Cancer Trends: A DBQ

Teacher Instructions:

DBQ stands for Document Based Question. This is a type of essay question used on the New York State Regents Social Studies Examinations. Students are given 9-10 authentic documents centered on a theme. Students are expected to analyze these documents with the aid of short, scaffolding questions. These scaffold questions focus students' attention on the main idea of each document. For some documents, additional scaffold questions "stretch" students' understanding of the central theme behind the document. The scaffold questions are graded on a point system.

After completing the scaffold questions, students are expected to create a well-written, cohesive essay centered on a theme. In the essay, students incorporate information from at least 4-5 of the documents and information from outside resources. The essay is graded holistically using both a content-based rubric and an ELA (English Language Arts) rubric.

DBQ can be a valuable instructional and assessment tool in the science classroom. Through the use of DBQ, teachers can assess students' understanding of central themes in science. Additionally, DBQ's can develop and assess a wide variety of skills. For example, students can gain experience in reading comprehension, graph and diagram analysis, and cartoon interpretation. DBQ's can give students the ability to study the scientific method and ethical decision-making. Students are also taught how to assess the validity of sources.

There are several advantages of using the DBQ in science instruction. Most importantly, students develop skills for the LE Regents Exam, especially Part B and C. Secondly, teachers are able to increase students' expertise with authentic documents by increasing their ability to interpret documents (a life-long skill and one of the skills most requested by colleges). Additionally, the use of DBQ requires very little student training because students are using these questions in Global 9/10 and, starting around eighth grade, are trained to answer these questions. Finally, DBQ reinforces important skills required across the curricula in ELA, Social Studies and the Sciences.

There are several options for modifying the DBQ in the science classroom. Keep in mind that the purpose of the DBQ is two-fold. First, students are expected to analyze authentic documents. Then, they must incorporate their analysis of those documents into a central

theme. Teachers should always assign the scaffold questions followed by some activity that brings together the divergent (but related) concepts derived from the scaffold questions. One such activity would be for teachers to assign a "thematic statement" in which the students write a statement to show how they think the various documents are related. Another activity would be for students to construct an outline of their essay. In keeping with the spirit of a DBQ, students could also be assigned to work in groups and construct a group essay. This would allow students to share ideas and build on the knowledge of others in the group. All of these methods cut down or eliminate some of the grading times for the teacher

Most references speak to the DBQ as a means of assessing historical, not scientific, knowledge. The websites below give a good overview of the nature and scope of a DBQ. The information they contain can allow teachers of science to create and use DBQs as an effective tool in science education.

- http://www.upstatehistory.org/services/DHP/DBQ.html
- http://www.emsc.nysed.gov/ciai/dbq/ssindex.html
- http://www.edteck.com/dbq/testing/dbq.htm (click on the "Learn more about DBQ's" links)

Cancer Trends: A DBQ
(Document Based Question)

This question is based on the accompanying documents. The question is designed to test your ability to work with science-based documents. Some of these documents have been edited for the purposes of this question. As you analyze the documents, take into account the source of each document and any point of view that may be presented in the document.

Task: Using your knowledge of biology and cancer, write a cohesive essay that incorporates at least five (5) of the following documents. In your essay be sure to:

- Identify the current cancer trend as related to age
- Identify at least three (3) factors that may explain that trend.

Part A

Short-Answer Questions

Directions: Analyze the documents and, in the space provided, answer the short-answer questions that follow each document.

