

# Geography 12

## August 1999 Provincial Examination

### ANSWER KEY / SCORING GUIDE

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- Topics:**
1. Focus 1 – Environments and People
  2. Focus 2 – Physical and Biological Processes
  3. Focus 3 – Resources
  - Focus 4 – Challenges of the Future

#### Part A: Multiple Choice

<b>Q</b>	<b>K</b>	<b>C</b>	<b>T</b>	<b>CGR</b>	<b>Q</b>	<b>K</b>	<b>C</b>	<b>T</b>	<b>CGR</b>
1.	D	U	2	2B1a	21.	C	U	2	2A2g
2.	C	U	2	2B2e	22.	C	U	2	2A2c
3.	C	U	2	2B2c	23.	B	U	2	2A2g
4.	A	K	2	2B2d	24.	D	U	2	2C2h
5.	B	U	2	2B2b	25.	B	U	2	2A3b
6.	D	K	2	2B2a	26.	C	U	2	2C2e
7.	D	K	2	2B2c	27.	B	U	2	2C3a
8.	A	K	2	2B3b	28.	B	U	2	2C2f
9.	D	U	2	3B3c, l	29.	C	U	2	2C3b
10.	A	U	2	2B3g	30.	D	K	2	2C2a
11.	C	K	2	2B3k	31.	A	K	1	1Ba
12.	D	U	2	2B3j	32.	C	K	1	1Ca
13.	A	K	2	2B3f	33.	D	K	3	3Ag
14.	C	U	2	2B3i	34.	D	K	3	3Ae
15.	D	K	2	2B4f	35.	C	U	3	3Ba
16.	D	U	2	2B3h	36.	A	U	3	4Ad
17.	B	K	2	2B4i	37.	B	U	3	4Ad
18.	B	K	2	2B4b	38.	C	U	3	4Ad
19.	B	U	2	2A1c	39.	A	U	3	3Bf
20.	A	K	2	2A1a	40.	B	U	3	3Cf, 2B1c

**Multiple Choice = 40 marks**

## Part B: Written Response

<b>Q</b>	<b>B</b>	<b>C</b>	<b>S</b>	<b>T</b>	<b>CGR</b>
1.	1	U	4	2	2B3e, h
2.	2	H	6	1	1Bb
3.	3	H	3	1	1Bd, f, 1Cf
4.	4	H	6	3	3Cb
5.	5	H	4	2	2B3l
6.	6	H	6	3	2C3c, 3Bh
7.	7	U	4	2	2A3g
8.	8	U	4	2	2C2f, 3Cf
9.	9	H	6	3	3Bc
10.	10	H	4	3	4Bd
11.	11	U	3	3	3Ck

**Written Response = 50 marks**

Multiple Choice = 40 (40 questions)

Written Response = 50 (11 questions)

**EXAMINATION TOTAL = 90 marks**

### **LEGEND:**

**Q** = Question Number

**C** = Cognitive Level

**T** = Topic

**K** = Keyed Response

**S** = Score

**CGR** = Curriculum Guide Reference

**B** = Score Box Number

**PART B: WRITTEN RESPONSE**

**Value: 50 marks**

**Suggested Time: 80 minutes**

**INSTRUCTIONS:** Answer each question in the space provided. You may not need all of the space provided. Answers should be written in **ink**. **Comprehensive answers are required for full marks.**

**Select either feature X or feature Y  
on the topographic map on page 17 to answer question 1.  
Indicate your selection with a ✓.**

