Geography 12

January 2002 Provincial Examination

ANSWER KEY / SCORING GUIDE

Topics:
1. The Nature of Geography
2. Systems of the Earth
3. Resources of the Earth

Part A: Multiple Choice

Q	K	C	S	T	PLO	Q	K	C	S	T	PLO
1.	B	K	1	1	1B1	21.	A	U	1	2	2A2
2.	D	U	1	2	2C1d, 2C2	22.	C	K	1	2	2A2
3.	D	U	1	2	2C1b	23.	B	U	1	2	2A2
4.	B	U	1	2	2C1b	24.	C	U	1	2	2A2
5.	D	U	1	1	1B4	25.	D	K	1	2	2A5, 2A4
6.	D	K	1	2	2C1b	26.	D	K	1	2	2A2
7.	A	U	1	2	2C1e	27.	A	U	1	2	2B1
8.	A	U	1	2	2C1c	28.	A	K	1	1	1A1
9.	A	U	1	1	1A2	29.	B	U	1	1	1C1
10.	D	K	1	2	2D3a	30.	D	U	1	1	1C1
11.	A	U	1	2	2D3c	31.	C	H	1	2	2A3
12.	D	U	1	2	2D3c	32.	B	U	1	2	2B2
13.	D	U	1	2	2D3e	33.	A	U	1	2	2B2
14.	A	U	1	2	2D3e	34.	D	U	1	2	2B3
15.	C	U	1	2	2D3b	35.	D	U	1	2	2B2
16.	A	U	1	2	2D3b	36.	B	U	1	1	1C1
17.	B	U	1	2	2D3b	37.	D	U	1	1	1C1
18.	A	U	1	3	3A4a	38.	C	U	1	1	1C1
19.	C	U	1	3	3A1	39.	B	U	1	2	2D3d
20.	B	K	1	1	1B4	40.	B	U	1	1	1C1

Multiple Choice = 40 marks

Part B: Written Response

Q	B	C	S	T	PLO
1.	1	H	6	1	1B4
2.	2	U	4	2	2D3
3.	3	U	4	2	2D4, 1B4
4.	4	U	4	3	3C3
5.	5	U	3	1	3A4c
6.	6	U	3	1	1C2, 2B3
7.	7	H	4	3	3B2
8.	8	H	4	1	1B3
9.	9	H	4	2	2B5
10.	10	U	4	3	3C3
11.	11	H	10	3	3C4, 3B2, 3C1

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 **PLO** = Prescribed Learning Outcome
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.**

REFERENCE DATA BOOKLET

Use Photograph 5 and the topographic map to answer question 1.

1. Based on evidence from the air photograph and topographic map, **explain** how the physical geography of the Spray Lakes region influences human activity. Answer in **paragraph** form. **(6 marks)**

Response:

Explanation	• steep terrain contributes to mass wasting and avalanches (potential loss of life and property) • U-shaped valleys can be used for transportation routes • extensively glaciated region — tourist attractions • extensively folded region of the Rocky Mountains and north–south valley structure has limited east–west movement • valley has been flooded as a reservoir • limited road access • recreation sites and recreational areas (boating, fishing, swimming and rafting) followed the construction of the dam and roads • human activity in the region is largely due to sightseeing, hunting, dam construction and water monitoring • very limited human activity in the area due to the rugged landscape • steep terrain invites development of a ski resort • flat terrain in valley encourages building of resort/golf course • narrow river valleys allow for the construction of dams • high costs of road maintenance in area due to mass wasting • slope of land leads to orographic rainfall which results in lush forests • temperate forests encourage logging • scenic alpine area has attracted year-round resort developers • scenic forested area may attract environmentalists who wish to protect the area • hydro-electric power generation
Note to Markers: **1 mark is deducted if response is not presented in paragraph form.**	

Select one of the following features to answer question 2.
Indicate your selection with a ✓.

