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4.1-010

If global warming, due to an increase in greenhouse gases, causes the albedo (reflectivity) of the planet to go down, the warming trend will be

(a) attenuated
(b) accentuated
(c) unaffected

4.1-110

The radiation coming from the Sun is now predominantly in the visible region. But when life started on Earth, the Sun was cooler than it is now. At that time, its radiation would have been stronger in the

(a) ultraviolet
(b) infrared
(c) x-ray region
(d) none of the above

4.1-120

A 40-second burst of γ-rays, from a huge explosion that occurred 12 billion years ago, was detected arriving at Earth on December 14, 1997. From 12 hours to 2 weeks later, a visible afterglow was detected in the same part of the sky. The best time to detect x-rays from this event would have been

(a) before the γ–rays

(b) from 0 – 12 hrs after the γ–rays

(c) from 12 hrs – 2 wks after the γ–rays

(d) more than 2 weeks after the γ–rays

4.1-210

UV radiation is more dangerous than visible radiation because

(a) UV has a longer wavelength
(b) UV has a higher frequency
(c) UV travels faster
(d) UV has a greater intensity

4.1-230

Conversion of violet radiation (800 nm) to x-ray radiation (32 nm) was reported in 1998. What is the minimum number of the violet photons needed to form one of the x-ray photons?

(a) 4
(b) 16
(c) 25
(d) 40

4.1-240

Which of the following metals is expected to have the smallest work function?

(a) Na
(b) Mg
(c) K
(d) Ca

4.1-250

A laser ejects electrons from a copper surface with a kinetic energy of 4×10^{-19} J. When the frequency of the laser is doubled, the kinetic energy of the released electrons will be

(a) doubled
(b) halved
(c) unaffected
(d) none of the above

4.1-260

Electrons ejected from the surface of an unknown metal have a higher velocity than electrons ejected from a tungsten surface by the same radiation. The work function of the unknown metal

(a) is greater than
(b) is less than
(c) has an unknown relationship to

that of tungsten.

4.1-270

When a chromium plate is irradiated with blue light, no electrons are released. To release electrons

(a) the intensity of the light should be increased
(b) red light should be tried
(c) either of the above
(d) neither of the above

4.1-310

Which of the following has the larger deBroglie wavelength?

(a) a 1 g red marble moving at 3 m s^{-1}
(b) a 5 g blue marble moving at 1 m s^{-1}

4.1-320

One electron is accelerated through 2000 volts and another through 8000 volts. The wavelength of the latter is

(a) 2 times (b) 1/2
(c) 4 times (d) 1/4

that of the former.

4.1-410

For a particle in a 1D box, in which of the following states is the probability of finding the particle in the center the smallest?

(a) $n = 1$ (b) $n = 2$ (c) $n = 3$

In which is there the greatest probability of finding the particle 1/4 of the way from either end?

4.1-510

The free electron corresponds to which state of a one-electron atom or ion?

(a) $n = -1$ (b) $n = 0$
(c) $n = +1$ (d) $n \rightarrow \infty$

4.1-520

The ground state energy of the H-atom is –13.60 eV. Which of the following is true?

(a) It takes 13.60 eV to dissociate the electron from a ground state H-atom

(b) At most 13.60 eV are lost when an electron binds to a proton to form a H-atom

(c) On this scale, the energy of a free electron is 0.

(d) all of the above

4.1-530

The energy required to remove the electron from a H-atom in its ground state is 13.60 eV. The energy required to remove the electron from a Li^{2+} ion in its ground state is

(a) 2 x 13.60 eV

(b) 3 x 13.60 eV

(c) 4 x 13.60 eV

(d) 9 x 13.60 eV

4.1-540

The ground state energy of a H-atom is –13.60 eV. The energy of the first excited state is

(a) - 2 x 13.60 eV

(b) - (1/2) x 13.60 eV

(c) - 4 x 13.60 eV

(d) - (1/4) x 13.60 eV

4.1-550

The ground state energy of a H-atom is –13.60 eV. The energy for excitation to its first excited state is

(a) (3/4) x 13.60 eV

(b) (1/4) x 13.60 eV

(c) (1/2) x 13.60 eV

(d) (1/3) x 13.60 eV

4.1-561

In a 1-electron atom or ion, how many times larger is the spacing between the energy levels with n=2 and n=3, than the spacing between the energy levels with n=3 and n=4?

(a) 16/9 (b) 7

(c) 20/7 (d) 16

4.1-562

In a 1-electron atom or ion, the wavelength of the radiation emitted in the n=3 to n=2 transition is

(a) 20/7 (b) 7/20

times the wavelength of the radiation emitted in the n=4 to n=3 transition.