Assignment 2 (1431642)

Question **12345678910111213141516171819202122232425262728293031323334353637383 9**

1. Question DetailsQuestion1 [1577490]
What is true of light whose frequency is less than $|\varphi_2-\varphi_1|$ when starting from the ground state?

- it can only be absorbed
- it can be either emitted or absorbed
- it can only be emitted
- matter will be transparent to light of this frequency

2. Question DetailsQuestion2 [1577493]
What is true of light whose frequency is equal to $|\varphi_2-\varphi_1|$ when starting from the ground state?

- it can be either emitted or absorbed
- it can only be emitted
- it can only be absorbed
- matter will be transparent to light of this frequency

3. Question DetailsQuestion3 [1577495]
When light of frequency equal to $|\varphi_2-\varphi_1|$ is absorbed, what happens to the amplitude of the light wave?

- it is not affected
- it goes down
- it goes up

4. Question DetailsChang10 7.EOCP.017. [1155652]
A photon has a frequency of 7.6×10^4 Hz.
(a) Convert this frequency into wavelength (nm).
4.0 ✓ 3.9e+12 nm
Does this frequency fall in the visible region?

- Yes
- No

(b) Calculate the energy (in joules) of this photon.
4.0 ✓ 5.0e-29 J

(c) Calculate the energy (in joules) of one mole of photons all with this frequency.
4.0 ✓ 3.0e-05 J

5. Question DetailsChang10 7.Supp.x.04. [1131958]
Observing definite energy amounts associated with specific wavelengths in the emission spectrum of hydrogen would lead one to believe that

- photons have a smaller rest mass than electrons.
- electrons have a smaller rest mass than photons.
- energy states in the hydrogen atom are quantized.
- the kinetic energy of electrons in the atom may only have certain values, while the potential energy is an arbitrary value.

6. Question DetailsChang10 7.PE.03. [1136933]
Practice Exercise 7.3

The energy of a photon is 5.61×10^{-20} J. What is its wavelength (in nanometers)?
4.0 ✓ 3550 nm

HINTS
I'm Stuck

7. Question DetailsChang10 7.Supp.1.07. [1132282]
Select the true statement among the ones presented below.

- Elements can be identified by their line spectra.
- Elements in the same family, when combined with oxygen, all have the same line spectra.
- Elements in the same family and in the same physical state all have the same line spectra.
- Elements in the same family all have the same line spectra.

---

8. Question DetailsChang9 7.EOCP.019. [707989]
When copper is bombarded with high-energy electrons, X rays are emitted. Calculate the energy associated with the photons if the wavelength of the X rays is 0.154 nm.
4.0 ✓ 1.29e-15 J

---

9. Question DetailsChang10 7.Supp.1.03. [1132553]
The frequency of an electromagnetic wave is the

- number of complete cycles or oscillations that occur over a distance of one centimeter.
- distance between successive maxima in any one cycle.
- number of complete cycles that occur over a one meter distance.
- number of complete cycles or oscillations that occur in a one second time interval.

---

10. Question DetailsChang10 7.Supp.1.04. [1133117]
From the following list of radiation types, select the one that has the longest wavelength.

- Ultraviolet rays
- Green visible light
- Gamma rays
- Red visible light

---

11. Question DetailsChang10 7.Supp.1.14. [1132499]
Which of the following listings starts with the lowest energy of electromagnetic radiation and increases to that which has the greatest energy?

- Microwave, infrared, visible, ultraviolet
- Visible, ultraviolet, infrared, gamma rays
- X-radiation, visible, infrared, microwave
- Radio, visible, infrared, ultraviolet

---

12. Question DetailsChang9 7.EOCP.1.02. [1049225]
(a) Calculate the frequency (in Hz) of an electromagnetic wave with a wavelength of 404 m.
4.0 ✓ 7.43e+05 Hz

(b) Calculate the frequency (in Hz) of an electromagnetic wave with a wavelength of 684 nm.
4.0 ✓ 4.39e+14 Hz

(c) Calculate the wavelength (in nm) of an electromagnetic wave with a frequency of 3.5×10^{17} Hz.
4.0 ✓ 0.86 nm

---

13. Question DetailsChang10 7.Supp.1.15. [1133196]
Which of the following listings starts with the shortest wavelength and increases to the longest wavelength of electromagnetic radiation?

- microwave, visible, infrared, gamma rays
- visible, X-rays, infrared, microwave
- ultraviolet, visible, infrared, microwave
- radio, infrared, visible, ultraviolet

---

14. Question DetailsChang10 7.Supp.1.02. [1132202]
If an infrared radiation has a wavelength of 6.5×10^{-4} cm, what would this wavelength be when expressed in Angstroms, Å?

- 3.2×10^{-4} Å
- 6.5×10^{4} Å
- 6.5×10^{-4} Å
- 4.6×10^{3} Å

---

15. Question DetailsChang10 7.Supp.1.05. [1132402]
What is the frequency of visible light having the wavelength of 464.1 nm?

- $139.1\ s^{-1}$
- $1.548 \times 10^{-15}\ s^{-1}$
- $6.460 \times 10^{5}\ s^{-1}$
- $6.460 \times 10^{14}\ s^{-1}$

---

16. Question DetailsChang10 7.Supp.1.10. [1133397]
You are watching a show on the cooking channel where a microwave oven is being used. For this particular oven the radiation has a wavelength of 12.0 cm. Calculate the energy of one photon coming from this oven.

