

**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.
- Describe the spatial pattern of the companies and institutions shown in the inset map.
 - Describe the concept of a growth pole.
 - Explain ONE way education infrastructure affects a region's potential for high-technology development.
 - Explain how the pattern shown on the map resembles the galactic city model.
 - Explain ONE way local economic changes may be a result of deindustrialization.
 - Explain how the products and services listed in the table demonstrate that this economy has moved into the quaternary sector.
 - 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.

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END OF EXAM

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Question 2**DEVELOPMENT INDICATORS FOR SELECTED COUNTRIES, 2020**

Country	Gross National Income per Capita	Percent of Workforce in Agriculture	Total Fertility Rate	Mean Years of Schooling Women/Men	Life Expectancy	Air Pollution Mortality Rate (per 100,000 people)	Percent of Population with Access to Clean-Burning Fuels
Afghanistan	\$1,976	39%	4.5	1.9 / 6.0	61	211	32%
Brazil	\$10,857	9%	1.7	8.0 / 7.7	69	30	96%
Finland	\$46,343	3%	1.6	12.6 / 12.3	81	7	100%

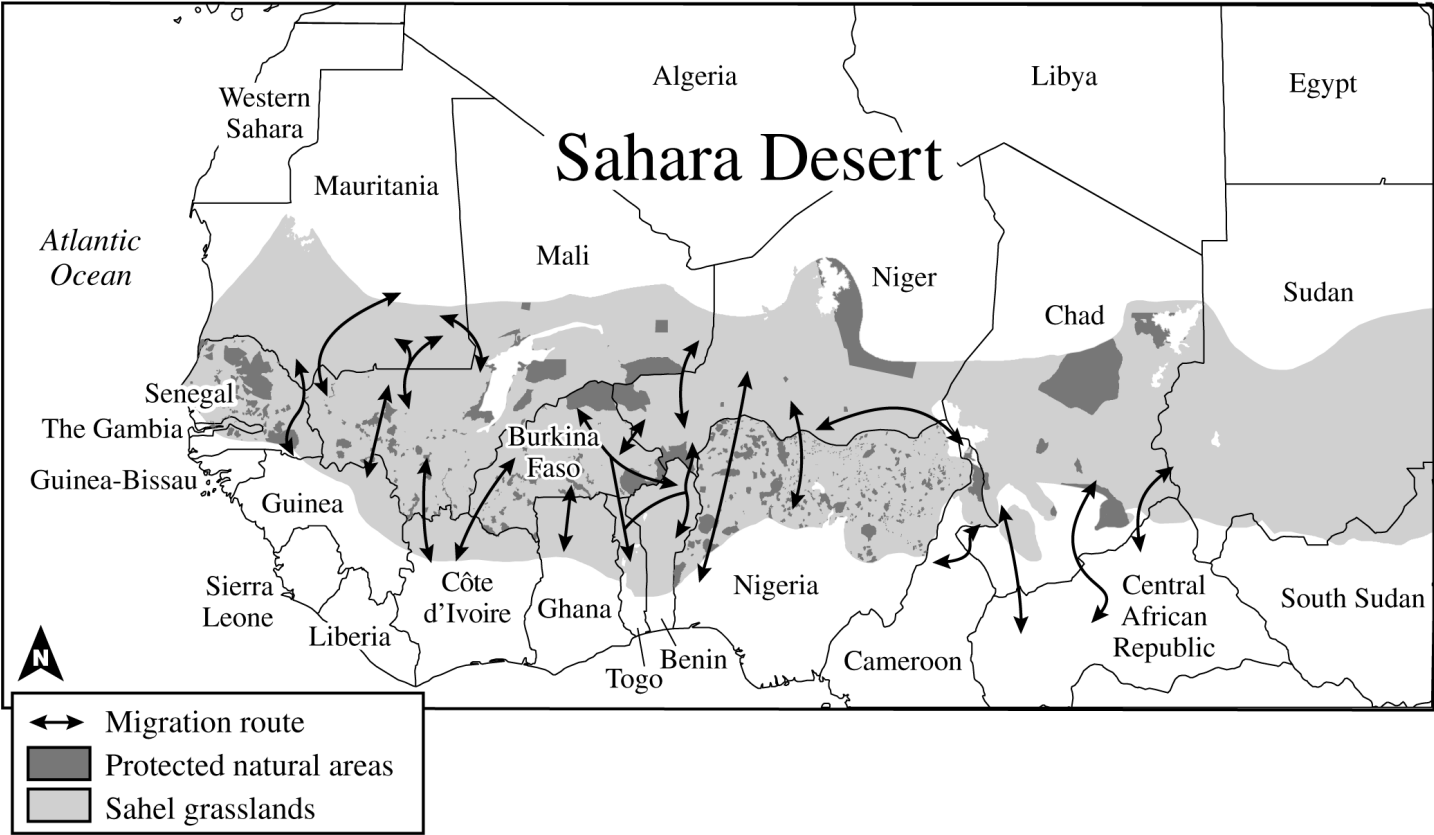
Source: World Bank, UNICEF

2. In 1990 the United Nations (UN) began using the Human Development Index (HDI) to measure levels of development. In 2015 the UN established the Sustainable Development Goals (SDGs) to set targets for environmental quality, economic development, and social programs.
- A. Using the data categories in the table, identify ONE indicator that is used to calculate HDI scores.
 - B. Using a different indicator than the one identified in part A, explain why Brazil's HDI score is higher than that of Afghanistan.
 - C. The UN and many countries have promoted sustainability principles. Describe ONE specific way that sustainability goals can respond to economic challenges.
 - D. Explain ONE reason why increasing women's access to education is likely to affect a country's total fertility rate.
 - E. SDG 8 is to "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all." Explain ONE way in which a country's development of ecotourism might affect economic growth.
 - F. Using data from the table, explain how access to clean-burning fuels for people's homes relates to the life expectancy of a country's population.
 - G. Explain how ONE of the countries in the table would be classified according to Rostow's stages of economic growth.

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Question 3

PASTORAL NOMADISM IN THE SAHEL REGION OF AFRICA



Source: Food and Agriculture Organization

The Sahel is an environmental transition zone between the Sahara desert and the wet tropical forest regions of Africa. The landscape is a semiarid grassland, having distinct dry and wet seasons, and the region is interspersed with shrubs and small woodlands.

SOURCES OF TENSION RELATED TO PASTORAL NOMADISM

Groups	Potential Sources of Tension
Nomadic herders versus crop farmers	• Damage to fields by migrating herds • Overgrazing by migrating herds • Competition for access to water • Increasing size of crop farms
Nomadic herders versus conservation organizations	• Grazing of protected areas • Degradation of natural habitats
Nomadic herders versus government officials	• Failure to follow regulations on cross-border migration • Activities such as smuggling foreign goods

Source: Organisation for Economic Co-operation and Development