Glacial feature X

River feature Y

1. a) **Name** the glacial or river feature selected. \_\_\_\_\_ **(1 mark)**

**Response:**

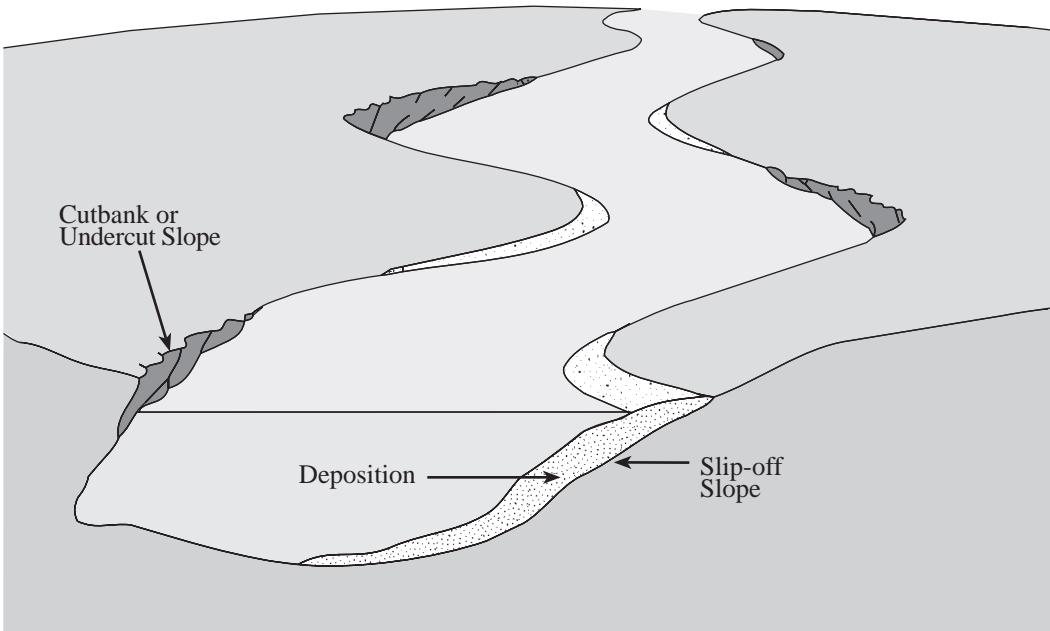
<b>Glacial Feature X</b>	<ul style="list-style-type: none"><li>• cirque (cirque glacier)</li><li>• hanging valley</li><li>• hanging glacier</li></ul>
<b>River Feature Y</b>	<ul style="list-style-type: none"><li>• river meander</li><li>• cutbank</li><li>• slip-off slope</li><li>• developing oxbow lake</li></ul>

- b) With the aid of a clearly labelled diagram, **explain** how the feature you have selected was formed. **(3 marks)**

**Response:**

<b>CIRQUE</b>	
<p>A cirque is formed when a semi-circular, steep-sided basin is cut into the side of a mountain or at the head of a valley. The accumulation of snow in a hollow eventually forms ice, névé, firn or a glacier. The glacier moves and pulls away from the sides. Water which has infiltrated fissures and frozen in place allows the moving glacier to pluck out rock. Freeze-thaw activity is taking place. This causes the sides to steepen and the wall to retreat (headward erosion). The depression is over-deepened and takes the shape of an armchair.</p>	
<p><b>Note to Markers:</b>  <b>Allow 1 mark for the diagram and 2 marks for the explanation. Part of the explanation may be shown within the diagram.</b></p>	

**Response:**

<b>RIVER MEANDER</b>	
	
<p>A river flowing across a flood plain will meet resistant rock which can cause the water to meander laterally. The effect of this meander is exaggerated because the velocity is greatest on the outside edge, causing erosion of the outside bank (cutbank or undercut slope). In addition, the river's energy decreases on the inside bank (slip-off slope) and deposition occurs, building up the inside bank.</p>	
<p><b>Note to Markers:</b></p> <p><b>Allow 1 mark for the diagram and 2 marks for the explanation. Part of the explanation may be shown within the diagram.</b></p>	

**Use the air photograph on page 15 and the topographic map on page 17 to answer question 2.**

2. With reference to the map and air photograph, **explain** the interactions between the atmosphere, biosphere, hydrosphere and lithosphere in the Jasper region. Answer in **paragraph** form. **(6 marks)**

**Response:**

<b>Hydrosphere</b>	<ul style="list-style-type: none"> <li>Given its location and elevation, snow builds up during the winter months and slowly melts throughout the rest of the year, resulting in run-off via the streams into the main river. Fluvial action has resulted in substantial erosion of the valley; flooding likely occurs in the spring. The reservoir suggests, however, that water storage is important in the area. As well, intermittent streams suggest dry summers. Possibility of avalanches in the winter.</li> </ul>
<b>Lithosphere</b>	<ul style="list-style-type: none"> <li>The lithosphere has been eroded by several forces: glaciation as evidenced by the lakes, gravel pits, striations and the U-shaped trough; the action of rivers including the braiding of the main river resulting in sand bars and islands. Erosion and deposition by streams, carving out gorges, and meandering patterns as well as in filling lakes such as Pyramid Lake and the glacial trough. Mass wasting along the railway line and highway (interaction between the three spheres). Thin mountain soils and some podzols.</li> </ul>
<b>Biosphere</b>	<ul style="list-style-type: none"> <li>The area is carpeted by northern coniferous trees which are well adapted to the thin mountain soils and cold winter conditions. Above the tree line, alpine vegetation dominates due to the harsh conditions and limited growing season. The river valley would be covered in deciduous trees which flourish near rivers due to the availability of water, lower elevations and warmer temperatures. Human activities have no doubt altered the natural vegetation and the fauna of the region.</li> </ul>
<b>Atmosphere</b>	<ul style="list-style-type: none"> <li>Cold temperatures and precipitation contribute to alpine glaciation. Changes in temperature contribute to weathering (frost action). Moderate temperatures and precipitation result in the growth of coniferous forests. Precipitation in the mountainous region is a result of orographic uplift.</li> </ul>
<p><b>Note to Markers:</b>  <b>This question is to be marked holistically.</b></p>	

Use the following map to answer question 3.