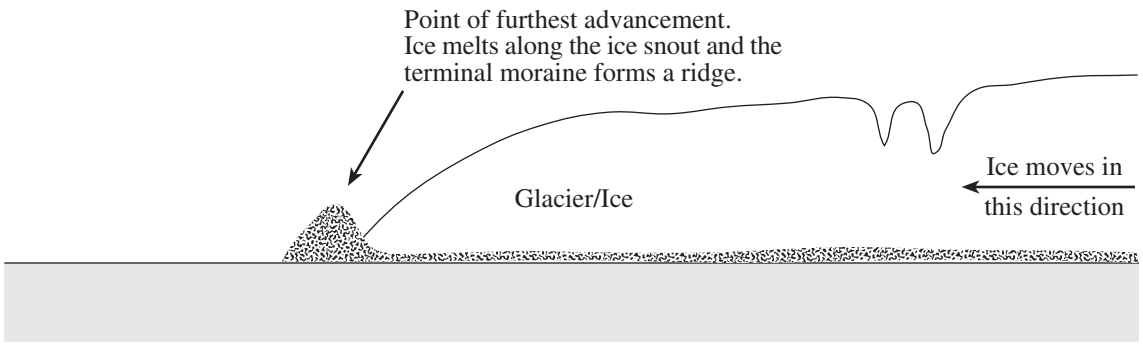
☐ Terminal Moraine ☐ Waterfall

2. **Sketch** and clearly **label** a diagram(s) of one of the features.

Explain how the feature is formed. **(4 marks)**

Response:

TERMINAL MORAINE



- A pile of unconsolidated glacial debris (till) left at the terminus of an advancing glacier.
- The end or terminal moraine forms across the snout of an advancing glacier.
- The edge of these boulder and clay deposits are well developed if the ice remains stationary for a long period of time.
- A depositional feature of glacial debris resulting from plucking and abrasion. The glacier pushed, shoved or bulldozed debris.
- Occurs through glacial advance and then retreat.
- Ice remains stationary for a long period of time.
- Unsorted till or drift.

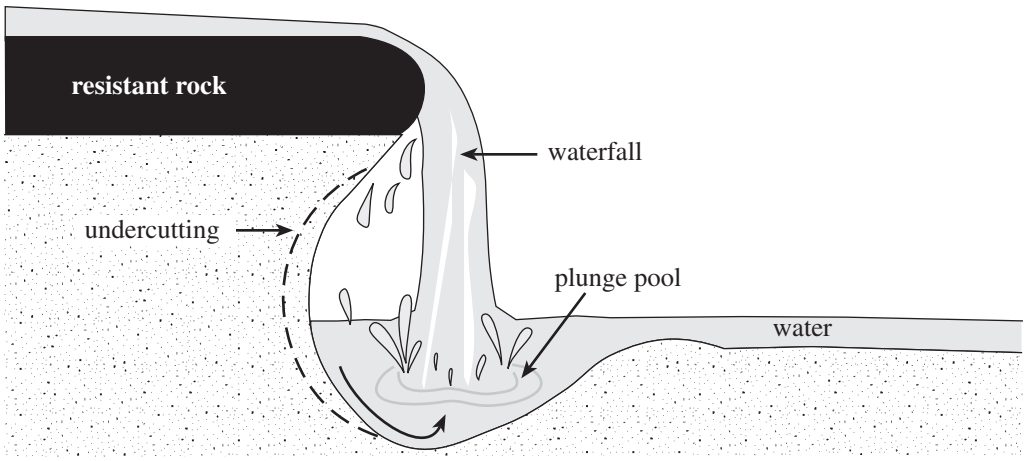
NOTE: Ice does not need to be present to receive full marks.

Note to Markers:

This question to be marked holistically. The explanation may be shown in the diagram. Maximum of 3 marks if there is no attempt to provide a diagram.

Response:

WATERFALL



- When a layer of resistant rock lies across a river's course, the less resistant rocks on the downstream side are more quickly eroded than the resistant cap rock.
- The river bed is therefore steepened where the two rocks meet and a waterfall or a plunge pool develops.
- This erosion is a result of hydraulic action (force of water) and corrasion (erosion of river bed by transported rock).
- Headward erosion undercutting the resistant rock results in the cap rock being unsupported. Eventually the ledge of cap rock breaks off and the waterfall retreats upstream.
- Hanging valley.
- Found in young rivers.
- V-shaped valley.
- Vertical erosion.
- Caused by faulting.
- Cutting back.

Note to Markers:

This question to be marked holistically. The explanation may be shown in the diagram.

