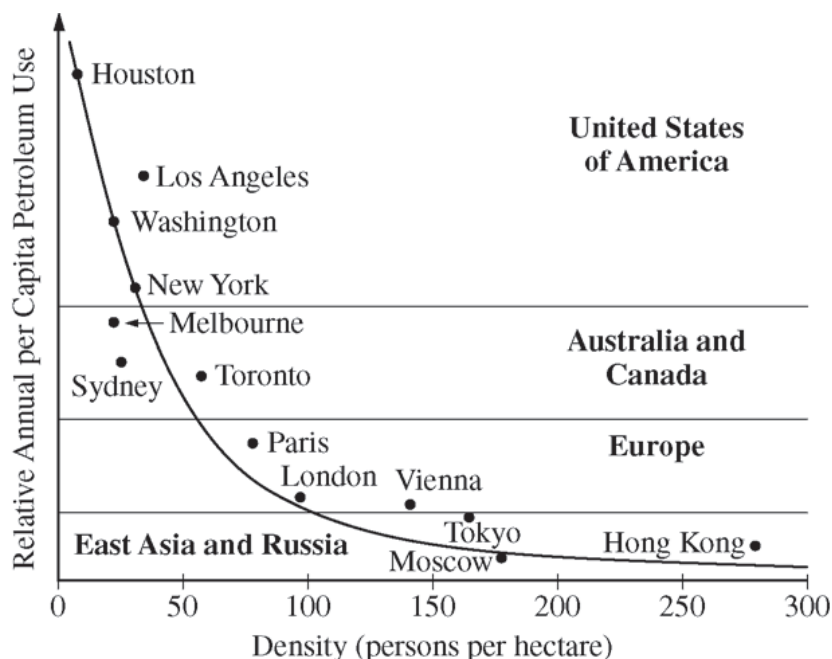


2. An offshore wind farm project using turbines to generate electricity is to be built along the Atlantic coast of the United States. It will be located about 13 km from the coast in water with an average depth of 10 m.
- (a) **Describe** one environmental benefit associated with an offshore wind project.
 - (b) **Identify** and **describe** one potential economic effect of an offshore wind project.
 - (c) **Describe** one additional way, other than wind power, that oceans can provide renewable energy for the generation of electricity.

The project will consist of 200 wind turbines, each with a capacity of 4 megawatts (MW). Each turbine costs \$1.2 million to build. Electrical demand in the area to be served by the project is expected to be 2.0×10^6 MWh per year.

- (d) **Calculate** how much electricity (in MWh) the wind project needs to generate per year in order to provide 80% of the annual electrical demand in the service area. Show all work.
- (e) Customers in the service area pay \$0.20/kWh for electricity. **Calculate** how much revenue will be produced if the wind turbines provide 80% of the annual electrical demand in the service area. Show all work.
- (f) Assuming all turbines are operating, **calculate** how many hours the wind turbines must operate to provide 80% of the annual electrical demand in the service area. Show all work.

4. The term “urban sprawl” describes the expansion of cities into rural areas. This phenomenon has occurred around the world and has had economic, health, and environmental consequences.
- (a) **Describe** TWO causes of urban sprawl.
- (b) **Discuss** TWO human health effects associated with urban sprawl.
- (c) The graph below shows the relationship between population density and petroleum use in selected cities. **Describe** the relationship between population density and petroleum use shown in the graph.



- (d) Smart growth focuses on ways to encourage sustainable urban development. **Describe** TWO steps a municipality could take to encourage smart growth in order to limit urban sprawl.
- (e) Highway systems and urban sprawl often threaten wildlife populations. **Describe** TWO methods to reduce harmful effects on wildlife populations from highways and urban sprawl.
- (f) Urban sprawl often results in the loss of productive agricultural land near cities. **Describe** one practical way to increase food production within urban areas.

STOP

END OF EXAM