3. a) Identify one common natural hazard associated with region X.

(1 mark)

Response:

<p><b>Common natural hazards associated with location X include:</b></p>	<ul style="list-style-type: none"><li>• tornadoes</li><li>• hurricanes</li><li>• storm surges</li><li>• coastal erosion</li><li>• coastal flooding</li><li>• saltwater intrusion</li><li>• severe cyclonic disturbances</li><li>• lightning strikes causing fires</li><li>• winter freezes (damage to crops)</li><li>• chemical weathering / erosion in limestone areas (karst erosion, sink holes/swallow holes, land subsidence)</li></ul>
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b) **Suggest two** ways the effects of the identified hazard can be minimized. **(2 marks)**

**Response:**

<b>The effects of hazards can be minimized by</b>	<ul style="list-style-type: none"><li>• cloud seeding (hurricanes, tornadoes and thunderstorms).</li><li>• restricting development in areas prone to the natural hazard.</li><li>• preparing evacuation plans to respond to the natural hazard.</li><li>• compliance with evacuation orders.</li><li>• monitoring the natural hazard (using computer projections and satellite imagery).</li><li>• implementing an early warning system to be used in case the natural hazard is pending.</li><li>• organizing emergency response teams to deal with the natural hazards (civil defence, smoke jumpers, Red Cross).</li><li>• implementing strict building codes which take into account the natural hazard (fireproof roofing, minimum strength requirements for roof construction and substrata geology survey).</li><li>• strengthening/widening barriers to the natural hazard (dikes, levees, groynes, firebreaks).</li></ul>
<p><b>Note to Markers:</b> <b>Comments regarding living in the area will be awarded a maximum of one mark (e.g. leave there/do not move there).</b></p>	



Use the following photograph to answer question 4.



BC Government air photograph 15BC80102 No. 040, reproduced courtesy of Geographic Data BC — Ministry of Environment, Lands and Parks.

4. a) **Describe three** ways that humans have already made use of the physical landscape in this region. **(3 marks)**

