PffP Midterm exam 1 Part A – Essay Questions February 22, 2007

Row_____ Seat_____

Last name_____ First_____SID_____GSI_____

Essay questions (20 pts): pick **one** and only one to answer; **circle** the one you choose. Write a page **on the back of this sheet**. This side is for your personal notes only. Cover the important points in a clear and concise manner – as if you have only a few minutes to tell the President, your roommate, or your parent, what that person needs to know. *Clear, effective writing is important*. If English is a new language for you, state so at the top of your essay. If you need to re-write the essay, ask for a new copy of this page.

1. Understanding the effects of heat is important for many reasons other than just keeping warm. What is heat? What is the meaning of "temperature". Explain, with numbers if possible, how heat plays a role in sea level rise, the destruction of the levees in New Orleans, and the Space Shuttle tragedy.

2. Describe what is meant by the "linear hypothesis" for nuclear radiation effects. What does it say about a "threshold"? Is the linear hypothesis true for radiation illness? Why is there a debate about the linear hypothesis; can't the issues be answered scientifically? Give an example to show how the linear hypothesis affects public discussion of radioactivity.

Circle the essay question you chose.

This page is for name and notes only.

The essay should be on the other side.

Last name_____ First_____SID_____GSI_____

PffP Midterm exam 1 Part B – Short Questions February 22, 2007

Last name_____ First_____SID_____GSI_____

Short questions (1 point each, 20 points total). Read the questions carefully so that you don't misinterpret them (e.g. by missing a word such as "not").

1. TNT is important because
   ( ) its large energy per gram
   ( ) its large power
   ( ) its combination of high power and high energy
   ( ) it is much cheaper than gasoline

2. Hybrid vehicles in the US use, as their fuel,
   ( ) ethanol
   ( ) methanol
   ( ) gasoline
   ( ) CCC

3. The cost of electricity from the wall plug is about
   ( ) 1 cent per kWh
   ( ) 10 cents per kWh
   ( ) $1 per kWh
   ( ) $1000 per kWh

4. "Smart rocks" and "brilliant pebbles" are designed to
   ( ) make it cheap to launch into space
   ( ) enable heat to be extracted from cold outdoor air to warm a house
   ( ) prevent ice from expanding
   ( ) shoot down ballistic missiles

5. At room temperature, the speed of molecules is about
   ( ) 9.8 meters/sec
   ( ) 1000 feet per second
   ( ) 8 kilometers per second
   ( ) 11 kilometers per second

6. A heat pump is similar in its operation to
   ( ) a gasoline engine
   ( ) a hybrid auto engine
   ( ) an electric motor
   ( ) an air conditioner

7. Temperature in the sun, compared to temperature in the shade
   ( ) is usually hotter
   ( ) is always hotter
   ( ) is exactly the same
   ( ) can not be defined

8. A helium-filled balloon with a volume of one cubic meter can lift no more than
   ( ) about one gram
   ( ) about one ounce (28 g)
   ( ) about one kilogram
   ( ) about 15 kg

9. If a satellite orbited the Earth at an altitude of 240,000 miles (the distance to the Moon) it would go around the Earth once every
   ( ) 90 minutes
   ( ) 4 hours
   ( ) day
   ( ) month

Turn page over for more questions

10. Escape velocity refers to the speed necessary to
( ) rise 100 km (X-Prize)
( ) get into low Earth orbit (LEO)
( ) get into GEO (geosynchronous)
( ) escape, maybe even to infinity (if the sun weren't there to pull it back)

11. Spy satellites are usually in
( ) MEO
( ) GEO
( ) LEO
( )KEO

12. Microwaves cause cancer by
( ) breaking DNA
( ) destroying red blood cells
( ) inducing radioactivity in the bone marrow
( ) microwaves don't cause cancer, according to the best physics measurements and theory

13. Muller believes that al Qaeda abandoned the dirty bomb idea because
( ) the radioactivity would not have caused many immediate deaths
( ) it was considered immoral
( ) it was likely to run out of control
( ) the radioactive materials were not available

14. Saddam Hussein built a device to purify U-238. It was a
( ) Calutron
( ) centrifuge
( ) diffusion plant
( ) we now know he never built anything to do this.

15. Radioactive fallout consists primarily of
( ) Pu-239
( ) U-235
( ) U-238
( ) fission fragments

16. Power for satellites is sometimes obtained from an RTG. This is a
( ) small atomic bomb
( ) small nuclear reactor
( ) amount of Pu-238 that creates heat from radioactive decay
( ) controlled thermonuclear fusion device

17. World population, now 6 billion, is expected to
( ) keep growing like a chain reaction
( ) Limit itself once it gets to about a hundred billion
( ) limit itself when it reaches 9 to 12 billion people
( ) reduce over the next 30 years because of disease and war

18. Depleted uranium is used for
( ) nuclear fission
( ) nuclear fusion
( ) dirty bombs
( ) artillery shells

19. Yucca Mountain is the site of
( ) a nuclear reactor meltdown
( ) a nuclear reactivity accident
( ) a major uranium enrichment facility
( ) tunnels to store nuclear waste

20. The bomb dropped on Hiroshima was a
( ) uranium gun design
( ) plutonium implosion design
( ) plutonium gun design
( ) thermonuclear binary weapon