NAME _____ Unit 6 Practice Test

390 A sound wave is best described by the terms

a) Electromagnetic and transverse
b) Electromagnetic and longitudinal
c) Mechanical and longitudinal
d) Mechanical and transverse

391 Which of the following waves listed has the highest frequency?

a) Infrared
b) Green Light
c) Blue light
d) Yellow Light

392 Three quarks cannot have a combined charge of

a) 1 uud
b) 2 uuu
c) -2
d) -1 ddd

393 As a fire truck moves away from a person standing on a side walk, the frequency of the siren heard by the person will

away lower f higher λ

a) Remain the same
b) Decrease
c) Increase
d) Increase then decrease

394 A photon is best classified as a

→ force carrier of EM

a) Quark
b) Boson
c) Lepton
d) Baryon

395 As a light wave in water moves into air at an incident angle of 10^0 the light will

n↓ v↑ θ↑ λ↑

a) Reflect and speed up
b) Reflect and slow down
c) Refract inward and slow down
d) Refract outward and speed up

396 Which of the following particles produces an electromagnetic wave when oscillated?

a) electron
b) Neutron
c) Hydrogen atom
d) Tau neutrino

EM wave produced by charged particle

397 Determine the frequency of a radio wave with a wavelength of 1875 m moving in air.

a) 1.6×10^5 Hz
b) 6.75×10^{-1} Hz
c) 1.5×10^{11} Hz
d) 6.1×10^5 Hz

$f = \frac{v}{\lambda} = \frac{3 \times 10^8 m/s}{1875 m} = 1.6 \times 10^5 Hz$

398 Which of the following wave categories is a type of mechanical wave

a) Radio - EM
b) Microwave - EM
c) Ultrasound
d) Ultraviolet - EM

399 A particle consisting of 2 protons and 2 neutrons contains

proton = uud
neutron = udd
2 × uud + 2 × udd
= 12 quarks

a) 15 leptons
b) 15 quarks
c) 12 quarks
d) 5 quarks

400 A tau neutrino is classified as which type of particle?

a) Quark
b) Baryon
c) Lepton
d) Hadron

401 A wave cycle takes 4 seconds. Determine the frequency of the wave.

$f = \frac{\text{cycles}}{\text{second}} = \frac{1 \text{ cycle}}{4 \text{ sec}} = 0.25 Hz$

a) 4Hz
b) 0.25 Hz
c) 1 Hz
d) 25 Hz

402 The combination of an up quark and an anti up quark produces

a) A baryon
b) A lepton
c) A meson
d) Energy from annihilation

See Skill 1 Notes

403 A wave completes 15 waves cycles in 37.5 m. What is the wavelength?

$\lambda = \frac{\text{meters}}{\text{cycle}}$

$\frac{37.5 m}{15} = 2.5 m$

a) 0.33m
b) 45 m
c) 675 m
d) 2.5 m

404 Which fundamental force holds the particles in the nucleus together

a) Gravity
b) Electromagnetic force
c) Strong force
d) Weak Force

405 A wave moving from one material into another experiences

same material

a) Reflection
b) refraction
c) Diffraction
d) Polarization

same material

406 Compared to the speed of a sound wave in air at STP, the speed of a radio wave is

a) Less
b) More
c) The same

Sound = 331 m/s radio = 3×10^8 m/s

407 Compared to the speed of a radio wave in air, the speed of a microwave in air is

a) Less
b) More
c) The same

both are EM waves

My mistake - rounding error

408 What is the speed of a wave with a wavelength of 0.3 m and a frequency of 12 Hz?

a) 27 m/s
b) 60 m/s
c) 4 m/s
d) 3.0×10^8 m/s

$v = f\lambda = (12\text{Hz})(.3\text{m}) = 3.6\text{m/s}$

409 What is the speed of light with a frequency of 5.09×10^{14}Hz when traveling through water?

a) 5.9×10^{14} m/s
b) 3.0×10^8 m/s
c) 2.25×10^8 m/s
d) 4.4×10^8 m/s

$v = c/n = \frac{3\times10^8 \text{m/s}}{1.33} = 2.25\times10^8 \text{m/s}$

410 Which color of light has a wavelength of 5.0×10^{-7}m in air?

a) Blue
b) Green
c) Orange
d) Violet

$f = v/\lambda = \frac{3\times10^8 \text{m/s}}{5\times10^{-7}\text{m}} = 6\times10^{14}\text{Hz}$