Document A

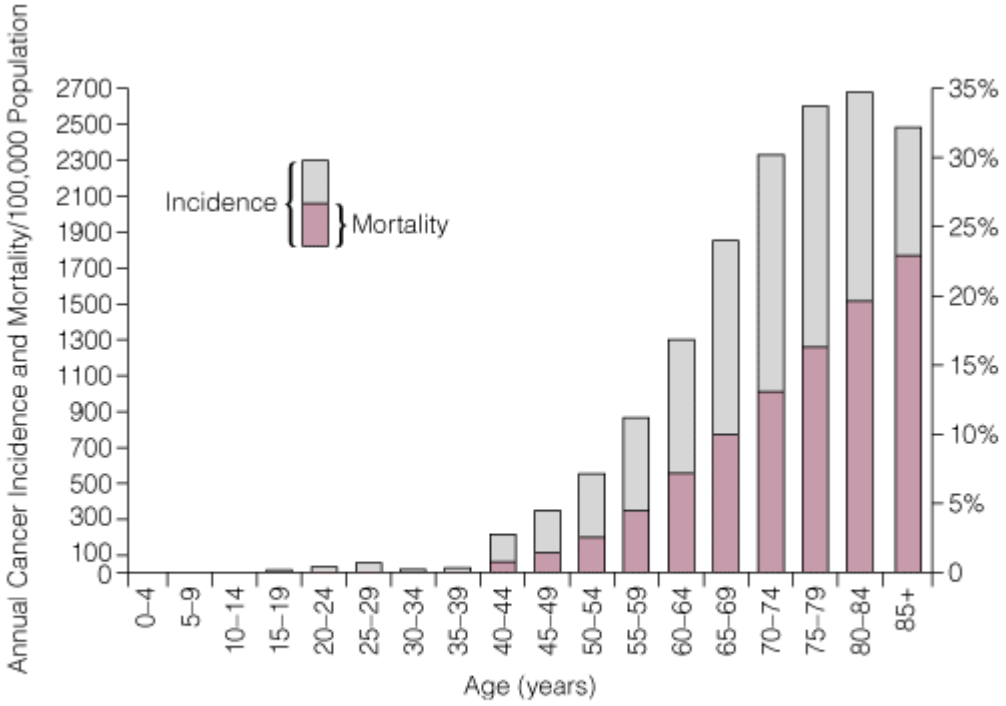


FIGURE 72–1. Age-specific incidence and mortality for all types of cancer. (Data from *SEER Cancer Statistics Review: 1973–1994*, Bethesda, MD, National Cancer Institute, 1997.)

Incidence: the number of people "getting" cancer.

Mortality: the number of people dying from cancer.

***Source**:* National Cancer Institute, 1997

1. Describe the trend in the incidence of cancer as age increases from 40-44 up to 75-79.

2. Write one possible hypothesis to explain the trend you described in the question above.

Document B

"Much cancer is caused by 'environmental factors,' broadly defined to include food, drink, and habits such as smoking tobacco and basking in the sun.

Numerous studies have shown that environmental factors are far more important than genetic, inherited factors. Cancer rates differ from country to country. When people migrate from one country to another, within a generation or two, their cancer rates change from those of their country of origin to those of their new homeland. For example, Japanese women living in Japan have low rates of breast cancer, but Japanese women who move to the U.S. soon have U.S. rates of breast cancer."

Source: David B. Thomas and Margaret K. Karagas, "Migrant studies," in David Schottenfeld and Joseph F. Fraumeni, Jr., editors, Cancer Epidemiology and Prevention [Second Edition] (New York: Oxford University Press, 1996), pgs. 236-254.

3. Explain why the Japanese women have increased rates of breast cancer after moving to the U.S..

Document C

"The part of cancer prevention we know the most about is the avoidance of carcinogens that induce or promote cancer. Carcinogens may alter normal growth-promoting genes (proto-oncogenes), to make them permanently turned on. Carcinogens may also damage growth-suppression genes (tumor suppressors) such that the genes become permanently turned off. Both gene changes may be necessary to create cancer. Since prolonged exposure to carcinogens is one of necessary ingredients for cancer, prevention of cancer in the elderly must begin before people become old."

Source: Merk Manual of Geriatrics, Merk, "Cancer". Hematological Disorders and Cancer. 1995-2007. http.//www.merk.com/mrkshared/mmg/sec9/ch72/ch72a.jsp. accessed May 2007.

4. Identify one carcinogen or activity that people can avoid to help prevent cancer "before people become old".

5. Identify one change in the cell cycle if growth-promoting genes are permanently turned on.

Document D

"Employees who are accidentally or chronically exposed to carcinogenic agents are at risk of developing cancer. The purpose of this research was to investigate the relationship between individual susceptibility and the lifetime cancer risk of workers exposed to styrene, a substance known to cause cancer.
The results of the research indicate that DNA damage does occur in workers exposed to low concentrations of styrene. This damage can lead to work related cancers. It also seems that the cancer risk is determined by individual genetic differences involved in DNA repair. Differences in DNA damage (between those individuals who are susceptible and those who are non-susceptible) increase with increased exposure to the carcinogen. These results stress the importance of reducing exposure levels of styrene and other possible carcinogens in the work environment."

Source: Veulemans, Hendrich. Evaluation of Cancer Risks. Katholieke Universiteit Leuven. May 31, 2006. http://www.Kuleuven.be/research/researchdatabase/project/3M05/3M050364.htm

6. Two individuals work side-by-side at a factory where styrene is produced. Both have worked together and performed the same job for 15 years. Explain why one individual who is exposed to styrene at the work place may get cancer and the other individual does not get cancer.

Document E

"When normal cells turn into cancer cells, some of the proteins on their surface change. These cells, like many body cells, constantly shed bits of protein from their surface into the circulatory system. Often, tumor antigens are among the shed proteins.

These shed antigens prompt action from immune defenders, including cytotoxic T cells, natural killer cells, and macrophages. According to one theory, patrolling cells of the immune system provide continuous, body-wide surveillance, catching and eliminating cells that undergo malignant transformation. Tumors develop when this immune surveillance breaks down or is overwhelmed."

Source: National Institutes of Health. National Cancer Institute. "Understanding Cancer Series." Slide 32.

