

Last name _____ First
name _____ SID _____

Essay questions (20 pts): 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. Cover the important points in a clear and concise manner – as if you have only a few minutes to convey the important information to the President (or your roommate).

1. Sound doesn't always travel in straight lines. The bending of its direction as it travels gives rise to many interesting phenomena. Give examples, and include details that would help a new student understand them.
 2. Discuss the different kinds of "invisible light" and how these forms of light are used in practical applications.
 3. Describe the way that the eye works when it works perfectly, and the ways in which it can give less than perfect vision.
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Multiple-choice questions (1 point each, 20 points total)

1. "Melange" refers to
 - material that slows neutrons
 - a dangerous kind of fission fragment
 - a mixed layer in the ocean with variable sound velocity
 - a kind of rock found in California
2. A nuclear reactor cannot blow up "like a nuclear weapon" because:
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 - it depends on "slow" neutrons
 - it has control rods that would stop it
 - it is kept cool by water
3. The moderator in a Canadian reactor is:
 - U-238
 - U-236
 - heavy water: D₂O
 - ordinary "light" water H₂O
4. "Red eye" in a camera photo comes from a reflection off the
 - cornea
 - lens
 - air
 - retina

5. Energy production in the sun is most similar to the energy production in
- a plutonium bomb
 - a uranium bomb
 - a hydrogen bomb (fusion bomb, thermonuclear bomb)
 - a bomb using TNT
6. Global warming may be caused by
- destruction of the ozone layer
 - burning of fossil fuels (e.g. coal and oil)
 - release of radioactivity from nuclear reactors and nuclear tests
 - the bending of heat waves by the upper atmosphere
7. In total darkness, you can see people if you have a camera that is sensitive to:
- ultraviolet radiation
 - infrared radiation
 - gamma radiation
 - far ultra-violet radiation
8. If you double the absolute temperature of an object, the wavelength of the emitted light
- gets longer by a factor of 2
 - gets longer by a factor of 16
 - gets shorter by a factor of 2
 - gets shorter by a factor of 16
9. Sound travels fastest in:
- air
 - water
 - rock
 - vacuum
10. The Global Positioning System (GPS) works when you receive radio waves from at least:
- one satellite
 - three satellites
 - seven satellites
 - millions of satellites
11. The clouds in thunderstorms rise until they reach
- the carbon dioxide layer
 - the CFC layer
 - the top of the atmosphere
 - the ozone layer
12. Caution: there may be a trick lurking here: The most important property of ozone (for future presidents to know) is that it
- causes cancer
 - absorbs ultraviolet radiation
 - protects people from infrared radiation
 - creates chloro-fluoro-carbons (CFCs)

13. Beats demonstrate that
- sound is a wave
 - sounds bends
 - sound bounces
 - sound spreads
14. Which phenomenon is used to show that the Earth has a liquid core?
- radioactive heat
 - earthquakes
 - sound channel
 - plate tectonics
15. Fiber optics transmit signals using
- light
 - sound
 - electromagnetic waves
 - fiber waves
16. The wavelength of light is closest to the diameter of a:
- human hair
 - red blood cell
 - atom
 - nucleus
17. A Calutron
- measures Calories
 - creates plutonium
 - turns plutonium into uranium
 - separates U-235 from natural uranium
18. The source of dangerous fallout from a nuclear bomb is:
- soil made radioactive by neutrons from the bomb
 - plutonium from the bomb
 - air made radioactive by neutrons from the bomb
 - the nuclei which underwent fission and became radioactive
19. The primary purpose of a control rod in a nuclear reactor is to:
- slow down neutrons
 - absorb neutrons
 - emit neutrons
 - cool the core
20. You are more likely to hear distant sounds when
- the air near the ground is warm and the air above it is cool
 - the air near the ground is cool and the air above it is also cool
 - the air near the ground is warm and the air above it is cool
 - the air near the ground is cool and the air above it is warm