

**Physics 10 final exam**  
**December 13, 2000**

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As the velocity of a moving object approaches the speed of light, what happens to its energy?

- goes to zero
- goes to infinity
- becomes  $mc^2$
- becomes  $(1/2) mc^2$

Energy equals:

- force times distance
- weight times height
- 9.8 times mass times height
- all of the above
- none of the above

If you were to triple the temperature and triple the density of a gas, you get:

- triple the original pressure
- the same original pressure
- 6 times the original pressure
- 9 times the original pressure

One watt is equivalent to :

- one joule/sec
- one coulomb/sec
- one calorie/sec
- one horsepower

When an electron is emitted from a radioactive nuclear, the electron is often called:

- an alpha particle
- a beta ray
- a gamma ray
- a cosmic ray

When the nucleus explodes, we say we have:

- TNT
- fusion
- a radioactive particle
- a cosmic ray

Why is Prof. Muller's radioactive watch safe to wear?

- the number of decays per second is very small
- it isn't really radioactive. It just absorbs light and reemits it.
- the emitted radioactivity does not make it out of the watch
- it is a kind of radioactivity that doesn't cause cancer

Why are we not harmed when we put our hands across a car battery?

- we have high resistance
- the battery has low energy
- the battery has high resistance
- the battery has low current

Which is not a unit of energy?

- kWhr
- calorie
- Calorie
- joule
- watt

What is creating new C-14 every day?

- radioactivity in the earth
- the earth's magnetic field
- ultraviolet light from the sun
- cosmic rays

When the velocity of a proton is half of the speed of light, then the gamma function is approximately equal to:

- 0
- 0.5
- 0.7
- 1
- 1.4
- 2

If Muller discovers a new, energetic particle (the “Mulleron”) that has zero mass, then we can conclude that the Mulleron

- can pass directly through matter
- is a black hole
- travels at the speed of light
- is radioactive

About how fast are molecules in air moving?

- 1000 feet per second
- the speed of light
- 9.8 meters/sec
- 9.8 cm/sec

Why do we use TNT for explosives?

- it has high energy per gram
- it is radioactive
- it does not pollute
- it releases its energy quickly

What would happen if all molecules in a chamber were brought to rest?

- the temperature would be 0 K
- the temperature would be 0 F
- the temperature would be 0 C
- the temperature can not be determined

If Jim and Mary are both from Berkeley and are the exact same age. Jim travels at a velocity of 65 mph to Los Angeles and waits there. Mary drives the next day, at 70 mph. When she gets to Los Angeles, who is older?

- Jim
- Mary
- They are the same age
- It depends on the distance

If you have 128 atoms of Mullerium, and Mullerium’s half-life is 12 years, how much will you have in 36 years?

- 64 atoms
- 32 atoms
- 16 atoms
- 2 atoms

Which of the following is a typical energy for an x-ray?

- 1 eV
- 1000 eV
- 10,000 eV
- 1,000,000 eV

What is the by-product of K-40 decay?

- Carbon-14
- Argon-40
- Potassium-41
- Kryptonite-35

If Sleeping Beauty falls into a deep slumber for 100 years and her prince (born on the same day as her) rides off into the sunset with another princess to live in a far away castle on top of the royal mountain, only to come back for her 50 years later, then will:

- Prince Charming will be younger than Sleeping Beauty
- Sleeping Beauty will be younger than Prince Charming
- They will be the same age
- It depends on how fast and how long he rode his horse.

Which of the following is not a zero mass particle:

- neutrino
- graviton
- gamma ray
- beta ray

What process is used for finding the age of things that once were alive?

- potassium argon dating
- carbon dating
- tritium dating
- DNA dating

Control Rods

- slow down neutrons.
- absorb neutrons.
- capture fission fragments
- absorb plutonium and uranium

How much energy would it take to send a small dust particle at the speed of light:

- Energy from all the dynamite in the world
- Energy from all of the nuclear weapons in the world
- The energy of a photon if you simply let it ride on a light photon
- All of the energy in the universe
- It is impossible

Lorentz contraction says that a football thrown past your face:

- is shorter by a factor of gamma
- is longer by a factor of gamma
- is the same length as it is at rest
- appears different, but is not truly different.