**Response:**

<b>Humans have used the physical landscape by</b>	<ul style="list-style-type: none"><li>• developing the shoreline—marina, homes built for the aesthetic appeal.</li><li>• using flat land—transportation corridors.</li><li>• capitalizing on the use of flat land—airport.</li><li>• utilizing arable soil and flat land—farmland.</li><li>• clearing forested areas—recreation (golf course) and residential development.</li><li>• using beaches—recreation.</li><li>• using waterway—transportation route.</li><li>• using gravel deposit—for quarry, building supplies.</li><li>• consuming arable land.</li></ul>
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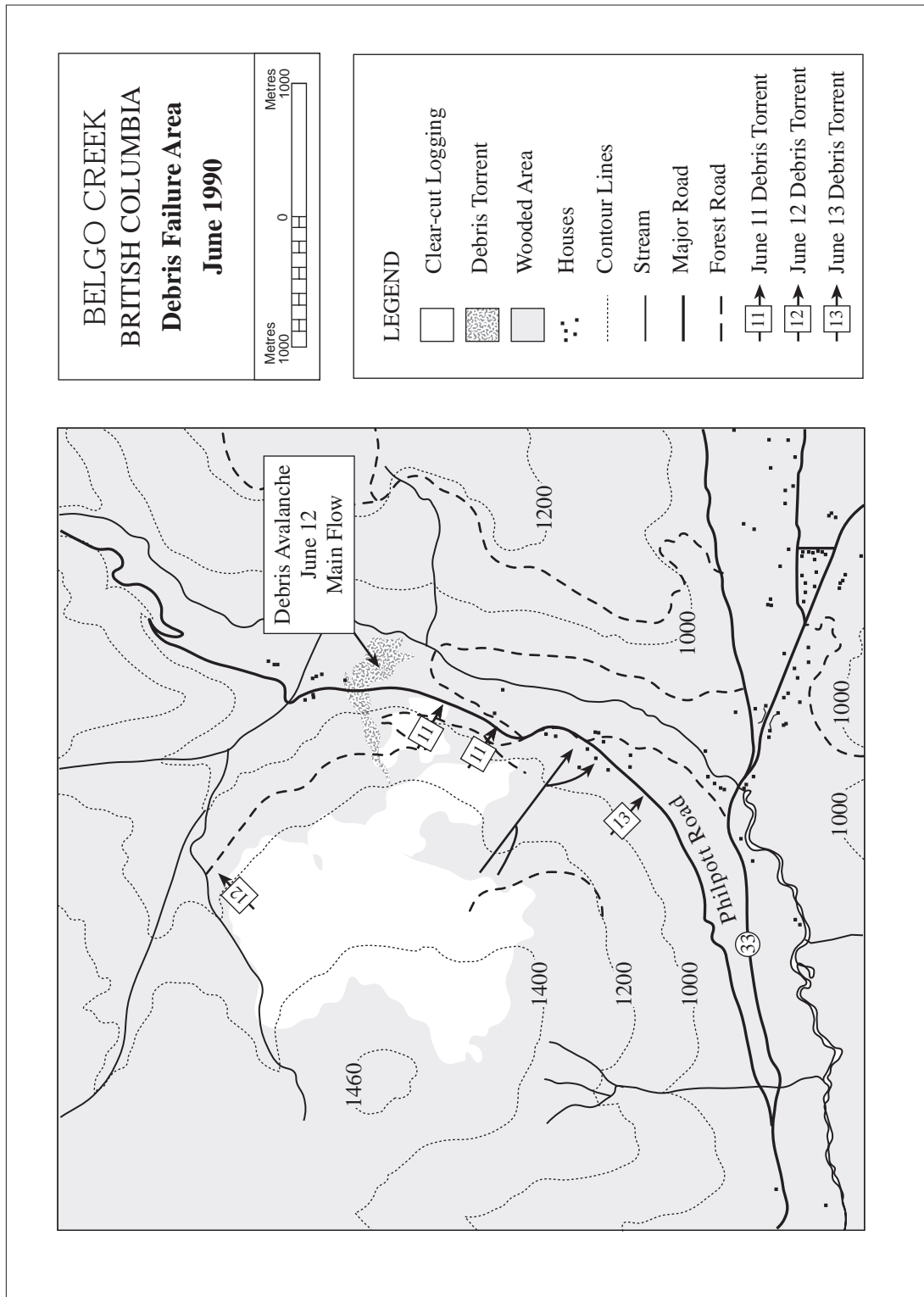
b) **Predict three** effects on the environment of an increasing population in this region.

**(3 marks)**

**Response:**

<b>Effects on the environment of an increasing population</b>	<ul style="list-style-type: none"><li>• increased size of airport</li><li>• increased sewage problems</li><li>• loss of farmland to development</li><li>• increased air pollution (acid rain)</li><li>• increased agricultural production; thus, increased use of pesticides and fertilizer; run-off will take these chemicals into streams, lakes, ground water and the ocean</li><li>• more forest removed for urbanization—increased run-off, siltation of streams, harmful effects on spawning salmon</li><li>• increased number of roads and rail routes—increased water pollution (leaking gas and oil)</li><li>• increased paved areas—increased run-off and potential for flooding</li><li>• increased size of marina for addition of more boats—increased water pollution (leaking oil and gas)</li><li>• increase of residential development along the shoreline.</li><li>• municipalities working to protect some parkland because of political pressure of residents</li><li>• more development leading to more environmental disturbances (e.g., loss of animal habitat, loss of green space—major changes to natural aesthetics)</li></ul>
<p><b>Note to Markers:</b></p> <p><b>Credit should be given to students who predict an appreciation of the threat to the environment created by urbanization and who propose counter-measures aimed at sustainability.</b></p>	

Use the following map to answer question 5.



5. In 1990, mass wasting in the Belgo Creek area of the interior of British Columbia claimed the lives of three people.

a) Using information from the map, **identify** and **explain two** causes of the mass wasting in the Belgo Creek area. **(2 marks)**

**Response:**

<p><b>Causes</b></p>	<ul style="list-style-type: none"> <li>• steep slopes—steeper gradient results in increased mass wasting</li> <li>• heavy rainfall—lubrication of soil</li> <li>• clear-cut logging—increased run-off, unconsolidated material and soil erosion</li> <li>• road construction—undercuts and weakens soil structure</li> <li>• site preparation for home construction—weakens soil structure</li> <li>• loose soil—susceptible to impact of heavy rainfall</li> </ul>
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b) Given that people want to live in this community, **suggest two** ways humans could **minimize** the impact of mass wasting in the area. **(2 marks)**