7. Explain how a healthy immune system can help prevent tumors from developing.

8. Explain why an individual with AIDS may be more likely to develop cancer.

Document F

Source: Elgert, Klaus. "Turning on the Immune System to Fight Cancer." Science from Virginia Tech. Feb. 7, 1997.

9. What might be a possible message this cartoon is trying to convey?

Document G

"Some scientists refer to immune senescence, a term that describes the progressive decline in function of the immune system with age. Some components [of the immune system] lose function; others increase functions inappropriately. Various aspects of the immune system respond to aging in different ways. Immune senescence occurs gradually. The chronic diseases of aging can also aggravate the effects of immune senescence."

Source: "Aging: Immune Response and Aging."
http://websites.afar.org/sites/pageserver?pagename=1A_bimmune-4_how

10. Explain why an older person may have a more difficult time fighting cancer than a younger person.

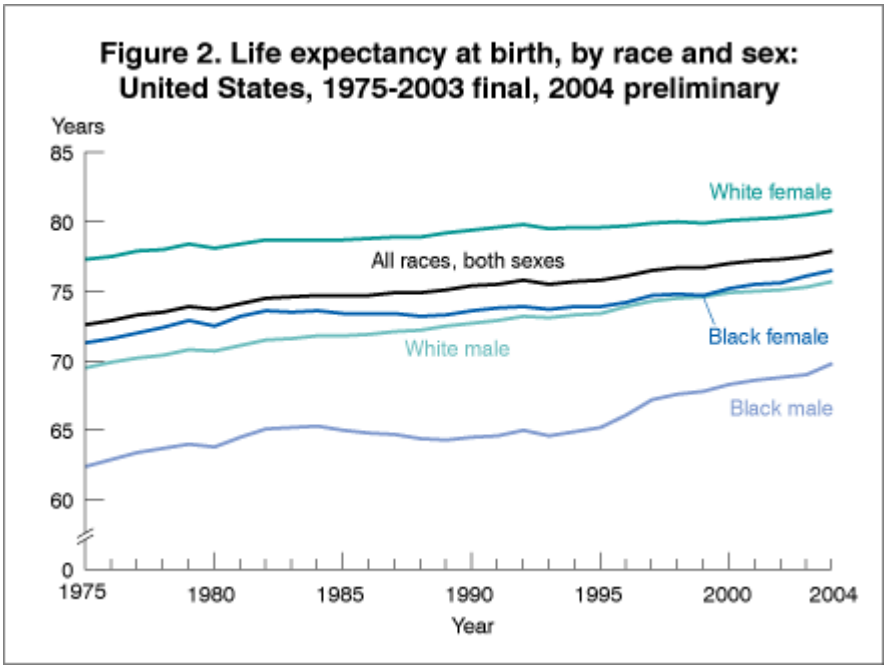
Document H

"In this study, investigators examined whether genetic differences in the way womens' bodies process the natural hormone estrogen may be related to breast cancer risk. All women have two main competing pathways that break down estrogen. The first pathway creates a "good" metabolite, called 2-hydroxyestrone. The second pathway creates a "bad" metabolite, called 16-alpha-hydroxyestrone. The "bad" metabolite has been associated with breast cancer. Researchers found that some women have a genetic predisposition to use the pathway that creates the "bad" metabolite (16-alpha-hydroxyestrone). These women have a greatly increased risk for breast cancer. Conversely, women who have a genetic predisposition to use the pathway that creates high levels of the "good" metabolite (2-hydroxyestrone) have a low risk for developing cancer."

Source: Kabat GC, Chang CJ, Sparano JA, Sepkovie DW, Hu XP, Khalil A, Rosenblatt R, Bradlow HL. Urinary estrogen metabolites and breast cancer: a case-control study. *Cancer Epidemiol Biomarkers Prev* 1997 Jul;6(7):505-9.

11. According to the passage, why do some women have a genetic predisposition to breast cancer?

Document I



Source: Miniño AM, Heron M, Smith BL. Deaths: Preliminary data for 2004. Health E-Stats. Released April 19, 2006.

12. What is one current trend in life expectancy in the US from 1975-2004?

13. Identify one change in the immune system that may lead to a decrease in function of the immune system as a person ages from 47 to 77 years old.

Part B

Essay

Directions:

Write a well-organized essay that includes an introduction, several paragraphs, and a conclusion. Use evidence from *at least five* documents in your essay. Support your response with relevant facts, examples, and details. Include additional outside information.

Task: Using your knowledge of biology and cancer, write a cohesive essay that incorporates at least five (5) of the following documents. In your essay be sure to:

- Identify the current cancer trend as related to age
- Identify at least three (3) factors that may influence that trend

Guidelines:

In your essay, be sure to

- Develop all aspects of the task [4 points]
- Incorporate relevant facts, examples, and details from *at least **five*** documents in the body of the essay [2 points per document/max. 10 points]
- Incorporate relevant outside information [3 points]
- Use a logical and clear plan of organization, including an introduction and conclusion that are beyond a restatement of the task. [3 points]