Speed of a massless particle (careful; may be trick)

- is the same to all observers
- is faster to people moving in the same direction
- slower to people moving in the same direction

Which travels fastest?

- L wave
- S wave
- P wave
- they all travel at the same speed

If the distance between P and S waves is 10 seconds, how far from the epicenter are you?

- 8.4 km
- 20 km
- 84 km
- 840 km

What process is most frequently used to find the age of rocks?

- potassium argon dating
- carbon dating
- tritium dating
- DNA dating

One joule per second is equal to one:

- calorie
- Calorie
- coulomb
- watt

For an effective nuclear explosion, the number of generations must be

- 2
- 3.14
- 4
- 8
- greater than 8

Which of the following cannot be used as a moderator?

- heavy water
- light water
- graphite
- uranium

The symbol beta (the letter b with a tail) stands for

- $v/c$
- 1 decay per second
- $1/\sqrt{1-v^2}$
- $mc^2$

Which of the following is an example of antimatter?

- electron
- black hole
- Higgs particle
- positron

Which of the following is polarized?

- blue sky light
- direct sun light (yellow)
- light from a candle
- light from a TV screen

With what can you boost the fission process?

- tritium/deuterium gas
- strontium-90
- cadmium
- potassium-40
- helium

What happens when the Curie point is met?

- the nuclear reactor turns off
- the electric force is turned off
- the magnet force is turned off
- gravity becomes reversed

What is "Critical Mass"?

- the amount of mass needed to start a chain reaction.
- the amount of mass needed to cause the most damage.
- The amount of moderator to make the chain reaction work
- The amount of tritium in a hydrogen bomb

The cost of energy from a battery is closest to:

- 14 cents per kWh
- 5 cents per kWh
- 14 dollars per kWh
- 1000 dollars per kWh

If we turn the sun into a black hole, then the force on the Earth will

- increase by a factor less than a million
- increase by a factor much greater than a million
- be unchanged

For the earth to become a black hole it would have to be reduced to the size of:

- Berkeley
- an automobile
- a coin
- a pin head

What would happen if the Higgs-Boson field was suddenly turned off?

- everything would move at the speed of light
- all magnetism would turn off
- matter would turn into antimatter
- the universe would no longer accelerate its expansion

How much energy is in a quanta of visible light? Approximately:

- 2 eV
- 1 cal
- 1 Cal
- 1 kWh

The spreading of a wave as it passes through an opening is called:

- dispersion
- diffraction
- refraction
- inversion

What is the half life of K-40?

- 12 years
- 6000 years
- 2 million years
- 1 billion years

When you hear distant automobiles in the morning, that is probably an indication of:

- global warming
- ozone layer depletion
- an inversion
- fog

One uranium fission produces about:

- 200 MeV
- 2 eV
- 1 Cal/gram
- 1000 kWh

When two different waves pass through an opening of the same size, which one will spread more?

- smaller wavelength
- larger wavelength
- higher frequency
- lower frequency

Kinetic Energy can be measured in:

- watts
- calories
- grams
- amperes

An object falls. What happens to its PE (potential energy) and its KE (kinetic energy)?

- PE unchanged; KE increases
- gains PE; KE unchanged
- loses PE and gains KE
- gains PE and loses KE

If two people A and B stay in the same location and do not move, then the distance between them:

- doesn't change
- can change
- becomes shorter
- we never studied this!

Whales and fiber optics both make use of what principle?

- Huygen's
- Heisenberg's
- Moore's
- Curie's

Nuclear waste comes primarily from

- left over uranium
- neutrons
- fission fragments
- tritium

The resolution of a human eye is about:

- 4 mm
- 2 cm
- 1 micron
- 1/60 degree

How many joules does it take to raise one gram of water by one degree Celsius?