3. a) **Explain** one advantage of fresh water flooding. **(1 mark)**

Response:

Advantages of Flooding	• Alluvium (silt, sand and clay) is deposited on the flood plain and rejuvenates agricultural soils. • Floodwater recharges groundwater reservoirs. • Many agricultural practices are heavily dependent on annual flooding (rice cultivation). • Increases the natural build-up of alluvium on natural levees. • Increases our understanding of this potentially destructive natural hazard and thus increases our ability to implement mitigation strategies (spillways) that lessen their harmful effects. • Flushes the soil (reduces salinization). • Removes harmful toxins from water through filtering (reduces disease). • Hydroelectricity. • Water source. • Recreation. • Economic growth. • Increase in fish habitat/fishing in dam reservoir. • Creates build-up of levees to control future floods. • Replenishes wetlands.

b) **Explain** two **economic** disadvantages of fresh water flooding. **(2 marks)**

Response:

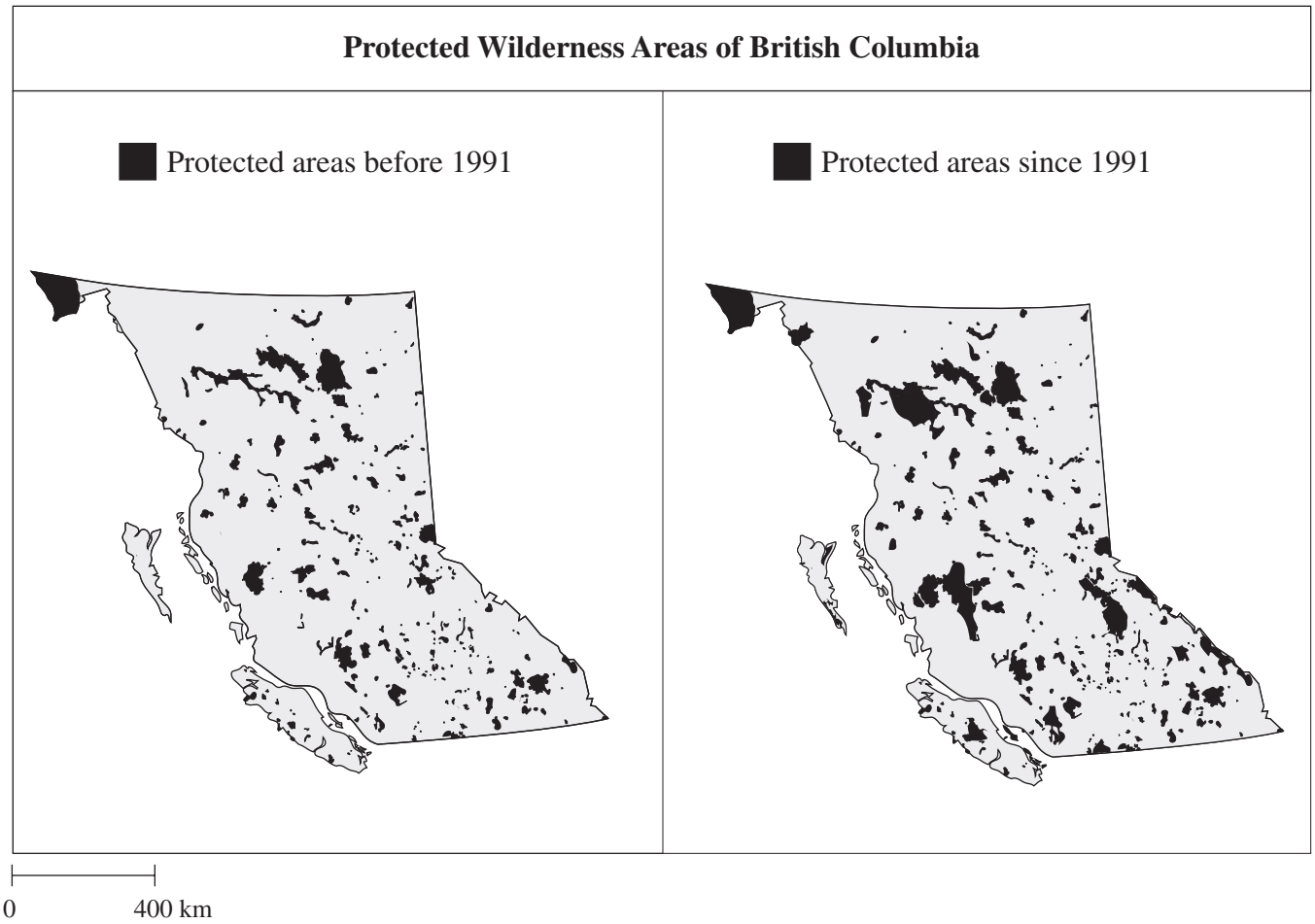
Economic Disadvantages of Flooding	• destroys crops, loss of jobs • destroys property • triggers soil erosion • forces relocation of populations • wipes out transportation routes (rail and road) • increases the rapid spread of disease (cholera) — increased medical costs • adds to groundwater and water source contamination (need for filtration plants) • destruction of spawning beds • various forms of mass wasting slips/slides • increase in water table downstream — destruction of foundations • can damage infrastructure • damage to communication lines and power lines • increased flood insurance costs • real estate values drop if prone to floods • increased mercury levels in water • drowning livestock • destruction of levees — costs money to rebuild

