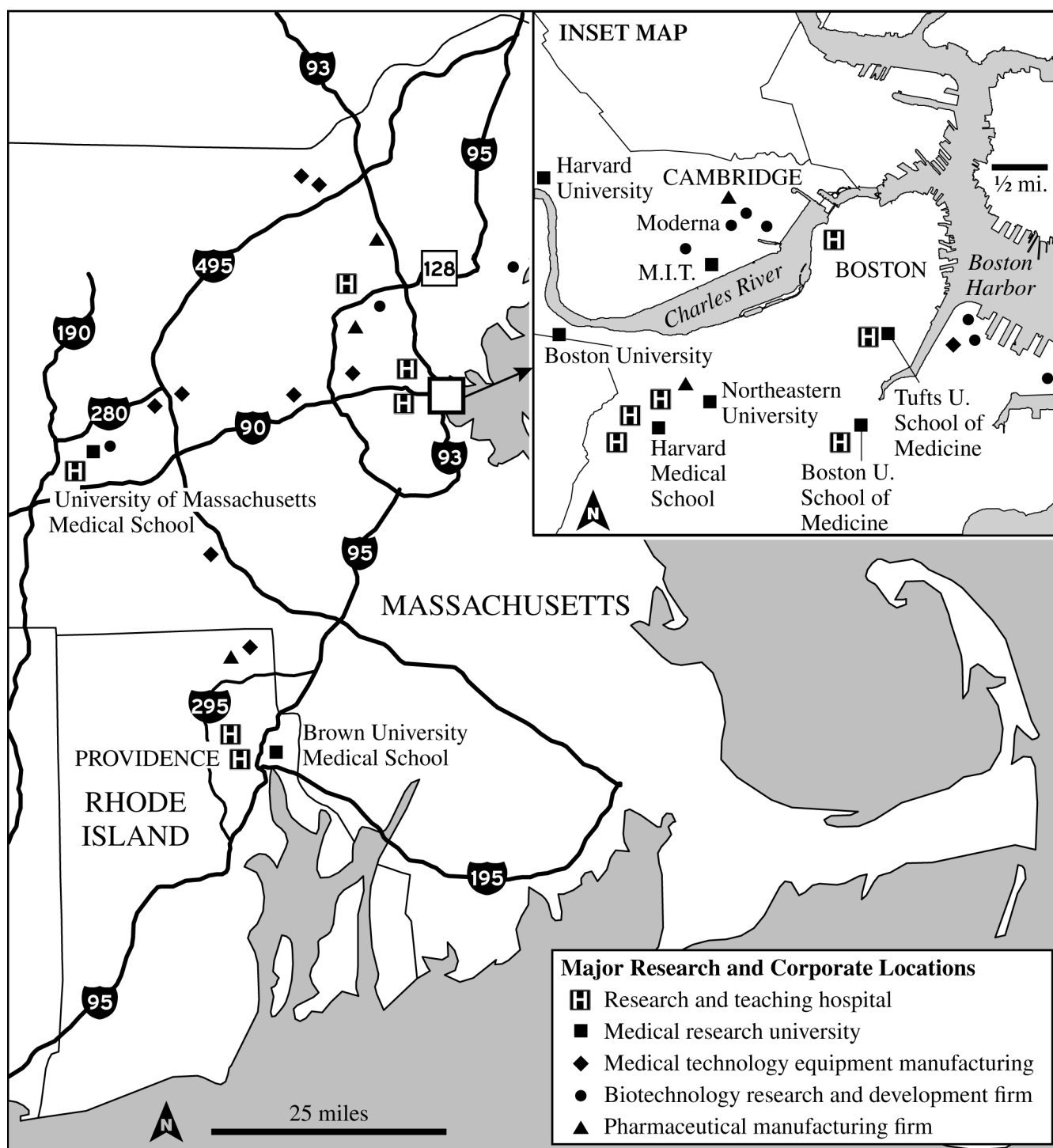


Question 3

MAJOR MEDICAL AND BIOTECHNOLOGY COMPANIES AND INSTITUTIONS IN THE BOSTON AND PROVIDENCE REGION



Source: National Institutes of Health

The inset map shows the downtown areas of Boston and Cambridge, Massachusetts.

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**SELECTED TECHNOLOGY RESEARCH AND DEVELOPMENT AREAS
IN THE MEDICAL FIELD**

Category	Product or Service
Biotechnology:	• Genetic engineering research • Biochemistry research • Diagnostic and testing science
Gene therapies:	• Cancer treatments • Neurological treatments • Rare and genetic disease treatments • Antiviral treatments and vaccines (e.g., Moderna)

3. Since the 1980s, the northeastern United States has developed into a major global center of high-technology industry that specializes in the medical field.
- A. Describe the spatial pattern of the companies and institutions shown in the inset map.
 - B. Describe the concept of a growth pole.
 - C. Explain ONE way education infrastructure affects a region's potential for high-technology development.
 - D. Explain how the pattern shown on the map resembles the galactic city model.
 - E. Explain ONE way local economic changes may be a result of deindustrialization.
 - F. Explain how the products and services listed in the table demonstrate that this economy has moved into the quaternary sector.
 - G. The map focuses on a regional scale. Explain a possible limitation of drawing country scale conclusions from a regional scale map.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

(F)	Explain ONE reason ethnonationalism might lead a government to promote pronatalist policies.	1 point
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Accept one of the following:

- F1. A government might promote pronatalist policies because children can be seen as a symbol of national pride and/or a centripetal force (cultural cohesion).
 - F2. A government might promote pronatalist policies because increases in population of a national, ethnic, culture group, or nation-state can improve social cohesion or social relations.
 - F3. A government might promote pronatalist policies because increased birth rates can bolster the desire for territorial expansion, economic growth, irredentism, or militancy (e.g., increased size of the military, social status gained through military service).
 - F4. The government of a theocratic state might promote pronatalist policies based on religious doctrine.
 - F5. Some governments may promote pronatalist policies aimed at the majority (e.g., dominant) culture (e.g., ethnic) group to increase the political power of the majority and/or decrease the power of minority groups.
 - F6. A government with restrictive immigration laws or policies may promote pronatalist policies to reverse a declining total population.
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Question 3: Two Stimuli**7 points**

(A) Describe the spatial pattern of the companies and institutions shown in the inset map. 1 point

Accept one of the following:

- A1. Agglomeration of similar economic activities.
- A2. Cluster or clustering of similar economic activities.
- A3. The concentration of similar activities along transportation routes (e.g., rivers, arterial roads).
- A4. There is a concentration of similar economic activities within a metropolitan area in Massachusetts.

(B) Describe the concept of a growth pole. 1 point

Accept one of the following:

- B1. A location where research, development, and/or innovation (e.g., new product or process) generate new products and/or services.
 - B2. An institution (e.g., university, hospital, laboratory) where scientific discoveries, inventions, and/or innovations create new economic opportunities.
 - B3. An area where new businesses start up and/or businesses locate to participate in the emerging market and/or attract investment for a new product and/or service.
 - B4. An area where new businesses start up and/or businesses locate to access a specifically skilled or educated pool of labor.
 - B5. An area designated by a government to facilitate economic activity for a specific purpose.
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(C)	Explain ONE way education infrastructure affects a region’s potential for high-technology development.	1 point
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Accept one of the following:

- C1. Graduates of educational institutions, who remain in the region throughout their careers, can promote regional economic development, create innovative products or services, and/or create a source of wealth for investment in the region’s high-technology businesses.
- C2. Educational institutions can develop a labor force with specialized capabilities that make an area better suited to attract high-technology businesses and/or investors from outside of the region to open new facilities and/or move existing facilities or headquarters into the region.
- C3. Educational institutions can sponsor research for new high-technology products and/or services that can be put into production or operation, thus creating new value, investment, and/or employment for the region’s economy.
- C4. Public investment in technical or specialized worker training, businesses, infrastructure, and/or equipment may divert funds away from investment in other community and social programs that support economic development.
- C5. Lack of educational infrastructure can negatively affect a region’s potential for high-technology development because there may not be a highly educated workforce, a specialized labor force, and/or sponsored research for high-technology products or services.

(D)	Explain how the pattern shown on the map resembles the galactic city model.	1 point
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Accept one of the following:

- D1. The region has multiple development centers (e.g., edge cities, central business districts [CBDs], suburban CBDs), which are based on a specialized product or service.
 - D2. The pattern of business development is decentralized or spread across the region in different locations.
 - D3. The region has a circumferential, circular belt, or radial highway pattern associated with a galactic city’s transportation landscape.
 - D4. The region contains several highway intersections that serve as nodes for new business districts, central business districts, or development centers.
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(E)	Explain ONE way local economic changes may be a result of deindustrialization.	1 point
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Accept one of the following:

- E1. Deindustrialization may cause the local economy to shift from a manufacturing or industry-based economy (secondary sector) to a service and/or technology-based economy (tertiary, quaternary, or quinary sector).
 - E2. Outsourcing of manufacturing or industrial jobs to other countries can lead to a decline in local employment levels and/or an increase in the percentage of the workforce that is unemployed or receiving unemployment benefits.
 - E3. Increased unemployment in the central business district (CBD), declining investment, and/or declining real estate values may result from the loss of manufacturing firms, jobs, and/or services that were once supported by the former industrial economy.
 - E4. Increases in the local use of post-Fordist methods of production (e.g., highly specialized firms, just-in-time delivery supply chains, flexible production methods) by manufacturing firms can indicate a response to deindustrialization to make industrial production more efficient.
 - E5. Gross national income (GNI) per capita in the area may decrease as local people lose employment in manufacturing and/or are unable to find similar-paying jobs in another economic sector.
 - E6. Unemployment rates or underemployment may increase as local people lose employment in manufacturing and/or are unable to find similar-paying jobs in another economic sector.
 - E7. Cities and communities may see decreased tax revenues due to higher unemployment and/or a decrease in population as people move away to search for jobs elsewhere (e.g., backwash effects, migration).
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| (F) | Explain how the products and services listed in the table demonstrate that this economy has moved into the quaternary sector. | 1 point |
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Accept one of the following:

- F1. The high-technology nature of the products and services listed demonstrates that the economy has moved into the quaternary sector.
- F2. The products and services rely on the knowledge and/or intellectual capabilities of the firms, institutions, and/or workforce that develop these advanced technologies.
- F3. The products and services are the outcomes of a highly educated, specialized, and/or creative class of employees who develop innovative solutions to consumer needs.
- F4. The products and services are dependent on the use of information technology for firms, institutions, and/or the workforce to be more productive, efficient, and/or cost-effective.

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| (G) | The map focuses on a regional scale. Explain a possible limitation of drawing country scale conclusions from a regional scale map. | 1 point |
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Accept one of the following:

- G1. Attempts to analyze research data from one scale of analysis to make claims about another scale of analysis may be inaccurate due to the change in scale's effect on spatial analysis.
- G2. Making research assumptions from map data at one scale of analysis to make claims about another scale of analysis may result in an incorrect calculation or an ecological fallacy due to the change in scale.
- G3. The region can be specialized in a sector or type of production that is different from the economic sectors or production types found in other regions of the country.
- G4. The region can have a long and continuing tradition of valuable or productive sectors that are very different from the changing mix of economic sectors that characterize the country's economy.

Total for question 3: 7 points