- 1
- 4
- 1000
- 4000
- $1.6 \times 10^{-19}$

For fusion to take place, we need:

- high temperatures
- critical mass
- a moderator
- fission fragments

Check all the following statement(s) which is (are) true:

- heat is a flow of energy
- temperature is a macroscopic property of an object
- temperature is a measure of the average molecular kinetic energy
- heat and temperature are the same thing

Check all the following statement(s) which apply. If two objects have the same temperature, then

- they have the same average atomic kinetic energy
- if they are in contact with each other, no heat will flow
- they have the same pressure

The specific heat of ice is 0.5 cal per gram degree C. How many calories is needed to raise 20 grams of ice 10 degrees C?

- 10
- 20
- 40
- 100
- 200

As an object gets hotter and hotter, the color of its glow will change from

- white, to yellow, to red, to blue
- blue, to white, to yellow, to red
- red, to yellow, to white, to blue
- yellow, to white, to blue, to red
- none of the above

An object with a speed of 81 km/hr has a kinetic energy of 90 joules. If the speed were reduced to 27 km/hr, the kinetic energy would change by a factor of

- 1
- 3
- 5
- 7
- 9

How much energy is required to leave a 66 watt light on for 6 hours?

- 396 kWh
- 60 kWh
- 11 kWh
- 0.011 kWh
- 0.06 kWh
- 0.396 kWh

Which of the following are retroreflectors? Check all that apply.

- bicycle reflectors
- human eyes
- stop signs
- animal eyes

Which lens below is the strongest (most diopters)? D is the diameter, FL is the focal length.

- FL = 5000 cm, D = 10 cm
- FL = 50 cm, D = 200 cm
- FL = 5 cm; D = 10 cm
- FL = 50 cm; D = 1 cm
- they are all the same

Nuclei are smaller than their atoms by a factor of

- 100
- 1000
- 10000
- 100,000
- 1,000,000

As the wavelength of light decreases, the frequency:

- decreases
- increases
- stays the same

If 1000 people are exposed to 1 Sievert of radiation, the number of them that will die of cancer is closest to (careful: possibly a trick question):

- 40
- 4
- 400
- 240

The source of the Sun's energy is

- fusion
- fission
- bombardment of meteorites
- gravity
- annihilation

As you travel deeper into the ocean, the water temperature T:

- decreases with depth
- increases with depth
- does not change with depth
- first gets colder, and then gets warmer

The first occurrence of fusion on Earth was in

- fusion reactors
- fission reactors
- the laboratory of Otto Hahn and Fritz Strassman
- in the explosion of the hydrogen bomb in the 1950s

The dangerous fallout from a nuclear bomb consists primarily of:

- fission fragments
- plutonium
- uranium
- radiocarbon

An earthquake waves does its worst damage when it reaches an area that

- slows it down
- increases its frequency
- decreases its frequency
- adds additional energy

The ozone layer is created by

- ultraviolet light
- cool temperatures
- cosmic rays
- carbon dioxide

When light passes through glass, its velocity

- stays the same
- increase
- decreases

Which of the following has the lowest frequency?

- TV
- AM radio
- visible light
- gamma rays

The probability of a U-238 nucleus capturing a neutron goes up when the neutron speed:

- decreases
- increases
- it doesn't matter what the neutron speed is

For a Presidential poll to have an accuracy of 3%, the number of people who must be polled is approximately:

- 50
- 200
- 1000
- 10000

SOFAR took advantage of

- the sound channel in the ocean
- the sound channel in the atmosphere
- the magnetic field of the earth
- the uncertainty principle

As you move to a higher altitude, the temperature of the air

- first gets cooler, then warmer
- stays constant, then gets cooler
- first gets warmer, then cooler

Which of the following was true about project Mogul?

- It was concerned with the atmosphere
- It resulted in the first nuclear bomb
- It led to the discovery of nuclear fission
- It involved the invention of integrated circuits

The Calutron was named after:

- California University
- Calories
- Calvin and Hobbes
- Ernest O. Calutron

Which of the following devices sometimes makes use of radioactivity (check all that apply)

- smoke detectors
- cloud chambers
- carbon dating
- wrist watch display

An electromagnetic wave is a

- longitudinal wave
- transverse wave
- both a longitudinal and transversal wave
- none of the above

Which of the following reactors can explode like a nuclear bomb?