c) **Identify** one strategy which could be used to reduce the impact of flooding. **(1 mark)**

Response:

Strategies to Reduce the Impact of Flooding	• Increase the construction of spillways (flood control channels) on areas of rivers that experience annual flooding. • Construct dikes and build up levees. • Large scale channelized diversion of river systems (downstream) — distributaries. • Build up sandbags. • Reforest riparian zones. • Limit development along river banks. • Create green belts. • Build barrages. • Build houses on stilts. • Construct dams. • Monitor flow of river and create evacuation plans and routes. • Allow natural river flow and annual flooding patterns to dictate development and use of the flood plain. • Plant river bank vegetation to hold banks. • Reforest upstream areas and adjust cutting practices to minimize flooding. • Provide rapid assistance by relief groups after flooding. • Use of riprap to slow down water speed. • Clean sewers to prevent urban flooding.

Use the following map to answer question 4.



4. a) **Outline** two reasons why it is important to preserve the wilderness areas of British Columbia. **(2 marks)**

Response:

It is important to preserve the wilderness areas of British Columbia because it	• preserves cultural and natural heritage. • protects old growth forests. • protects archaeological sites. • provides recreational opportunities. • protects aesthetic value of wilderness. • provides opportunities for ecotourism. • preserves natural and biological diversity. • protects drainage basins and water supplies from contamination. • preserves the habitat of endangered species (the grizzly bear). • may contain medicines which could be used in education and research. • can impact native land claims issues — consideration for future generations. • provide direct and indirect jobs (parks persons). • helps maintain the balance of CO_2 and oxygen. • helps reduce mass wasting, landslides, erosion and water contamination.

b) **Outline** two reasons why some people would choose to exploit the natural resources of wilderness areas of British Columbia. **(2 marks)**

Response:

Some people choose to exploit the wilderness areas of British Columbia because it	• provides direct jobs from forestry, mining, big game guiding, etc. • provides indirect jobs (restaurants, gas stations, furniture manufacturing). • provides government revenue (stumpage fees, taxes, mining royalties). • maintains remote towns which could become ghost towns if a major source of income were to be removed. • increases infrastructures (roads, powerlines) to remote areas where other natural resources can be found. • meets regional demands for economic development. • is in keeping with the attitudes of some people in society (provincial government, corporations, shareholders). • is needed to meet demand for food and clothing (fish, furs), viscose, wood products and pulp and paper. • lack of education, legislation, knowledge. • provides short-term profits which, in their minds, supersedes long-term benefits. • is required to relieve pressure to urbanize, industrialize or increase agriculture. • is required to meet the demand for products (international). • desire for furs — fashion. • meets cultural needs (hunting, fishing, logging).

Select one of the following renewable energy sources to answer question 5.
Indicate your selection with a ✓.

