

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. What is an "energy gap"? Explain this term, and state briefly the reason that some substances have such a gap. Describe three technologies that rely on an energy gap. Be sure to explain how the energy gap makes them work.
 2. When electricity arrives in our home and we use it to light a bulb, we usually don't think about all the steps required to get it there. Explain how electricity is produced and provided to homes. You may want to include such concepts as generators, transformers, resistive losses, AC vs. DC, fuses, current and voltage.
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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. Wobbling hydrogen nuclei (protons) are used for
 - PET scans
 - CAT scans
 - ultrasound
 - MRI
2. A compass points north, attracted by
 - buried permanent magnets
 - an Earth dynamo
 - magnetism from the north star
 - electric fields from the Earth's core
3. An electric generator makes electric current by moving a wire past
 - a magnetic field
 - an electric field
 - an electrostatic charge
 - a semiconductor
4. A sound wave travels faster in air if
 - it has higher amplitude
 - it has higher frequency
 - it has lower frequency
 - none of the above
5. Project Mogul was created by
 - Ewing
 - Moore
 - Edison
 - Tesla
6. An octave in frequency is a factor of
 - 1
 - 2
 - 4
 - 8
7. The first earthquake wave to arrive is the
 - P wave
 - S wave
 - T wave
 - L wave
8. In water (compared to air) light travels
 - faster
 - slower
 - the same speed
9. Red eye results when light
 - reflects off the retina
 - reflects off the cornea
 - reflects off the lens
 - reflects off the iris
10. The colors of an oil slick demonstrate that
 - light is a wave
 - oil absorbs yellow and blue
 - the eye has three color sensors
 - the eye has four color sensors
11. radar uses what kind of wave?
 - sound wave
 - electromagnetic wave
 - metallic wave
 - neutrino wave

turn page over for
more questions

12. Global warming is thought to be due to
- ozone depletion
 - the presence of the sound channel
 - carbon dioxide
 - UV absorption
13. Stinger missiles use
- IR
 - UV
 - radar
 - x-rays
14. Bats navigate using
- IR
 - UV
 - radar
 - ultrasound
15. Xerox machines use
- the energy gap
 - interference
 - superconductors
 - photon-caused electron emission
16. superconductors work because of
- an energy gap
 - electrons don't collide with photons
 - interference
 - Shannon's theorem
17. amps are a measure of
- power
 - voltage
 - resistance
 - current
18. inside modern earphones you will find
- semiconductors
 - transistors
 - transformers
 - rare earth magnets
19. a dynamo is a kind of
- electricity generator
 - medical imaging device
 - superconductor
 - earthquake
20. The Doppler shift changes
- the energy gap
 - the frequency
 - the velocity
 - the direction