Physics 10 Midterm exam October 4, 2002

Last name_____ First name_____SID_____

**Essay questions**: pick **one** and only one to answer. Write a page or two (or whatever is appropriate) in on the last sheet or in your blue book. The essay is worth 20 points.

1. Events that appear to be clumped may actually be random. Give examples that illustrate this phenomenon, including some simple calculations.

2. Discuss the future of solar energy. What tasks will it be able to do, and what will it not be able to do. Give numbers whenever they are relevant to the argument.

3. Radioactivity is not well understood by the general public. Give examples of facts that would surprise them, and things they think to be true that aren't. Include numbers when the are relevant to making your case.

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**Brief questions** (worth 1 point each, 20 points total)

1. A cubic centimeter of water, when boiled, would have a volume of about
   - ( ) 1 cubic centimeter
   - ( ) 100 cubic centimeters
   - ( ) one liter (1000 cubic centimeters)
   - ( ) a cubic meter

2. An automobile uses approximately
   - ( ) 1 kW
   - ( ) 100 kW
   - ( ) 1000 kW
   - ( ) 10,000 kW

3. Which of the following contains the least energy
   - ( ) 1 gram of chocolate chip cookies
   - ( ) 1 gram meteor moving at 30 km per second
   - ( ) 1 gram of nuclear fuel U-235
   - ( ) 1 gram of gasoline

4. A large nuclear power plant produces about
   - ( ) 1000 horsepower
   - ( ) 1000 kW
   - ( ) 1000 megawatts
   - ( ) 1000 gigawatts

5. Molecular motion stops at
   - ( ) –272 C
   - ( ) 0 C
   - ( ) –273 F
   - ( ) – 32 C

6. When heated 100 C, a metal rod will
( ) expand its length slightly
( ) contract its length slightly
( ) remain the same length
( ) bend slightly

7. If 1000 people received 1 rem each, the number of excess cancers will be approximately:
( ) less than one
( ) 2.5
( ) 25
( ) 100

8. Which of the following is *not* radioactive:
( ) Potassium-40
( ) tritium
( ) deuterium
( ) they are all radioactive

9. A non-radioactive atom can be made radioactive by exposing it to
( ) electrons
( ) protons
( ) neutrons
( ) x-rays

10. In the list below, mark all that are units of energy:
( ) Calorie
( ) kilowatt-hour
( ) watt
( ) megaton of TNT

11. The half life of K-40 is one billion years. Compared to the original amount on the earth, the present amount is:
( ) greater
( ) about the same
( ) less
( ) unknown

12. Muller believes that the next terrorist attack is most likely to come from:
( ) explosives in checked luggage
( ) another commercial airplane crashed into a building
( ) explosives hidden in carry-on luggage
( ) an attack on a nuclear power plant

13. C-14 has a half life of about 6000 years. It is found in the atmosphere because:
( ) It is constantly produced by cosmic rays hitting the atmosphere
( ) It doesn't decay until a person who eats it has died
( ) The Earth is only 6000 years old
( ) It continues to leak out of rocks and soil

14. The Chernobyl explosion is calculated to have killed 24,000 people of out a population of 1,000,000. The one standard deviation uncertainty in the number killed is approximately:

( ) 150
( ) 24,000
( ) 1000
( ) 10,000

15. Even though Denver has more radiation than Berkeley, the cancer rate is lower. This is because:

( ) Denver is higher
( ) The people in Denver have genes that are resistant to cancer
( ) People in Denver have a different diet
( ) We don't really know.

16. Which of the following is not an example of the doubling rule?

( ) Moore's Law
( ) Detecting Thomas Jefferson's descendents
( ) Lightning
( ) The future growth of population
( ) All of the above follow the doubling rule

17. The number of cells in your body is about $10^{14}$. The number of generations necessary to create this number of cells is approximately:

( ) $10^{7}$
( ) 64
( ) 14
( ) 46

18. A gas has the same temperature as a solid. The energy of the gas molecules is:

( ) greater than that of the molecules in the solid
( ) equal to the energy of the molecules in the solid
( ) less than the energy of the molecules in the solid
( ) unknown, unless you identify the chemical formulas.

19. Avogadro's number is closest to:

( ) $10^{64}$
( ) $10^{14}$
( ) $10^{70}$
( ) $10^{23}$

20. The speed of molecules in a piece of ice is closest to:

( ) 0 meters/sec
( ) 33 meters/sec
( ) 1000 feet/sec
( ) 30 kilometers/sec