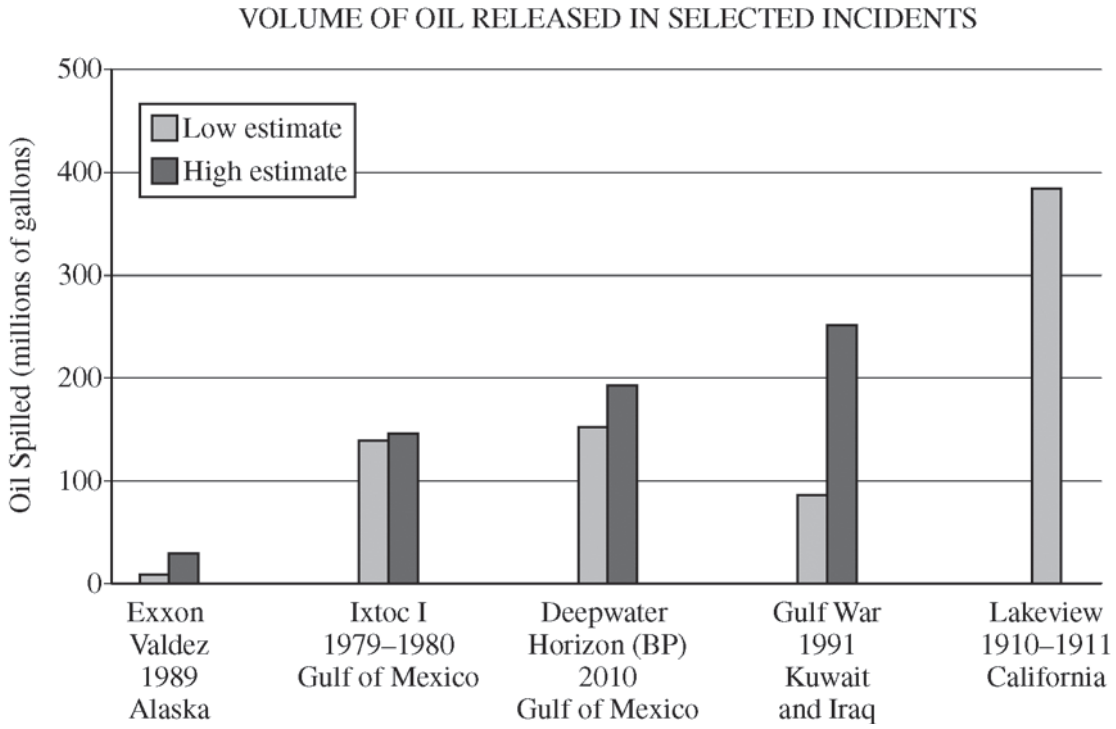

3. Oil spills can be devastating in scope and damage. Since 1900, there have been many oil spills around the world that have had significant ecological and economic impacts.

   (a) Using the data in the graph above, **determine** the maximum volume of oil estimated to have been spilled during the Deepwater Horizon (BP) incident.

   (b) **Describe** TWO environmental problems that can result from oil spills in coastal areas.

   (c) **Identify** one economic impact that results from oil spills in coastal areas.

   (d) Chemical dispersants have been used in cleanup efforts following major oil spills.

      (i) **Discuss** both one advantage and one disadvantage of the use of chemical dispersants for oil spill cleanup.

      (ii) **Identify** either one biological or one physical method (other than chemical dispersal) used for oil spill cleanup in coastal waters or on beaches and **describe** how the method is used.

   (e) Catastrophic spills make up less than 20 percent of the oil that pollutes marine waters. **Identify** one other source of oil contamination and **explain** how the oil from this source enters marine waters.

   (f) Petroleum has many uses as a raw material for consumer goods. **Identify** one substitute for petroleum in a specific consumer product (other than fuel).

AP® ENVIRONMENTAL SCIENCE
2015 SCORING GUIDELINES

Question 3

Oil spills can be devastating in scope and damage. Since 1900, there have been many oil spills around the world that have had significant ecological and economic impacts.

(a) Using the data in the graph above, **determine** the maximum volume of oil estimated to have been spilled during the Deepwater Horizon (BP) incident.

(1 point for identifying a specific number ≥185 million gallons and ≤199 million gallons. Include units)

(b) Describe TWO environmental problems that can result from oil spills in coastal areas.

(2 points: 1 point for each of two reasonable description of an environmental problem)

- Birds may lose their buoyancy or ability to fly if their feathers are coated with oil
- Degradation of nursery grounds, feeding grounds, and habitat may lead to a loss of biodiversity
- Food webs may be disrupted when populations of specific organisms in the web are reduced or suffer negative health impacts
- Oil spill may decrease the amount of sunlight reaching photosynthetic organisms in water
- Organisms may be killed by smothering, or by ingesting, inhaling, or absorbing oil

(c) Identify one economic impact that results from oil spills in coastal areas.

(1 point for an economic impact which may be positive or negative impact)

Negative Economic Impacts	Positive Economic Impacts
Cost of cleanup efforts	Financial aid brought into local economies through grants, disaster relief, and settlements
Decline in tourism/loss of revenue from tourism or commercial fishing	Increase in jobs and revenue during cleanup and monitoring of spill
Monetary value of lost crude oil	

(d) Chemical dispersants have been used in cleanup efforts following major oil spills.

(i) Discuss both one advantage and one disadvantage of the use of chemical dispersants for oil spill cleanup.

(2 points: 1 point for an advantage and 1 point for a disadvantage)

Advantages of Chemical Dispersants	Disadvantages of Chemical Dispersants
Breaks down oil into smaller droplets, diluting the concentration of oil to reduce its toxicity	Dispersants increase underwater damage as the dispersed oil settles
Easy to apply quickly and easily, or is less costly than shoreline cleanup	May be toxic to organisms/humans
Minimizes spreading of surface oil	May increase the area affected by the oil spill
Protects birds from surface oil	Oil is dispersed but not removed

Question 3 (continued)

(ii) Identify either one biological or one physical method (other than chemical dispersal) used for oil spill cleanup in coastal waters or on beaches and **describe** how the method is used.
(1 point for description of an acceptable method)

Biological Method	Physical Methods
Introduction of microbes that degrade the oil	Burning oil on the surface of water
	Dredging and vacuuming to remove oil
	Physical washing of rocks/organisms
	Use of absorbent material to remove oil or to keep the spill from spreading
	Using booms to contain oil on the surface and skimmers to separate the oil from the water

(e) Catastrophic spills make up less than 20 percent of the oil that pollutes marine waters. **Identify** one other source of oil contamination and **explain** how the oil from this source enters marine waters.
(2 points: 1 point for identification of a source, and 1 point for an explanation of how oil from that source enters the water)

Source	Explanation
Leaks from oil infrastructure	Leaks can occur during the exploration, production, and transport of oil
Oil from boats	Oil can leak from boat engines and during the emptying of bilge tanks
Natural seeps	Crude oil leaks to the surface naturally from the ocean floor
Oil from automobiles	Oil dripped from cars can be washed into water with storm runoff
Oil intentionally dumped	Oil is then carried to water with runoff or directly dumped into the water

(f) Petroleum has many uses as a raw material for consumer goods. Identify one substitute for petroleum in a specific consumer product (other than fuel).
(1 point for identification of a reasonable substitute for petroleum in a product)

- Paper bags
- Corn-based plastic water bottles
- Bamboo or wood storage containers
- Natural fibers (cotton, hemp, bamboo, etc.) in garments, upholstery, etc.