

Last name \_\_\_\_\_ First name \_\_\_\_\_ SID \_\_\_\_\_

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Essay question: (do this question last, in your blue book or on the blank sheet) worth 20 points. Pick **one** of the following questions. Discuss the noticeable and/or important effects that arise from:

- (1) the cancellation of waves
  - or** (2) the different velocities of waves as they travel through different parts of the same material
  - or** (3) invisible light
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Multiple choice questions, worth a maximum of 30 points (1 point each)

If the time between the S and P waves is 5 seconds, the distance to the earthquake is:

- about 5 miles
- about 1 mile
- about 25 miles
- about 1/5 mile

To make clothes appear extra clean, manufacturers apply:

- infrared radiation
- electron beam
- ultraviolet radiation
- fluorescent dyes

when a nuclear reactor loses its moderator

- the chain reaction stops
- the chain reaction increases
- the chain reaction is unaffected
- the radioactivity stops

A mirage forms when the light near the ground is

- moving at greater than  $c$
- moving faster than light at higher altitude
- moving slower than light at higher altitude
- reflected by a thin layer of water

A nuclear reactor cannot explode like an atomic bomb because:

- there are no gamma rays to focus the implosion
- there is no tritium present
- no neutrons are present
- the neutrons are too slow

A "black light" is designed to emit

- UV
- IR

- radio waves
- x-rays

Two soap bubbles from the same soap appear to be different colors. They probably have:

- different sizes
- different absorption
- different temperature
- different thickness

The most information (bits per second) can be carried by which kind of light:

- Radio
- Infrared
- Red
- Blue
- Ultraviolet

"Red eye" in a camera results from light reflecting off:

- the retina
- the lens
- the pupil
- the corner reflector

If the pin hole in a pinhole camera is made larger, then: (check all that are correct):

- the image gets brighter
- the image gets sharper
- the image gets smaller

The ozone layer is created by:

- carbon dioxide
- lightning
- sunlight
- chlorofluorocarbons

Newton could have recognized light was a wave if he had studied:

- the colors of rainbows
- the bending of light when it enters water
- corner reflectors
- the colors of oil floating on water

Light waves are

- longitudinal
- transverse
- circular

Mark all of the following that are used as moderators:

- ordinary water
- heavy water
- graphite (carbon)
- strontium-90

If people ate the radioactivity in a nuclear reactor, the number of people it could kill is:

- 24,000
- 137,000
- 2,500,000
- 50,000,000

The "pit" of a pit viper detects

- IR
- very low frequency sound
- very high frequency sound
- sound in the audible range

Sound waves are primarily:

- longitudinal
- transverse
- circular
- shear

To have a sound channel, there must be

- a minimum in the velocity of sound
- a maximum in the velocity of sound
- a decrease of the velocity with depth
- an increase of the velocity with depth

GPS works by:

- sending signal to satellites that then radio back the location
- receiving signals and calculating the position
- detecting the position of the sound channel in the atmosphere

Sunlight is brightest in which color:

- UV
- red
- green
- blue
- IR

SOSUS was

- a program to build an atomic bomb
- a program to exploit a sound channel
- a program to drop food in Afghanistan
- an unmanned airplane for surveillance

Mogul was

- a program to build an atomic bomb
- a program to exploit a sound channel
- a program to drop food in Afghanistan

an unmanned airplane for surveillance

You are most likely to be able to hear distant sounds in the evening because

- sound bends upwards, away from the ground
- sound is most likely to travel in a straight line at that time
- sound bends downwards towards the ground

The ozone layer is most likely to be damaged by

- the burning of fossil fuels
- chemicals in old refrigerators and air conditioners
- global warming
- release of Strontium-90 into the atmosphere

If you triple your speed, the force of air resistance

- increases by a factor of  $1/3$
- increases by a factor of 3
- increases by a factor of 9
- increases by a factor of 27

In music, an "octave" refers to two frequencies that differ by a factor of

- eight
- four
- two
- one

If we double the frequency of sound, the wavelength is

- doubled
- halved
- unchanged
- quadrupled

Shannon is famous for having invented or discovered (among other things):

- GPS
- Global Hawk
- the sound channel
- the bit

Stinger missiles are guided by:

- IR
- UV
- GPS
- lasers

Most of the energy of electricity used in a light bulb goes to:

- IR
- visible light
- UV
- green