☐ Wind ☐ Tidal

5. a) Besides the fact that it is renewable, **identify** one benefit associated with your energy selection. **(1 mark)**

Response:

Wind Powered Electrical Generation	• pollution free • unlimited supply • winds are stronger in winter when the demand for energy is greatest • after initial investment to construct (costly), wind farms are cheap to maintain • land between turbines could be used for crop or cattle grazing • no waste produced • suitable for isolated communities • farmers make extra income from lease of land • technology already widely available • minimal environmental mishap possibilities • reduces reliance on fossil fuels • more frequent windstorms because of global warming (energy supply has increased)
Tidal Powered Electrical Generation	• will not flood lake areas • non-polluting (does not use fossil fuels which create acid rain or global warming) • economically viable after initial start-up costs • improved transportation due to the development of traffic or rail bridges across estuaries • decrease the need for nuclear power and its associated radiation risks • extremely reliable

b) **Outline** two disadvantages of your energy selection. **(2 marks)**

Response:

Wind Powered Electrical Generation	• high degree of technology and the costs of implementation, maintenance and building of the required infrastructure, this technology is often limited to those in the developed world (some developing nations) • not reliable (wind does not blow all the time) • during severe winds turbines must be shut down to prevent damage • noisy • electricity produced by wind costs more than conventional methods • interferes with radio/cellular reception • conflicts with scenic beauty • alters wildlife habitat • technology still not available to store energy generated during a storm so that it can be used during calm periods • sometimes location specific • the public is not aware of the benefits and value (lack of education) • requires great quantities to be feasible • once made, do not provide employment opportunities as other energy sectors do • detracts from natural, scenic appeal (aesthetic)

Tidal Powered Electrical Generation	• high degree of technology and the costs of implementation, maintenance and building of the required infrastructure, this technology is often limited to those in the developed world (some developing nations) • blocking of shipping routes • wildlife would suffer • fishing industry will suffer • affects large scale water movements raising sea levels (13 cm rise in Boston as a result of the Bay of Fundy barrage) • only available in adequate water areas • rising sea levels could nullify usefulness • do not provide employment opportunities after completion (compared to other energy sectors) • may have to be shut down due to cold spells, freezing and ice • may be impediment to coastal tourism • need a lot to make a lot
Note to Markers: **Students do not need to have one specific human and physical characteristic.**	

REFERENCE DATA BOOKLET	**Use Photograph 6 to answer question 6.**

6. a) **Identify** the natural vegetation in Photograph 6. **(1 mark)**

Response:

Natural Vegetation	• temperate rainforest • coniferous evergreen • taiga • boreal • western marine forests • spruce, fir, hemlock • westcoast pine (specific species)
Note to Markers: **Softwood, old growth $\leftarrow \frac{1}{2}$ mark.**	

b) **Explain** one way the natural vegetation in Photograph 6 has adapted to the climate. **(1 mark)**

Response:

Adaptations	• cones to protect seeds • thick bark to protect from the cold • waxy needles to reduce transpiration • flexible branches to allow snow to fall off and allows for flex in high winds • cone shaped to allow snow to fall off • shallow, extensive root systems due to poor thin soil conditions and heavy precipitation • roots to anchor against the wind • longer growing season because of milder temperatures, therefore the vegetation is evergreen • straight and tall to reach the sunlight • strong roots to hold to the hillside • adapted to acidic soil • aspect

c) **Outline** one major threat to this biome. **(1 mark)**

Response:

Threats to Biome	• world demand for wood products • deforestation (clear-cut) • acid precipitation • urban expansion • forest fires • disease (pine beetle) • global warming • construction of hydro-electric dams • open pit mines • resort development (recreation) • introduction of new species after reforestation • landslides and avalanches • soil erosion
Note to Markers: **Human activity $\leftarrow \frac{1}{2}$ mark.**	

7. a) **State** one way that the removal of vegetation decreases soil productivity. **(1 mark)**

Response:

Removal of Vegetation Decreases Soil Productivity	• removal of natural vegetation for pasture means – roots no longer hold soil in place – reduced infiltration causes increased surface run-off – less transpiration which reduces rainfall so soil dries out – trees no longer act as a wind break – reduced soil fertility, decaying leaves no longer provide natural fertilizer • overgrazing means – loss of vegetation exposes soil to wind and water erosion • logging machinery removes or disturbs soil • compaction of soils due to human activity • leaching

b) **Describe** three different strategies to reduce soil erosion. **(3 marks)**

Response:

Strategies to Reduce Soil Erosion	• reduce wind erosion – shelter belts – windbreak – cover crops – stubble farming • reduce water erosion – improve drainage – contour ploughing – improve irrigation practices – terracing, intercropping – strip cultivation • maintain soil fertility – crop rotation – natural fertilizers (compost, manure) – natural predators instead of chemical insecticides – reforestation – low-density grazing – fallow fields • stop removal of wetlands • stop slash and burn agriculture • use mulching • build check dams (dams in general) • reduce human activities that compact soil • reduce acid rain which causes soil erosion

Use the following information to answer question 8.

