

3. North Carolina is one of the fastest-growing states by population in the United States, with most growth concentrated in major cities like Charlotte. Increased population leads to increased demands for resources such as power and water.

The majority of electrical energy in North Carolina is produced during the combustion of coal.

- (a) **Identify** one negative human health effect linked to the exposure to pollutants resulting from the combustion of coal.
- (b) Coal ash, the powdery, solid substance that remains after coal combustion, presents a variety of potential environmental issues. Disposal of toxic coal ash is a growing concern in the state. Coal ash can be mixed with water and disposed of in large, unlined pits or as dry ash in landfills.
- (i) **Describe** an environmental problem associated with coal ash waste disposal.
- (ii) A proposed solution is to dispose of North Carolina's coal ash in clay-lined pits. **Justify** this solution by providing one advantage of using clay soil.
- (c) The population of Charlotte, North Carolina, has grown over the last few decades. The table shows the increase in the population size of Charlotte from 2013 to 2019.

**Population of Charlotte, North Carolina, 2013–2019**

| Year | Population |
|------|------------|
| 2013 | 757,278    |
| 2014 | 774,807    |
| 2015 | 792,137    |
| 2016 | 808,834    |
| 2017 | 826,060    |
| 2018 | 841,611    |
| 2019 | 857,425    |

- (i) **Calculate** the percent change in Charlotte's population from 2013 to 2019. **Show** your work.
- (ii) Based on Charlotte's 2019 growth rate of 1.88%, **calculate** the year when the population of Charlotte will double, assuming the growth rate stays the same. **Show** your work.
- (iii) The average Charlotte resident uses 90 gallons of water per day. **Calculate** the gallons of water used by the population of Charlotte in the year 2018. **Show** your work.
- (d) Drought periods are becoming more frequent in North Carolina, causing water resources to become more scarce. **Describe** one realistic action that citizens could take to reduce domestic outdoor water use.

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**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**