**Response:**

<p><b>The impact of mass wasting can be minimized through</b></p>	<ul style="list-style-type: none"> <li>• reforestation.</li> <li>• building diversion channels.</li> <li>• monitoring areas of mass wasting (road closures).</li> <li>• reducing mass wasting along transport routes (rock scaling, cement rock faces, screen rock faces, construction of rock/cement berms).</li> <li>• reassessing the use of clear-cut on very steep slopes.</li> <li>• improved engineering of roadways and alteration of drainage patterns in the area (terraces).</li> <li>• slope modification to prevent buildup of water (use piping to remove excess water from hillsides).</li> <li>• restricting residential construction to areas less prone to a debris avalanche.</li> <li>• restricting logging to areas outside a specified perimeter.</li> <li>• education of the community concerning risks and precautions of living in deforested, sloping regions.</li> <li>• increased government role (inspection, enforcement of existing regulations)</li> </ul>
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**Select one of the following issues to answer question 6.  
Indicate your selection with a ✓.**

Depletion of Ocean Resources       Soil Degradation

6. Mismanagement of resources is a global problem. **Discuss** the problems associated with your selection and **propose** ways to better manage the resource. Answer in **paragraph** form. **(6 marks)**

**Response:**

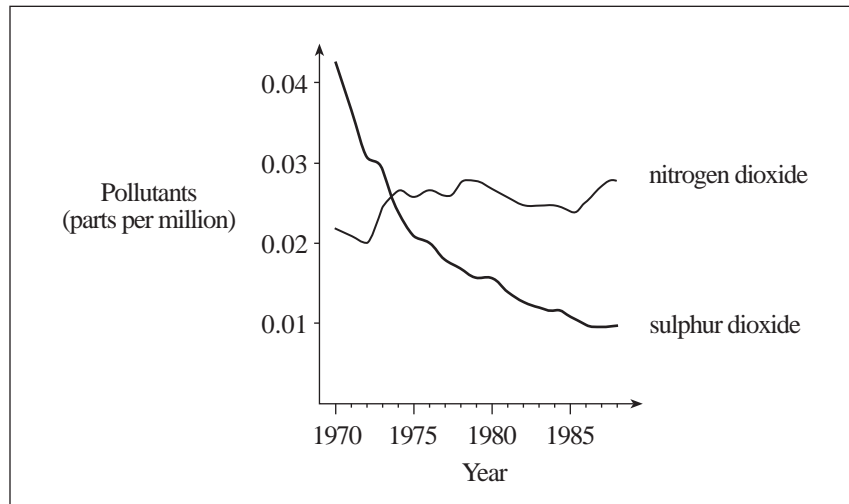
	<b>Problems</b>	<b>Management</b>
<b>Depletion of Ocean Resources</b>	<ul style="list-style-type: none"> <li>• oil spills</li> <li>• overfishing</li> <li>• human sewage</li> <li>• industrial waste</li> <li>• domestic run-off</li> <li>• agricultural run-off</li> <li>• dumping of garbage</li> <li>• flags of convenience</li> <li>• global warming (potentially by humans) has led to species depletion</li> <li>• coral reef endangerment (extreme harvesting techniques) pollution, food chain threatened</li> </ul>	<ul style="list-style-type: none"> <li>• settling ponds</li> <li>• filtration plants</li> <li>• international agreement</li> <li>• tertiary treatment of sewage</li> <li>• stricter legislation and enforcement for ocean transport</li> <li>• heavier fines for ocean dumping/oil spills</li> <li>• international treaties and fishing quotas</li> <li>• education regarding the importance of oceans</li> <li>• establish wider marine boundaries for countries (e.g., extend the 200 mile limit)</li> </ul>
<b>Soil Degradation</b>	<ul style="list-style-type: none"> <li>• compaction</li> <li>• overgrazing</li> <li>• monoculture</li> <li>• over cultivation</li> <li>• soil erosion (wind)</li> <li>• down slope ploughing</li> <li>• using trees for fuelwood</li> <li>• heavy use of chemical pesticides and fertilizers</li> <li>• large population increases the demand for agricultural land</li> <li>• poor irrigation techniques result in soil erosion and salinization</li> <li>• acid rain/deposition</li> </ul>	<ul style="list-style-type: none"> <li>• inter-cropping</li> <li>• stubble farming</li> <li>• strip cultivation</li> <li>• plant wind breaks</li> <li>• contour ploughing</li> <li>• organic fertilizers and pesticides</li> <li>• afforestation/agroforestry</li> <li>• education regarding new farming techniques</li> <li>• use of natural enemies for pest control</li> <li>• improve farming techniques (crop rotation, non-chemical fertilizers, limit herd size)</li> <li>• observing carrying capacity</li> </ul>

**Note to Markers:**

**This question is to be marked holistically.**

Use the following graph to answer question 7.