- heavy water
- light water
- fast breeder
- slow breeder
- no reactor can explode like a nuclear bomb

Which of the following contains the most energy per gram:

- TNT
- chocolate chip cookies
- fusion
- battery
- fission

A high-fidelity stereo speaker produces sound by:

- the force of a magnetic field on electric current
- the force of an electric field on an electric charge
- the force of a magnetic field on an electric charge
- the force of an electric field on a magnetic charge

Which type of bomb is effective at killing life but does little damage to buildings?

- neutron bomb
- plutonium bomb
- uranium bomb
- TNT

What are mirages?

- reflections of the sky
- water absorbed into the ground
- the absorption of blue light in the surrounding air
- retroreflectors in the ground

Which of the following is NOT true?

- primary waves are longitudinal
- secondary waves are transverse
- surface waves do the most damage

What is the Schwartzchild Radius of the sun?

- 1 million km
- 3 km
- 10 cm
- 1 cm
- 1 micron

When does annihilation occur?

- when an object falls into a black hole
- when a gamma ray hits an atom
- when a neutron hits a uranium nucleus
- when an electron hits a positron

How many electron volts are there in a typical nuclear decay?

- 1
- 1000
- 1 million
- 1 billion

Light is polarized when it bounces off (check all that are correct):

- water
- glass
- air

The earth is significantly protected from cometary impacts by

- The moon
- the atmosphere
- the Earth's magnetic field
- Venus
- Jupiter

A neutrino can have which of the following values for its energy (careful: tricky question)

- 0 joules
- 200 joules
- either of the above two values
- 200 joules (negative)
- any of the above three values

Assume Florida had 6 million voters on election day. Between Bush and Gore, how many votes would constitute a statistically significant lead?

- 1 vote
- 153 votes
- 550 votes
- 1800 votes

Momentum is measured by:

- velocity times energy
- mass times energy
- velocity times mass
- mass times velocity squared

The ocean sound channel:

- is very quiet
- is very noisy
- is radioactive
- focuses earthquakes

A lens is made by combining a lens having a focal length of 50 cm with another lens having a focal length of 100 cm. What is the approximate strength of the new combination?

- 150 cm
- 50 cm
- 2 diopters
- 3 diopters
- none of the above

Current is measured by:

- volts
- calories
- amps
- watts
- ohms

Sound travels faster in a gas which is:

- less dense
- hotter
- colder
- more dense

When you increase the distance between two charges by a factor of 4, the force between them:

- is two times less
- is four times less
- is sixteen times less
- is the same

Static electricity occurs when two surfaces rub against each other and:

- protons flow from one to another
- electrons flow from one to another
- positrons flow from one to another
- neutrons flow from one to another

When you look at a galaxy 5 billion light years away, you:

- see this galaxy as it was 5 billion years ago
- see this galaxy as it was about a million years ago
- you can never see a galaxy 5 billion light years away
- you see the galaxy the way it is now

According to Muller, the "Flying Disks" of Roswell were:

- advanced space vehicles
- nuclear weapons
- microphones
- alien devices of undetermined purpose

A hologram can create which kind of image?

- real
- virtual
- real or virtual
- neither real nor virtual

The amount of spreading of a wave is higher if:

- The opening is smaller.
- The opening is larger.
- The wavelength is smaller.
- None of the above.

Radio waves and x-rays have the:

- same frequency
- same speed
- same wave length
- same energy
- none of the above

The north geographic pole of the Earth

- is a south magnetic pole
- has always had the same polarity
- is exactly at the magnetic pole
- none of the above

The force of gravity between two ants that are separated by 100 meters is:

- attractive
- repulsive
- zero
- it depends on whether they can see each other

In a standard television set, the image is produced by:

- electrons hitting a phosphor
- protons hitting a phosphor
- xrays
- ultraviolet radiation

x-rays are most strongly absorbed by

- water
- carbon
- calcium
- oxygen
- hey, we weren't taught this!