411 Which characteristic is the same for every color of light in a vacuum?

a) Frequency
b) wavelength
c) Speed
d) Period

412 In which way does blue light change as it travels from crown glass into diamond?

a) ~~Its frequency decreases~~
b) ~~Its frequency increases~~
c) Its speed decreases
d) Its speed increases

crown glass = 1.52
diamond = 2.42
n ↑
so v ↓

413 The slope of a graph of photon energy vs. frequency equals

a) Photon speed
b) Wavelength
c) Planck's constant
d) Speed of light squared

414 How much energy is produced from the complete conversion of an electron into energy?

a) 1.6×10^{-19}J
b) 2.7×10^{22}J
c) 3.2×10^{-19}J
d) 8.2×10^{-14} J

$E = mc^2 = (9.11\times10^{-31}\text{kg})(3\times10^8\text{m/s})^2$

415 How much energy is produced when 2 universal mass units are converted into energy?

a) 1.86×10^3 MeV
b) 2.8×10^3MeV
c) 3.0×10^8 MeV
d) 1.6×10^{-19} MeV

$2u \times (931\times10^3\text{MeV}) = 1.86\times10^3\text{MeV}$

416 Determine the energy of photon with a frequency of 5.09×10^{14} Hz.

a) 1.6×10^{-19}J
b) 3.0×10^8 J
c) 3.4×10^{-19}J
d) 5.9×10^{-7}J

$E = hf = (6.63\times10^{-34}\text{Js})(5.09\times10^{14}\text{Hz}) = 3.37\times10^{-19}\text{J}$

417 Determine the energy in electronvolts of photon with a wavelength of 5×10^{-7}m

a) 4.0×10^{-19}eV
b) 6×10^{-14}eV
c) 2.5 eV
d) 3.8×10^{33}eV

$E = hc/\lambda = 3.978\times10^{-19}\text{J} \times \frac{1}{1.6\times10^{-19}}\text{eV/J} = 2.486\text{eV}$

418 Light with a frequency of 5.09×10^{14} Hz in air is incident on a boundary with water at an angle of 30^0. What is the angle of refraction?

a) 15.4^0
b) 45^0
c) 0^0
d) 22^0

$n_1\sin\theta_1 = n_2\sin\theta_2$
$1\sin30^\circ = 1.33\sin\theta_2$
$\theta = \sin^{-1}.376$
$\theta = 22^\circ$

419 Light with a frequency of 5.09×10^{14} Hz in air is incident on a boundary with another substance. The angle of incidence is 45^0 and the angle of refraction is 30^0. What is the index of refraction for the substance?

$n_1\sin\theta_1 = n_2\sin\theta_2$
$1\sin45^\circ = n_2\sin30^\circ$
$n_2 = 1.4$

a) 1.4
b) 0.7
c) 1.66
d) 1.33

420 What is the minimum amount of energy required to ionize an electron in the ground state of a mercury atom?

a) 13.6 eV
b) 10.38 ev
c) 4.64 eV
d) 20 eV

n = a = 10.38eV

421 Determine the energy emitted by an electron as it falls from n=3 to n=2 in a hydrogen atom.

a) 12.09 eV
b) 1.89 eV
c) 15.11 eV
d) 1.51 eV

n = 3 = 1.51eV
n = 2 = 3.40eV
1.89eV

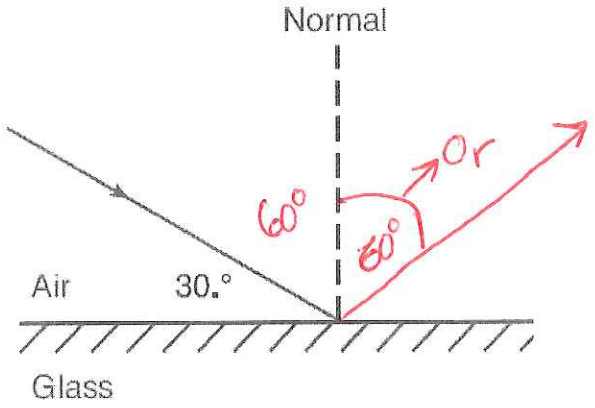
422 A singer breaking a glass by hitting a specific frequency is known as the phenomena of

a) Diffraction
b) Doppler effect
c) Interference
d) Resonance

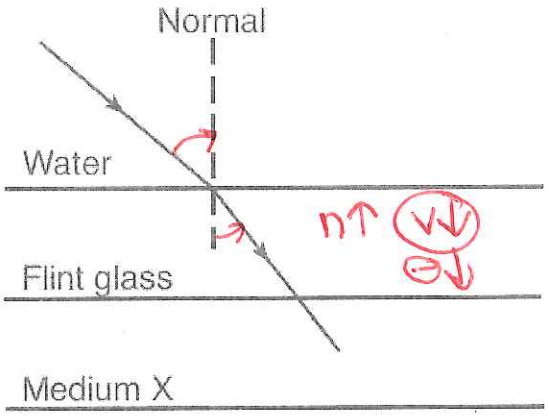
423 Maximum constructive interference occurs when two waves

a) Are in phase
b) Out of phase by 90^0
c) Out of phase by 180^0
d) Out of phase by 45^0

