

Clicker questions

the answers are in the lower right corner

question

A wave on a string goes from a thin string to a thick string. What picture best represents the wave some time after hitting the boundary?

B

Clicker Question 1

A tube open at both ends has a fundamental frequency of f . If one end of the tube is closed the fundamental frequency of the tube will be.

A. f
 B. $2f$
 C. $f/2$
 D. $4f$

C

Clicker question 2

A string of length L fixed at both ends is vibrating at the frequency of the second harmonic. There is a anti-node at a distance of _____ from the end.

A. $L/2$
 B. $L/3$
 C. $L/4$
 D. $L/6$

C

Clicker question 1

A fire truck is approaching a fire with its siren on at frequency f and speed of 5 m/s. The observers at the fire hear a frequency $f_o = \underline{\hspace{2cm}}$. v is the speed of sound = 340 m/s

A) $\frac{v+5}{v}f$ B) $\frac{v-5}{v}f$
 C) $\frac{v}{v+5}f$ D) $\frac{v}{v-5}f$

D

Clicker question 2

A train is approaching a tunnel in a mountain with its whistle blowing with frequency f and speed 20 m/s. The sound reflects off the mountain and is heard by an observer on the train with a frequency of _____.

A) $\frac{v+20}{v-20}f$ B) $\frac{v-20}{v-20}f$
 C) $\frac{v+20}{v+20}f$ D) $\frac{v-20}{v+20}f$

A

Clicker question 3

The door in a microwave oven is glass with a metal screen and blocks microwaves from escaping. The reason why you can see the food but not feel the heat is that _____.

- A) Microwaves cannot pass through glass.
- B) The size on the holes in the screen are larger than the wavelength of light but smaller than the wavelength of microwaves.
- C) The microwaves are completely absorbed in the oven.
- D) The microwaves are directed only in the vertical direction.



B

Question 1

For total internal reflection at an interface the light _____.

- A) must have a small angle of incidence
- B) must go from a higher to lower index of refraction.
- C) must go from a lower to higher index of refraction.
- D) can go from either a higher or lower index of refraction



B

Clicker Question 1

A boy stands 0.2 m in front of a concave mirror with a focal length of 0.5 m. His image will be _____.

- A) real and upright
- B) real and inverted
- C) virtual and upright
- D) virtual and inverted



C

Clicker Question 2

A boy stands 0.5 m from a convex mirror with a radius of curvature of 1.0 m. The magnification will be between _____.

- A) 0 and 1.0
- B) 1.0 and infinity
- C) 0 and - 1.0
- D) - 1.0 and - infinity.



A

Clicker question 3

A candle is placed 30 cm in front of a converging lens with a focal length of 20 cm. The image will be _____ and _____.

- A) Real, upright
- B) Real, inverted
- C) Virtual, upright
- D) Virtual, inverted



B

Clicker question 4

A candle is placed 15 cm in front of a converging lens with a focal length of 20 cm. The image will be _____ and _____.

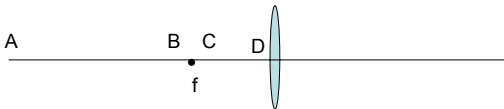
- A) Real, upright
- B) Real, inverted
- C) Virtual, upright
- D) Virtual, inverted



C

Clicker question 1

Where would an object be placed in front of the converging lens below, in order to produce a real, enlarged image?



B

Clicker question 2

A camera lens focuses the image an approaching runner onto a detector. As the runner gets closer the distance from the lens to the detector _____.

- A) increases
- B) decreases
- C) remains the same

A

Clicker question 3

Your eye focuses on an approaching runner by changing its focal length. As the runner approaches, the focal length of the eye must _____.

- A) increase
- B) decrease
- C) remain the same

B

question 4

You are a survivor on a desert island and want to make a fire by focusing sunlight. You can use _____.

- A) a flat sheet of glass from Josh.
- B) the eye glasses from Alex who is nearsighted.
- C) the eye glasses from Brenda who is farsighted.
- D) the compact mirror from Rhoda.

C

Clicker question 1

For a compound microscope to have the highest angular magnification the focal length of the objective lens must be _____ and the focal length of the eyepiece must be _____.

- A. long, long
- B. long, short
- C. short, long
- D. short, short

D

Clicker question 2

For a refracting telescope to have the highest angular magnification, the focal length of the objective lens must be _____ and the focal length of the eyepiece must be _____.

- A. long, long
- B. long, short
- C. short, long
- D. short, short

B

Clicker question 3

Suppose you have light going through two crossed polarizers. What will happen if a third polarizer is placed in between the two with polarization angle of 45° ?

- A) nothing will change
- B) the transmitted light will decrease
- C) the transmitted light will increase
- D) the transmitted light will go to zero



C

Clicker Question 1

In a two slit interference experiment, how does the separation between peaks in the interference pattern change if the distance between slits is increased?

- A. Increase
- B. Decrease
- C. Stays the same
- D. Indeterminate



B

Clicker Question 2

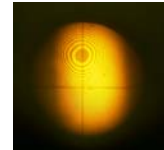
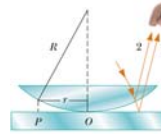
In a two slit interference experiment how does the distance between the peaks on the screen change if the wavelength of the light is increased?

- A. increases
- B. decreases
- C. stays the same
- D. indeterminate



A

Clicker question 3



For the Newton's ring pattern formed by a lens the condition for the path difference at the first bright concentric ring is that $2t = \underline{\hspace{2cm}}$.
(t = the distance across the air gap, n = refractive index of glass)

- A) $\frac{1\lambda}{2n}$
- B) $\frac{1}{2}\lambda$
- C) $\frac{\lambda}{n}$
- D) λ



B

Clicker question 1

A diffraction pattern is observed when a laser beam is passed through a small slit. If the slit width is made smaller the diffraction pattern will _____.