8. a) **Describe** two impacts that this dam may have had on the fish habitat of the Theodosia River. **(2 marks)**

Response:

Dams	• block the migration of fish to spawning grounds. • reduce silt downstream (a source of food for the fish). • cause upstream flooding which covers spawning beds. • reduce downstream flow making migration and spawning difficult. • cause vegetation to rot, releasing mercury which contaminates the reservoir. • cause downstream wetlands to dry. • create thermal pollution. • increase nitrogen levels. • reduce infiltration flow. • interrupt biodiversity/ecosystem. • pollution resulting from creation/removal of dams.

b) Other than being removed, **suggest** two strategies that can be applied to reduce the influence of dams on fish habitat. **(2 marks)**

Response:

The influence of dams on fish habitat can be reduced by	• opening dams to maximum flow during spawning season to facilitate fish movement. • building fish ladders to facilitate spawning. • building fish hatcheries, implementing enhancement programs and building artificial spawning beds. • stream enhancement/salmonid programs. • transporting fish upstream by large barges. • transportation both downstream and upstream. • advanced planning to reduce impact. • not building any future dams on rivers with spawning. • political pressure. • environmental review.

9. a) **Outline** two human activities that contribute to global warming. **(2 marks)**

Response:

Activities	• The burning of fossil fuels, wood and other biomass materials for energy needs releases numerous by-products — notably carbon dioxide (CO_2). • A global transportation industry that is (literally) driven by fossil fuels consumption contributes to the emission of large amounts of CO_2 and other greenhouse gases. • The release of methane by domestic animals, and by the slow release of "trapped methane" in polar regions, results in climate change. • The release of chlorofluorocarbons (CFCs) used in refrigeration and air conditioning units, aerosol sprays and packaging. • Ocean pollution (oil spills, sewage) destroys plankton which increases CO_2 and reduces O_2. • Removal of tropical rainforests that absorb CO_2 (cattle ranches increase methane content). • Industrial processes produce greenhouse gases (gas emissions). • Landfills release methane. • Buying another country's right to pollute rather than meeting required pollution reduction levels.

Use the following information to answer question 9b.

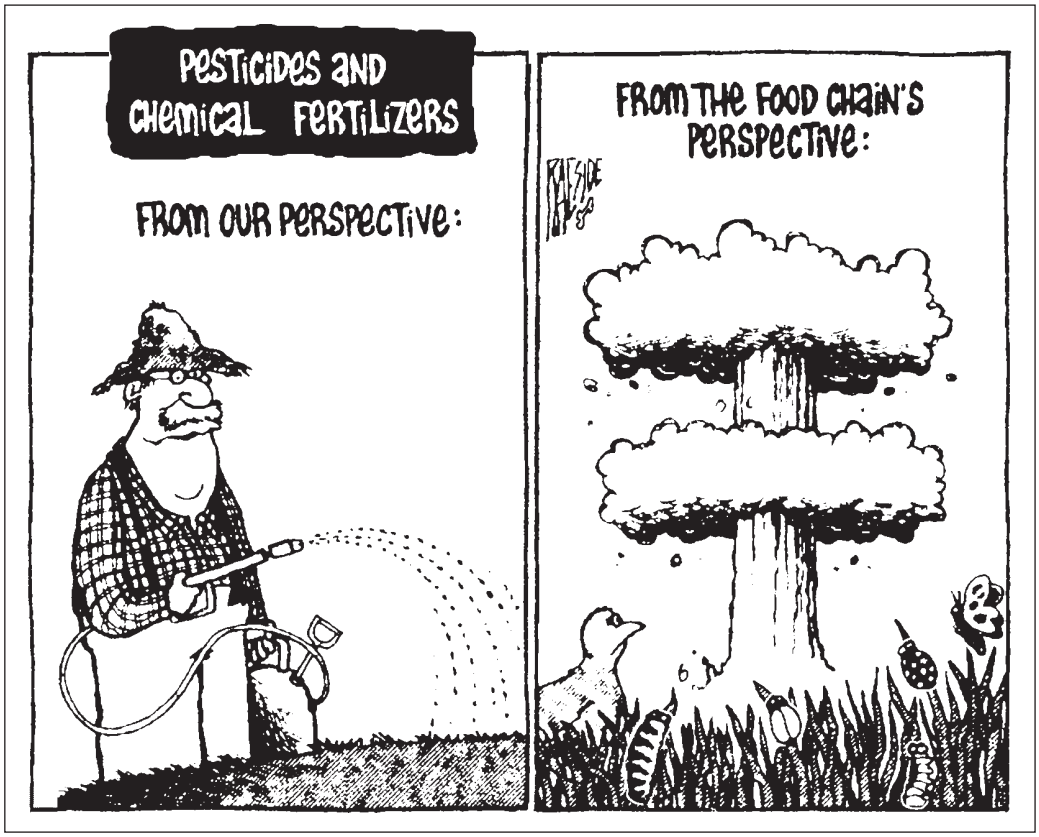
Montreal Protocol 1987	Rio Summit 1992	Kyoto Protocol 1997
Countries agree to reduce CFCs	Countries assemble to discuss environmental issues	Countries agree to reduce emissions by 20% before 2005