424 Draw the reflected ray on the diagram below. Label the angle of reflection including value of angle

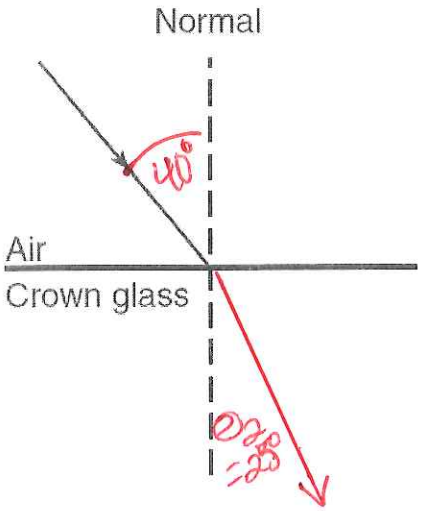


425 What happens to the speed of the light wave as it moves from water to flint glass?



Velocity decreases

426.



For the light ray to the left

a) Use a protractor to determine the angle of incidence [1]

40°

b) Determine the angle of refraction (show all work including equation, and substitution with units) [2]

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$1 \sin 40° = 1.52 \sin\theta_2$

$\theta_2 = 25°$

c) Draw in the angle of refraction on the diagram at left [1]

427 A photon with a frequency of 6.0×10^{14} hertz is absorbed by an excited hydrogen atom. This causes the electron to be ejected from the atom, forming an ion.

a) Calculate the energy of this photon in joules. [Show all work, including the equation and substitution with units.] [2]

$E = hf = (6.63\times10^{-34}\ \text{J·s})(6\times10^{14}\ \text{Hz}) = 3.98\times10^{-19}\ \text{J}$

b) Determine the energy of this photon in electronvolts. [1]

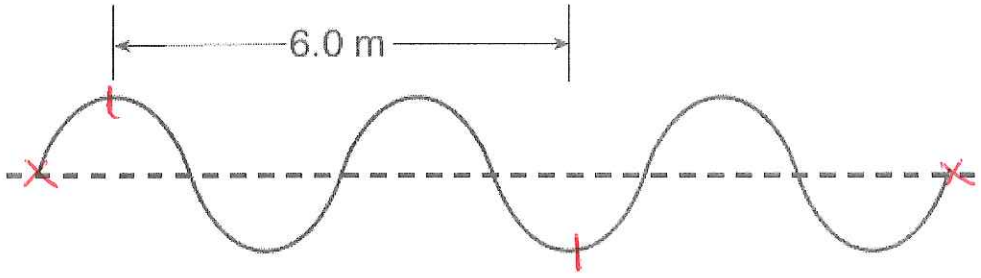
$3.98\times10^{-19}\ \text{J} \times \frac{1\ \text{eV}}{1.6\times10^{-19}\ \text{J}} = 2.486\ \text{eV}$

c) What was the initial energy level of the electron before being ejected from the atom by the photon?

The initial level must have been level 3 (or higher) n=-1.51eV

(n = 2 would have been too low)

428



d) For the wave pictured above, determine the wavelength of a single cycle [1]

$\lambda = \frac{\text{meters}}{\text{cycle}} = \frac{6\text{m}}{1.5} = 4\text{m}$

e) If the entire wave train above took 12 seconds to pass, what is the frequency of the wave? (show work including equation, substitution and units) [2]

$f = \frac{\text{cycles}}{\text{seconds}} = \frac{3\text{cycles}}{12\text{seconds}} = .25\text{Hz}$

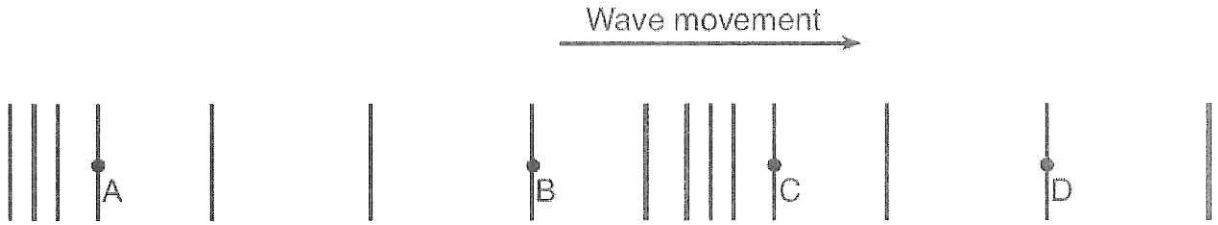
f) Determine the speed of the wave (show all work including equation, substitution and units)? [2]

$v = f\lambda = (.25\text{Hz})(4\text{m}) = 1\text{m/s}$

g) What type of wave motion is pictured in the diagram above? [1]

transverse

429 A sound wave moving through STP is pictured below.



a) What type of wave motion is represented in the picture above?

longitudinal

b) List two points (by letter) that are one wavelength apart.

A & C

c) What is the speed of this wave at STP?

331 m/s Soundwaves move 331 m/s at STP

d) What is the speed of this wave in a vacuum?

It can't move in a vacuum