

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. There are several kinds of satellite orbits, sometimes called LEO, MEO, and GEO (sometimes called HEO). What do these acronyms mean? Describe how the properties of each of orbit allows it to be used for special purposes.
 2. A country such as North Korea may be developing a nuclear weapon. What kind of fission weapon might they attempt? Describe the steps and methods that a country such as North Korea would have to use to make a fission weapon.
-

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 _____

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. As fuel, US hybrid autos use
 - gasoline
 - electric power from wall plugs
 - hydrogen
 - natural gas
2. Astronauts will not be launched using rail guns, because rail guns
 - can't reach high velocity
 - use more fuel than rockets
 - of reasonable length will cause too many "gs"
 - cannot launch large satellites
3. At geosynchronous orbit, the strength of the Earth's gravity (compared to the gravity on the surface) is
 - same as on the Earth's surface
 - about twice
 - about 1/25
 - zero
4. According to the "linear hypothesis", if 2500 people get one rem each, the number of excess cancers (above natural) will be
 - about 1
 - about 2500
 - none, since all will die of radiation illness
 - about 500 (i.e. 20%)
5. The purpose of a moderator is to
 - provide atoms to fission
 - absorb neutrons
 - absorb fission fragments
 - slow the neutrons
6. Denver has a lower cancer rate than Berkeley. According to Muller, this is because
 - Denver has higher radiation
 - Denver has lower radiation
 - People in Denver consume less radioactive food
 - Muller doesn't know why
7. According to Muller, a "dirty bomb", also called a "radiological weapon", is
 - a very likely terrorist weapon
 - impossible in principle
 - very difficult to build and deploy, and therefore not likely
 - a common type of weapon currently being used in Iraq
8. Yucca Mountain is the location of
 - a proposed nuclear waste storage site
 - a location with claimed cancer excess
 - a giant asteroid or comet impact
 - a natural nuclear reactor that existed about 1.7 billion years ago
9. Glass feels cooler than plastic because
 - the molecules are lighter
 - the molecules are heavier
 - the molecules have lower velocity
 - glass conducts heat better

10. In the Chernobyl Nuclear accident, the reactor
- released the energy equivalent of a small nuclear bomb
 - had its fuel melt into a puddle that sunk into the Earth
 - caused no known deaths
 - had a reactivity accident, with radiation released because of fire
11. The key limit to the efficiency of a "heat engine" is
- the temperature difference
 - the energy density of the fuel
 - the availability of oxygen
 - the speed of fuel burning
12. There is virtually no hydrogen in the Earth's atmosphere because it
- is radioactive, and most decayed
 - had escape velocity and left
 - was rare when the Earth formed
 - there is lots of hydrogen gas
13. Which of the following has the most energy per pound:
- meteor
 - TNT
 - U-235
 - gasoline
14. A "heat pump" is similar to a
- gasoline engine
 - air conditioner
 - tungsten light bulb
 - gasoline stove
15. Muller calls the "X-Prize"
- a key innovation for future space flight
 - an inspiration for future energy efficiency
 - largely a fraud, since the winner can't launch to orbit
 - as important as the Nobel
16. For thermonuclear fusion to happen, we need
- a critical mass of material
 - very high levels of radioactivity
 - very high temperature
 - a large number of neutrons
17. Which is true about plutonium (mark only one):
- it has a smaller critical mass than uranium
 - it is the deadliest material known to humans
 - depleted plutonium is useful for anti-tank shells
 - it cannot cause cancer
18. Sunlight power is approximately (ignore inefficiency of solar cells):
- one megawatt per square meter
 - one gigawatt per square meter
 - 1 megawatt per square kilometer
 - 1 gigawatt per square kilometer
19. Electricity from ordinary flashlight batteries costs approximately (per kW hour)
- 5 cents
 - 17 cents
 - 37 cents
 - a thousand dollars
20. To reduce air resistance, satellites orbit the Earth at a minimum altitude of about:
- 8 km
 - 11 km
 - 150 km
 - 24,000 miles