b) **Suggest** two reasons why management strategies such as the Montreal Protocol and the Kyoto Protocol are difficult to implement. **(2 marks)**

Response:

Global environmental management strategies are difficult to implement because	• there is a lack of will to change practices that (may) alter the consumer lifestyle for those in developed and developing nations. • International agreements such as the Montreal Protocol and the Kyoto Protocol have little binding authority; any international agreement depends on the good will of its signatories to follow through with commitments to reduce CO_2 emissions. • the ever increasing demand for fuel sources is directly linked to our global population problem. • of lobbying from multinational corporations. • superpowers decline to attend global meetings. • of the costs of implementing management solutions to the problem (scrubbers, large scale reforestation, technology change). • of the convenience of fossil fuels (expensive alternatives). • there are massive investments in fossil-fuel resource development and use. • government subsidies are not going to alternatives. • there are not just cost considerations, but time is also needed to implement changes. • it is difficult to monitor countries. • there is still a lot of debate on the issue.

Use the following cartoon to answer question 10.



A Raeside cartoon from *The Times Colonist*. May 19, 2000. Page A12.

10. a) What is the meaning of the cartoon? **(1 mark)**

Response:

The intent of the cartoonist's message is to show that	• while pesticides and chemical fertilizers are widely used to increase both the quality and yield of crops, the environmental repercussions of their use have widespread consequences throughout the entire biosphere. • a small amount of chemicals can eliminate a species. • bioaccumulation of pesticides in the food chain will have a devastating effect. • there is a lack of awareness of the consequences of our actions.

b) Why do North Americans rely so heavily upon the use of pesticides and chemical fertilizers? **(1 mark)**

Response:

Pesticides and Chemical Fertilizers	• Commercial agriculture has responded to consumer demands, which dictate that farmers grow blemish and disease-free fruits and vegetables (aesthetic value). • Chemical fertilizers serve the purpose of replenishing exhausted soils (which are strained due to the continuous overuse), and they serve to increase the growth rate of vegetation. • Urban expansion has forced farmers to increase farm yields on less land. Increase in population (more mouths to feed). • Fertilizers and pesticides are cost effective and convenient. • They improve farm yield. • They destroy the pests which would reduce farm yield. • They help to beautify lawns and golf courses. • Use of monocultures often dictates their use.

c) **Outline** two sustainable agricultural practices that could reduce our reliance on pesticides and chemical fertilizers. **(2 marks)**

Response:

Sustainable Agricultural Practices	• Ban the use of chemical fertilizers and pesticides. • Increase the use of organic fertilizers to increase the productivity of exhausted soils. • Rotate fields with crops that add nutrients back into the soil with crops that may deplete the soil of its nutrient value. • Increase the use of biological controls to combat pests and disease (integrated pest management). • Biogenetically produce high yield variety crops that are more resistant to pests and disease. • Use more labour intensive practices. • Zero tillage. • Change in people's attitude and municipal bylaws — re-use of pesticides and fertilizers. • Educate public on the nutritional value of organic foods vs. the lack of nutrition from chemically produced foods. Increased demand for organic foods will lower prices as production increases. • Integrated pest management systems. • Sterile insect release programs. • Purposeful flooding. • Composting. • Pheromone release. • Construction of wind belts to reduce erosion of topsoil. • Concentrate on indigenous vegetation crops.