Atmospheric Pollution in Canada



7. a) **Outline two** effects on the environment of the atmospheric pollutants illustrated in the graph above. **(2 marks)**

**Response:**

<b>Consequences of sulphur dioxide and nitrogen oxide pollution</b>	<ul style="list-style-type: none"><li>• kills aquatic life</li><li>• produces acid rain</li><li>• acidification of soil</li><li>• acidification of lakes</li><li>• brings out metallic minerals</li><li>• weakens and kills vegetation</li><li>• erosion of buildings and statues</li><li>• weakens immune systems of animals</li><li>• genetic mutations and fetal embryonic abnormalities</li><li>• altered weather patterns as a result of global warming</li></ul>
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b) **Suggest two** reasons for the trends illustrated in the graph above.

**(2 marks)**

**Response:**

<b>Nitrogen oxide emissions have increased because of the</b>	<ul style="list-style-type: none"><li>• lack of rapid transit.</li><li>• inadequacies of using rapid transit.</li><li>• affluent society (two car families).</li><li>• expansion of suburbs (need for transportation).</li><li>• growing population (growing number of vehicles).</li></ul>
<b>Sulphur dioxide emissions have dropped off because of the use of</b>	<ul style="list-style-type: none"><li>• alternative energy.</li><li>• cleaner burning coal.</li><li>• scrubbers (industrial filters).</li><li>• catalytic converters in automobiles.</li><li>• stricter government regulations and international treaties.</li></ul>



8. a) **Outline two** reasons for deforestation.

**(2 marks)**

**Response:**

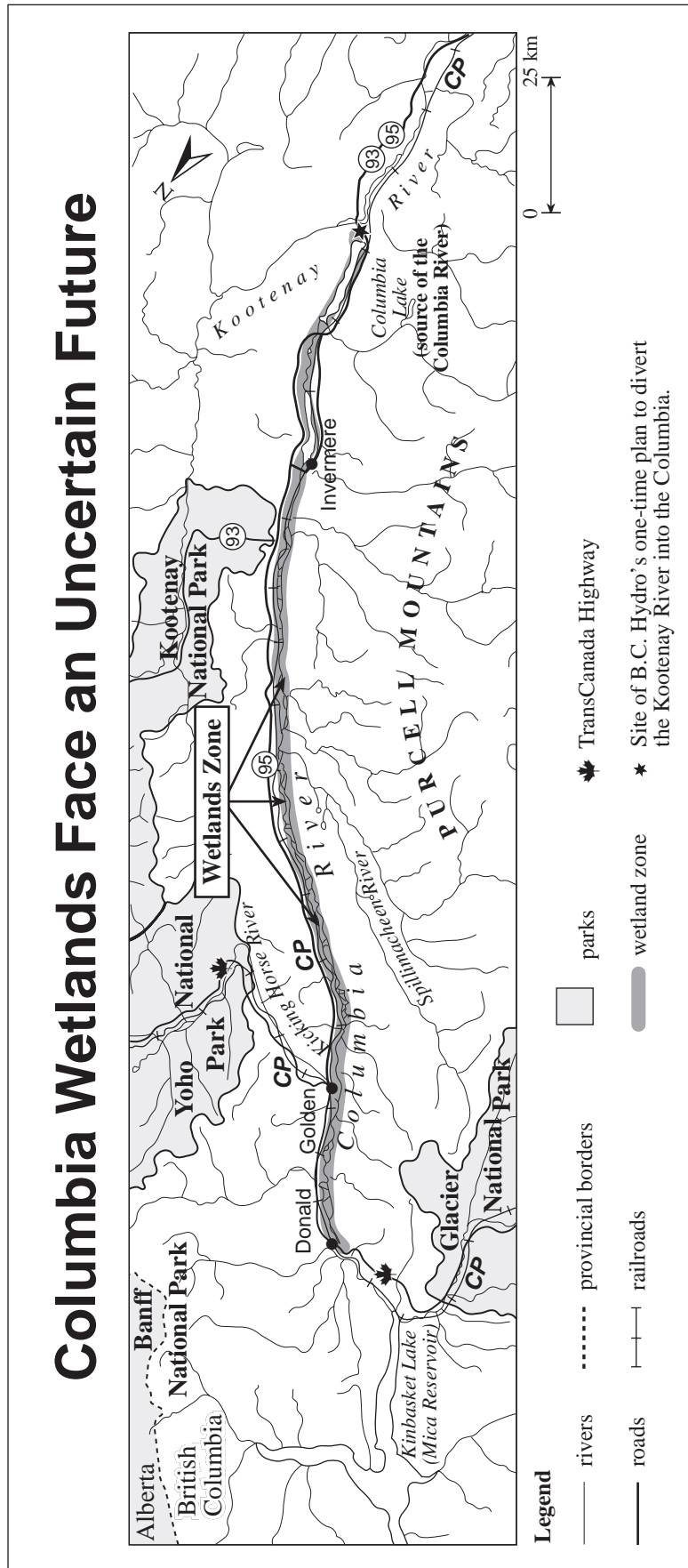
<b>Reasons for deforestation</b>	<ul style="list-style-type: none"><li>• fuel wood</li><li>• mining sites</li><li>• resettlement</li><li>• farmland (cattle ranch)</li><li>• urbanization (urban sprawl)</li><li>• infrastructure (roads, houses)</li><li>• demand for wood and paper products (i.e., logging)</li><li>• preparation for planting cash crops</li><li>• to pay off national and international debt</li><li>• lack of international cooperation and guidelines</li></ul>
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b) Apart from soil degradation, **identify** and **explain two** different effects of deforestation on the environment. **(2 marks)**