- A. Not change
- B. Be wider
- C. Be narrower



B

Clicker question 2

If light with a shorter wavelength is used in the single slit diffraction experiment. The angle to the first minimum will be _____.

- A) increased
- B) decreased
- C) remain the same
- D) uncertain



B

Clicker question 3

Laser light with a wavelength of $0.5 \mu\text{m}$ is passed through a slit with a width $a = 0.5 \text{ mm}$ (1000 times larger than λ). The first minimum in the diffraction pattern seen on a wall far away will occur at an angle of about _____.

- A) 10^{-2} radian
- B) 10^{-3} radian
- C) 10^{-4} radian
- D) 10^{-5} radian

B

Clicker question 4

A laser beam is used to "read" the information on an optical disc. In order to get more information on the disc the wavelength of the laser should be _____.

- A. Larger
- B. Smaller
- C. It doesn't matter.

B

Clicker question 1

A star in the sky appears to be blue. The temperature of this star must be _____.

- A) higher than that of the sun
- B) lower than that of the sun
- C) equal to that of the sun
- D) about that of the earth

A

Clicker question 2

A light emitting diode can be a more efficient light source than an incandescent lamp because

- A. it is powered by electricity
- B. it does not use black body radiation
- C. it uses black body radiation
- D. it has a high temperature

B

Clicker question 3

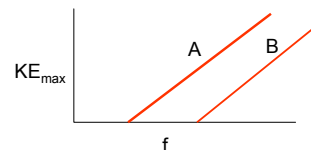
Photons with $\lambda = 250 \text{ nm}$ (5.0 eV) hit a metal surface and emit photoelectrons with a maximum KE of 1.0 eV . What is the work function of the metal?

- A) 1.0 eV
- B) 2.0 eV
- C) 3.0 eV
- D) 4.0 eV

D

Clicker question 4

In a photoelectric effect experiment the following data was obtained with two different metals.



Which metal has the larger work function?

- A) A
- B) B

B

Clicker question 1

An electron with an energy of 1000 eV has a de Broglie wavelength of 0.04 nm. If the speed of the electron is increased by 10 fold the wavelength will be _____.

- A. increased by a factor of 10
- B. decreased by a factor of 1/10
- C. increased by a factor of $\sqrt{10}$
- D. decreased by a factor of $1/\sqrt{10}$



B

Clicker question 2

An electron with an energy of 1000 eV has a de Broglie wavelength of 0.04 nm. If the energy is increased by 10 fold the wavelength will be _____.

- A. increased by a factor of 10
- B. decreased by a factor of 1/10
- C. decreased by a factor of 100
- D. decreased by a factor of $1/\sqrt{10}$



D

Clicker question 1

In the Bohr model of the hydrogen atom the lowest energy state of the electron has a circumference equal to _____ times the de Broglie wavelength of the electron

- A) $\frac{1}{2}$
- B) 1
- C) 2
- D) n



B

Clicker question 2

In the Bohr model of the hydrogen atom the photon emitted in the transition from the n=3 to n=1 state has an energy of _____ times 13.6 eV (E_0)

- A) 3/9
- B) 3/4
- C) 8/9
- D) 1



C

Clicker question 3

Suppose the rule for the orbital angular momentum quantum number is that l can have values from 0 to n. (instead of n-1) The number of electrons in the n=1 shell would be

- A. 2
- B. 6
- C. 8
- D. 10



C

Clicker question 4

The noble gas Kr has Z=36 and a outer electron configuration of $3d^{10}, 4s^2, 4p^6$. The next noble gas is Xe Z=54. The electrons to be added will be in the following subshells.

- A. 4d
- B. 4d 5s
- C. 4d 5s 5p
- D. 4d 5s 5p 5d



C

Clicker Question 1

Light from an incandescent lamp is not like laser light because it is _____.

- A. not monochromatic
- B. not collimated
- C. does not arise from stimulated emission
- D. all of the above



D

Clicker Question 2

The reason a laser beam is highly collimated is due to _____.

- A) a population inversion
- B) reflection from mirrors
- C) focusing by lenses
- D) atomic excitations



B

Clicker question 3

You are designing a diode laser with a shorter wavelength to read more information in a DVD. To do this you need to use a semiconductor_____.

- A. with a larger band gap
- B. with a smaller band gap
- C. with a smaller size
- D. with a larger size



A

Clicker question 4

In order to have the highest efficiency, a solar cell should have a band gap _____.

- A) as large as possible
- B) as small as possible
- C) close to the average photon energy for sunlight
- D) with any size



C

Clicker question 2

Suppose you had nuclei of $^{14}_6\text{C}$ and wanted to release energy by forming a new nucleus. How could this be done?

- A. by fusion
- B. by fission
- C. by separation of protons and neutrons
- D. it could not be done



A

Clicker question 3

The amount of ^{14}C in the atmosphere is relatively constant because it is generated by a nuclear reaction. When it is fixed by incorporation plant or animal material it decays with a half life of 5730 years. This can be used to determine the age of specimens.

Suppose an ancient bone is found in which the ratio of $^{14}\text{C}/^{12}\text{C}$ is 1/4 that found in the atmosphere.

About how old is the bone?

- A. 3000 years
- B. 6000 years
- C. 9000 years
- D. 12000 years



D

Clicker question 4

Two light nuclei come together and fuse forming a larger nucleus. The mass of the product nucleus is less than the mass of the original nuclei. In this reaction _____

- A. energy is released
- B. energy is taken up
- C. energy is unchanged



A