REFERENCE DATA BOOKLET

Use the Case Study of the Proposed Oil and Gas Development for the Arctic National Wildlife Refuge to answer question 11.

A proposal has been made that the U.S. government allow the extraction of oil and gas from the Arctic National Wildlife Refuge.

11. Using your understanding of geography and the data provided:

- **describe** the physical characteristics which make the Arctic National Wildlife Refuge a fragile ecosystem;
- **outline** the economic benefits associated with oil extraction and development in the refuge;
- **assess** the consequences of proceeding with this proposal.

Answer in **multi-paragraph** form. **(10 marks)**

Response:

Physical Characteristics	• Large commercial gas and oil deposits. • Cold Arctic climate — bitter cold winters, dominated by a polar high-pressure system; short, cool summers affected by a weak sub-polar low pressure system; marginal precipitation, with most precipitation occurring in the short summer months. • Tundra vegetation is sparse; only mosses, lichens, ground-hugging vegetation, short flowers and shrubs are able to grow in this northern Arctic environment. Summers are incredibly short with only 10 to 12 weeks when temperatures rise above freezing. Short growing season. • Azonal soil — tundra soil: permafrost dominates as the length of summer is insufficient to thaw the complete horizon. There is little to no humus and boggy soils. Inceptisol soil type. • Natural landscape ranges from mountain foothills to entirely flat terrain. Coastal location. Marine environment. • The Arctic National Wildlife Refuge is home to numerous species of animals, including caribou, wolves, grizzly bears, 36 indigenous species of fish and land mammals, 9 species of marine mammals, and 160 different types of migratory and resident birds (many of these animals are endangered). • This is a seismically active area.

Economic Benefits	• Drilling in the Arctic National Wildlife Refuge will help satisfy America's appetite for fossil fuel sources, thus reducing reliance on imported petroleum resource (OPEC oil). • The oil industry is Alaska's primary revenue generator; providing as much as 73% to 86% of the state's total revenues. • Further oil exploration and development is supported by a large number of Alaska's business groups as the industry provides enormous direct and indirect employment opportunities. • Improvements in the means of extraction and transportation of petroleum products have kept environmental damage to a minimum. • Oil deposits within the Arctic National Wildlife Refuge and along the Alaskan coast are easily accessible, making this resource a relatively affordable option. • As long as the oil remains untapped, Americans will have to pay more money for imported petroleum resources. • Cheaper to transport because of improved technology. • Exporting (profit).

Consequences	**Negative Consequences** • Further oil exploration and development will continue to threaten this fragile ecosystem. • Both exploration and development will have adverse affects on animal, fish and fowl habitats. • Impact on other industries (fishing) from oil spills. • Species depletion (disruption of food chain). • The loss of migratory species will also impact the lifestyle and income of many Alaskans (notably its aboriginal peoples). • Our continued dependence on fossil fuels will only further delay the development of alternative energy sources (solar, wind, tidal, fuel cell technologies). • The environmental repercussions may be irreversible. • The continued consumption of fossil fuels will only add to our growing global CO_2 emission problems (global warming) and acid precipitation concerns $(NO_x$ and $SO_2)$. • Increase in solifluction/mass wasting. • Risk of ocean pollution due to the use of oil tankers. • Threat of spills on the coastal plain from drilling operations. • Destruction of fragile ecosystem (permafrost). • Disruption of aboriginal lifestyle. • Political issues arising between state and federal governments. • Changes to flora and fauna. • Political activism. • Accidental mishaps. • International conflict. • Potential seismic activity. • Airborne pollutants could move. • Stricter laws governing resource extraction. • Creates boom/bust towns. **Positive consequences** • Increased jobs. • Increased road construction making the area more accessible. • Increased infrastructure. • Cultural and social changes to aboriginal archeological systems. • Sustainability.

END OF KEY