**Response:**

<b>Effects of deforestation on the environment</b>	<ul style="list-style-type: none"><li>• Soil erosion and loss.</li><li>• Loss of the carbon sink.</li><li>• Loss of habitat, placing additional stress on flora and fauna.</li><li>• Siltation of rivers smothering spawning beds.</li><li>• Loss of biodiversity means loss of gene pool and potential medical cures.</li><li>• Increased evaporation will cause drying out of the soil.</li><li>• Decreased transpiration will diminish plant-atmosphere transfer of water vapour.</li><li>• Destruction of watersheds, siltation and contamination of fresh water.</li><li>• Loss of aboriginal lands/artifacts means a loss of cultural roots.</li><li>• Climate changes (local and global) causes ecosystem changes.</li><li>• Loss of carbon dioxide/oxygen exchangers leading to increased CO<sub>2</sub> and less O<sub>2</sub>.</li><li>• Aesthetic and visual pollution, taking away from the beauty of the area.</li><li>• Changes to the scenery take away from the beauty of the area.</li></ul>
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Use the following map to answer question 9.



Based on a map by Steven Fick in *Canadian Geographic*, April/May '91

9. The Columbia wetlands are valuable. **State** why these wetlands are important, **identify** threats to them and **propose** strategies for their sustainability. Answer in **paragraph** form. (6 marks)

**Response:**

<p><b>Wetlands are important ecosystems because</b></p>	<ul style="list-style-type: none"> <li>• flood plains sustain large numbers of living creatures, including migratory birds, eagles, herons, swans. Beaver, muskrat, turtles and fish live in the waters. Tucked into the Rockies on the leeward side of the Purcell Mountains (giving the region lighter precipitation), ungulates such as elk and deer move into the valley for winter survival.</li> <li>• they act as natural filters for water.</li> <li>• they store water during periods of drought and release water slowly during and following snow melt.</li> </ul>
<p><b>Threats</b></p>	<ul style="list-style-type: none"> <li>• Water diversion from proposed dams.</li> <li>• Draining of the wetlands to provide room for development of the valley for recreational purposes such as golf courses and marinas on the lakes.</li> <li>• Expansion of the residential and commercial development of towns like Windermere.</li> <li>• Run-off and waste disposal from the towns.</li> <li>• Agricultural use of the flood plain and its related threats to fresh water: herbicide and fertilizer run-off.</li> <li>• Run-off from the slopes surrounding the valley caused by logging.</li> </ul>
<p><b>Sustainable use</b></p>	<ul style="list-style-type: none"> <li>• Restrict agriculture and real estate development.</li> <li>• Enhance the reliable supply of water by building water management structures such as drainage ditches and weirs.</li> <li>• Enlist the support of conservation groups such as Ducks Unlimited, Nature Conservancy and the Canadian Wildlife services in purchasing private lands for wetland rehabilitation.</li> <li>• Require treatment/filtration of water being dumped into river.</li> <li>• Water conservation programs.</li> <li>• Education programs featuring the value of wetlands.</li> <li>• Restore wetlands that have been damaged (e.g. Florida Everglades).</li> </ul>
<p><b>Note to Markers:</b>  <b>This question is to be marked holistically.</b></p>	

Use the following map and information to answer question 10.

