

Concepts of Science    **NAME** \_\_\_\_\_

Exam 3 March 9, 1999    Seat No. \_\_\_\_\_

**When Solving Problems, be sure to show all work**

1. Calculate the frequency of a laser with a wavelength 492 nm. (10%)

2. a. Briefly explain why ozone in the upper atmosphere is beneficial while ozone at the Earth's surface is not. (5%)

b. Although chlorofluorocarbons are detrimental to the ozone layer, it is actually a chlorine atom that consumes the ozone. Write equations showing all chemical reactions in this process. (5%)

3. Calculate the mass of a  $3 \times 10^5$  kg rocket travelling  $2.8 \times 10^8$  m/sec. (10%)

4. Fill in the blanks in the sentences below with one of the words in the word list on the next page. These words can be used more than once. (40%)
- a. \_\_\_\_\_ are an example of electromagnetic radiation.
  - b. \_\_\_\_\_ first proposed that the universe is expanding
  - c. \_\_\_\_\_ dating can be used to date 3.5 billion year old fossils
  - d. Burning coal containing \_\_\_\_\_ produces acid rain
  - e. \_\_\_\_\_ energy results from the conversion of mass into energy
  - f. In 1859, Charles Darwin published the \_\_\_\_\_.
  - g. Scientists believe that the universe formed approximately 15 billion years ago in an event called the \_\_\_\_\_.
  - h. In 1953, Stanley Miller subjected a reducing atmosphere to an electric discharge and generated \_\_\_\_\_.
  - i. A change in the genetic content of a population with time is referred to as \_\_\_\_\_
  - j. Many scientists feel that an increase in carbon dioxide in the atmosphere will bring about \_\_\_\_\_
  - k. The two ways in which nuclear energy is generated are \_\_\_\_\_ and \_\_\_\_\_
  - l. \_\_\_\_\_ wrote an essay on population which greatly influenced Darwin
  - m. The theory of evolution says that humans and \_\_\_\_\_ have a common ancestor.
  - n. The worst nuclear accident in history occurred at \_\_\_\_\_.
  - o. The process by which the cell converts food to energy is called \_\_\_\_\_

p. In the 19th century Michelson and Morley carried out a sophisticated experiment in which they measured the\_\_\_\_\_

5. State the two basic postulates of the special theory of relativity (10%)

6. List one human and one environmental problem resulting from too much nitrogen. (10%)

7. Briefly distinguish between basic and applied research. Give an example of each. (10%)

**Word List:**

velocity of sound, nitrogen, "origin of the Species", big bang, increasing, high, low, global warming, solar, nuclear, carbon dioxide, glucose, increasing, DNA, pressure, liquid nitrogen, evolution, Watson and Crick, RNA, fission, ATP, fusion, microwaves, speed of light, carbon-14, sulfur, "Evolution is a Fact", creationism, Chernobyl, ozone destruction, dangerous, 4.5 billion, genotype, three million, ten thousand, gasoline, coal, hydrogen, troposphere, decreasing, stratosphere, mesosphere, ozone, sulfur dioxide, Gregor Mendel, proteins, hot water, Thomas Malthus, Bishop Ussher, Alfred Russell Wallace, Edwin Hubble, life, dinosaurs, respiration, potassium-argon, "Principles of geology", amino acids, energy, "Origin of the Species", metabolism, respiration, wavelength, red shift, quantum mechanics, Charles Lyell, phenotype, human genome, frequency, AIDS, Stanley Miller, F. S. Rowland, oxygen, cloning, chromosomes, heat, intensity, bacteria, virus.

**Useful Information:**

Meter = 39.37 inches = 1.094 yards

Quart = 0.9463 liter

Yard = 0.9144 meter

Pound = 0.453 kilograms

Mile = 1.609 kilometers

Ounce = 28.53 gram

Inch = 2.54 centimeter

KE =  $\frac{1}{2} mv^2$ ; PE = mgh; where  $g=9.8$  meter/sec<sup>2</sup>

$c = \lambda \nu$  ; where  $c = 3 \times 10^8$  meter/sec;  $E=mc^2$  ;  $E = h\nu$

Relativistic mass:  $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$       Relativistic length:  $l = l_0 \sqrt{1-\frac{v^2}{c^2}}$

Relativistic time:  $\tau = \frac{\tau_0}{\sqrt{1-\frac{v^2}{c^2}}}$

**Do not write below this line**

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1. \_\_\_\_\_ 2. \_\_\_\_\_

3. \_\_\_\_\_ 4. \_\_\_\_\_

5. \_\_\_\_\_ 6. \_\_\_\_\_

7. \_\_\_\_\_

Total Minus \_\_\_\_\_

Grade \_\_\_\_\_