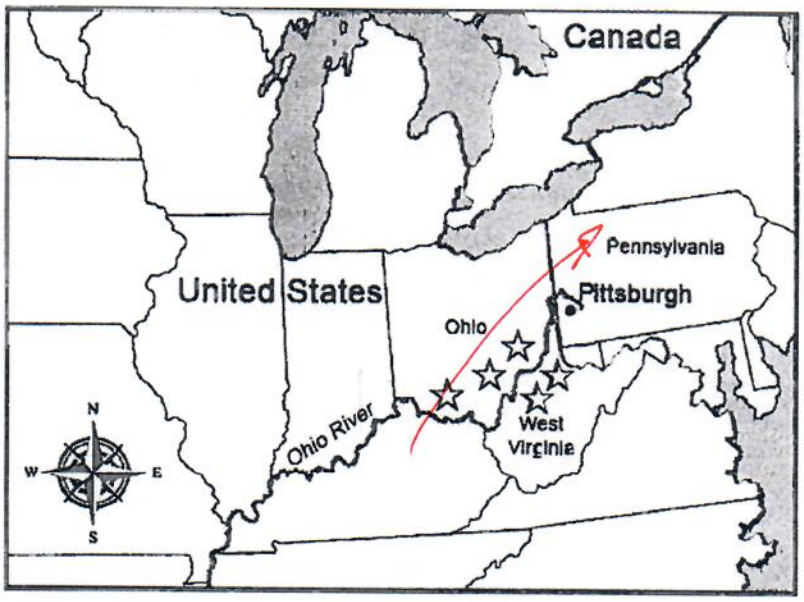
tidal: Rewable, but can disrupt marine life.

Coal: Non-Renewable, release greenhous gases

34) The Ohio River is home to a large number of coal-fired power plants (represented by a ☆ in the diagram below). Most of these coal-fired power plants are situated in the states of Ohio and West Virginia.

Cities in close proximity to the power plants have average air pollution levels. However, Pittsburgh, in the state of Pennsylvania, is one of the cities with the highest air pollution levels in the United States.

What is the direction of the prevailing winds in this area?



(A) North-East
B) North-West
C) South-East
D) South-West

35) Eutrophication is a widespread environmental problem.

Scientists agree that eutrophication is accelerated by increasing inputs of phosphorus and nitrogen, which are abundant in human sewage, livestock excrement, and fertilizers.

How do increases in nitrogen and/or phosphorous lead to changes in water quality and eutrophication in lakes?
Include a minimum of four statements in your answer.

1. these substances act as nutrients for algae
2. decreased light penitration into water
3. when algea die, decomposers use up alot of stored O_2 in water
4. lack of O_2 in water causes fish to die.

36) **Oceanic circulation involves two types of ocean currents: surface currents and deep currents.**

The following table lists 4 factors that influence oceanic circulation.

FACTORS INFLUENCING OCEANIC CIRCULATION

1- Rotation of the Earth
2- Differences in water temperature
3- Differences in water salinity
4- Prevailing winds

Which two factors in particular influence deep currents?

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

37) Which of the following choices (A, B, C or D) provides accurate information about one of the types of power plants listed?

	Type of 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

38) Which of the following statements is TRUE about melting permafrost?

Melting permafrost . . .

A) . . . increases soil stability.
B) . . . contributes to global warming.
C) . . . modifies ocean surface currents.
D) . . . prevents vegetation from growing.

39) **Scientists discovered that a certain bacterium grew best in a slightly alkaline environment. The table below gives the pH value of each environment in which this bacterium was cultivated.**

pH Values in the Environments Tested

Environment	pH
1	2.4
2	6.1
3	7.6
4	13.2

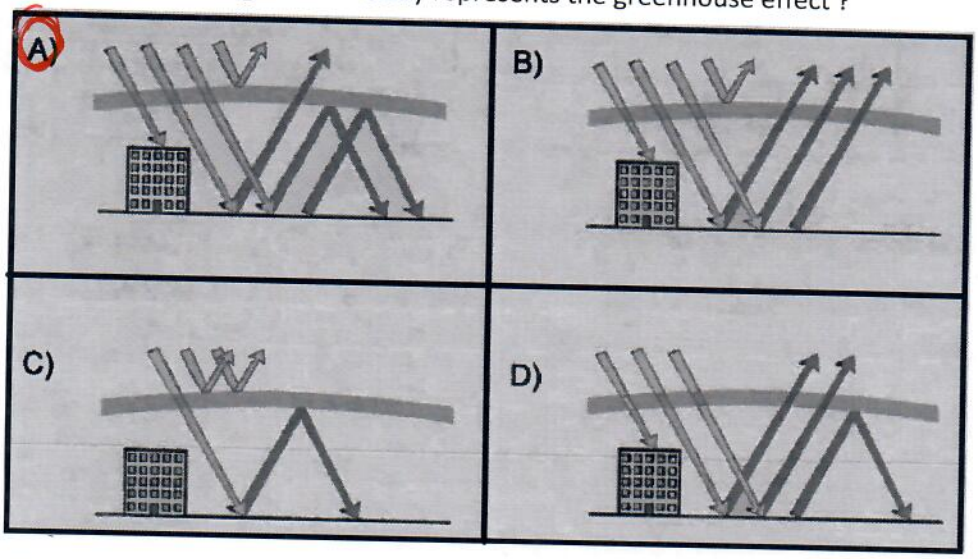
In which one of these environments did this bacterium grow best?

A) Environment 1 B) Environment 2
C) Environment 3 D) Environment 4

40) Which statement is TRUE regarding the **greenhouse effect**?

A) Ultraviolet (UV) rays emitted by the sun are dispersed in the atmosphere.
B) Some of the infrared rays emitted by the sun are trapped in the atmosphere.
C) Ozone prevents certain types of harmful solar radiation from passing through the atmosphere.
D) Ammonia (NH_3) is one of the main gases that keep the heat released by the sun in the atmosphere.

41) Which of these diagrams correctly represents the greenhouse effect ?



42) **Global warming could have a significant impact on polar regions. Authorities have therefore thought about moving certain northern villages because roads could become unfit for travel and landslides could occur. Large quantities of methane and carbon dioxide could also be released into the air.**

What is responsible for these consequences of global warming?

A) Melting permafrost
B) Forest decline
C) A change in the flow of water in a drainage basin
D) Increasing precipitation

43) **Four statements about glaciers or pack ice (ice floes) are provided below.**

1- **Glaciers and pack ice (ice floes) hold a large supply of salty water.**
2- **Melting glaciers and melting pack ice (ice floes) will increase the surface area that reflects sunlight.**
3- **Melting glaciers lead to rising sea levels.**
4- **Melting pack ice (ice floes) is one of the factors that slows down thermohaline circulation.**

Which of these statements are TRUE?

A) 1 and 2 **B) 1 and 4** **C) 2 and 3** **D) 3 and 4**

44) **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 carbon dioxide, $CO_{2\,(g)}$.
D) It controls the tidal cycle.

45) Some areas of the ocean located near the equator are known for their strong surface currents.

What factor explains the presence of these **surface currents** near the equator?

A) Ocean water is very salty.
B) The winds are present throughout the year.
C) The density of warm water is low.
D) The sun's rays are almost perpendicular to the surface of the water.