The map shows the Cabinet Mountains Wilderness area in western Montana, bordering Idaho, British Columbia, and Alberta. Key features include Pend Oreille Lake, Sandpoint, Noxon, and the Clark Fork River. A proposed ASARCO mine and processing site are marked near Noxon. The wilderness area is depicted with several mountain peaks.

The American Mining and Smelting Company (ASARCO) has set its sights on western Montana for one of the largest copper/silver mines in North America. The proposal calls for drilling 9 000 feet below two peaks in the Cabinet Mountains Wilderness. It means blasting out 108 million tons of silver and copper-bearing ore. The ore will have to be transported through miles of tunnels and then chemically processed at a site next to the Clark Fork River.

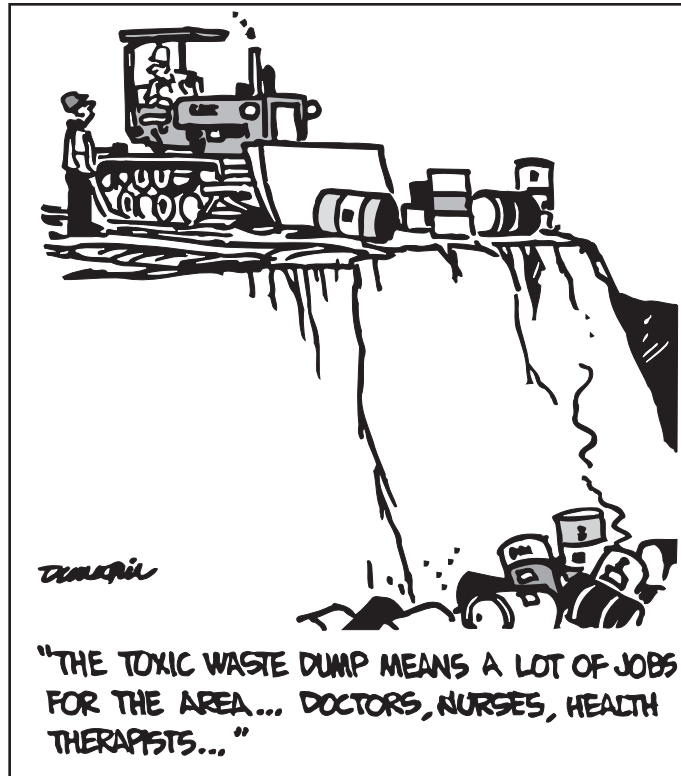
The Clark Fork River is a stronghold for dwindling populations of trout. It is in the midst of over 200 acres of old growth forest and is home to grizzly bears, harlequin ducks, bald eagles, fishers, lynx and wolverines.

10. **Suggest four** different measures that a mining company could use to protect the environment over the life span of the mine. **(4 marks)**

**Response:**

<p><b>To protect the environment, the mining company could</b></p>	<ul style="list-style-type: none"> <li>• build a treatment plant for the waste water and chemicals used in the mining process.</li> <li>• use cement lined containment ponds for tailings.</li> <li>• install self-contained water systems to prevent the release of contaminants or heated water.</li> <li>• have an outside agency monitor for leaks on the mine site and have them conduct regular environmental inspections.</li> <li>• post a reclamation bond and reclaim the land when the mine is closed down.</li> <li>• plant duckweed on the tailing ponds.</li> <li>• plant vegetation on the waste dumps.</li> <li>• develop a recycling program for wastes.</li> <li>• introduce strict environment laws for new town sites.</li> <li>• reintroduce animal species.</li> <li>• require drainage ditches and check dams to reduce erosion during road construction.</li> <li>• restrict or control blasting.</li> </ul>
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Use the following cartoon to answer question 11.



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11. a) In your own words, describe the issue the cartoon is addressing.

(1 mark)

**Response:**

<p><b>Message</b></p>	<ul style="list-style-type: none"><li>• Out of sight out of mind.</li><li>• We live in a throw-away society.</li><li>• People sacrifice the environment and human health for jobs.</li><li>• If we bury toxic waste, effects will be long lasting.</li><li>• If we bury toxic waste, we are only harming ourselves.</li><li>• We do what is least expensive (cheapest) regardless of environmental risks.</li></ul>
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b) **Discuss two** problems associated with the disposal of toxic waste.

**(2 marks)**

**Response:**

<b>Problems</b>	<ul style="list-style-type: none"><li>• impact on people's health</li><li>• damage to animal and marine life</li><li>• lack of sites leads to illegal dumping</li><li>• burial/storage in seismically active areas</li><li>• seepage of leachates into the ground water</li><li>• once toxins are dumped, there is little monitoring of the sites</li><li>• the "NIMBY" attitude (not in my back yard)</li></ul>
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**END OF KEY**