- 1.66×10^{-24} J
- 2.64×10^{-26} J
- 1.66×10^{-32} J
- 1.66×10^{-26} J

---

17. Question DetailsChang10 7.TB.065. [1134502]
The frequency of the emitted light from a cesium atom is an *intensive* property.

- True
- False

---

18. Question DetailsChang10 7.EOCP.009. [1155755]
The average distance between Mars and Earth is about 1.3×10^{8} miles. How long would it take TV pictures transmitted from the *Viking* space vehicle on Mars' surface to reach Earth? (1 mile = 1.61 km.)

4.0 ✓ 7.0e+02 s

---

19. Question DetailsChang10 7.PE.05. [1137021]
Practice Exercise 7.5

Calculate the wavelength (in nanometers) of a H atom (mass = 1.674×10^{-27} kg) moving at 6.00×10^{2} cm/s.

4.0 ✓ 66.0 nm

HINTS
I'm Stuck

---

20. Question DetailsChang9 7.EOCP.039. [1046740]
Thermal neutrons are neutrons that move at speeds comparable to those of air molecules at room temperature. These neutrons are most effective in initiating a nuclear chain reaction among ^{235}U isotopes. Calculate the wavelength (in nm) associated with a beam of neutrons moving at 6.20×10^{2} m/s. (Mass of a neutron = 1.675×10^{-27} kg.)

4.0 ✓ 0.638 nm

---

21. Question DetailsChang10 7.TB.064. [1134741]
According to de Broglie's equation, the wavelength associated with the motion of a particle increases as the particle mass decreases.

- True
- False

---

22. Question DetailsChang10 7.Supp.1.06. [1132049]
What is the quantity of energy associated with one photon of light having a wavelength of 464.1 nm?

- 4.280×10^{-12} J
- 4.280×10^{-19} J
- 1.025×10^{-48} J
- 2.100×10^{35} J

---

23. Question DetailsChang10 7.Supp.x.06. [1132621]
If the mass of a neutron is 1.00865 a.m.u., calculate (using the de Broglie relation) the wavelength of a neutron which is moving with a speed of 4.505×10^{4} m/s.

- 8.781×10^{-15} m
- 2.632×10^{-3} m
- 8.781×10^{-12} m
- 4.372×10^{-30} m

---

24. Question DetailsLairdUChem1 1.EOCP.065. [941742]
How many photons at 660 nm must be absorbed to melt 5.0×10^{2} g of ice? (Hint: It takes 334 J to melt 1 g of ice at 0°C.)
4.0 ✓ 5.5e+23 photons
On average, how many H_2O molecules does one photon convert from ice to water?
4.0 ✓ 3.0e+01 molecules

---

25. Question DetailsChang10 7.Supp.x.07. [1133913]
If one mole of photons has a wavelength of 5.461×10^{2} mm, calculate its energy in joules.

- 2.437×10^{-12} J
- 1.376×10^{6} J
- 2.191×10^{-1} J
- 2.191×10^{5} J

---

26. Question DetailsChang10 7.Supp.x.08. [1132355]
What is the frequency, expressed in sec-1, for radiation that has an energy of 3.371×10^{-19} joules per photon?

- 1.697×10^{15} sec^{-1}
- 5.893×10^{-7} sec^{-1}
- 5.087×10^{14} sec^{-1}
- 1.966×10^{-15} sec^{-1}

---

27. Question DetailsChang10 7.TB.001. [1135256]
What is the wavelength of radiation that has a frequency of 6.912×10^{14} s^{-1}?

- 4.337×10^{2} nm
- 4.337×10^{-7} nm
- 1.447×10^{-15} nm
- 2.304×10^{6} nm
- 2.074×10^{23} nm

---

28. Question DetailsChang10 7.TB.003. [1134623]
Calculate the frequency of visible light having a wavelength of 486 nm.

- 2.06×10^{14} /s
- 2.06×10^{6} /s
- 1.20×10^{-15} /s
- 4.86×10^{-7} /s
- 6.17×10^{14} /s

29.

Question DetailsChang10 7.TB.006. [1134278]

is the energy in joules of a mole of photons associated with visible light of wavelength 486 nm?

- 6.46×10^{-16} J
- 6.46×10^{-25} J
- 246 kJ
- 12.4 kJ
- 2.46×10^{-4} J

---

30. Question DetailsChang10 7.TB.016. [1135335]

In an electron microscope, electrons are accelerated to great velocities. Calculate the wavelength of an electron traveling with a velocity of 7.0×10^{3} kilometers per second. The mass of an electron is 9.1×10^{-28} g.

- 1.0×10^{-13} m
- 1.0 m
- 1.0×10^{-10} m
- 1.0×10^{-7} m

---

31. Question DetailsChang10 7.TB.017. [1135075]

Calculate the wavelength associated with a $^{20}Ne^{+}$ ion moving at a velocity of 2.0×10^{5} m/s. The atomic mass of Ne-20 is 19.992 amu.

- 1.0×10^{-18} m
- 2.0×10^{-13} cm
- 1.0×10^{-13} m
- 1.0×10^{-16} m
- 9.7×10^{12} m

---

32. Question DetailsChang10 7.TB.018. [1135668]

Calculate the wavelength of a neutron that has a velocity of 200. cm/s. (The mass of a neutron = 1.675×10^{-27} kg.)

- 216 nm
- 1.8×10^{50} m
- 198 nm
- 5.05 mm
- 1.98×10^{-9} m

---

33. Question DetailsChang10 7.TB.020. [1134192]

The longest wavelength of light that causes electrons to be ejected from the surface of a copper plate is 243 nm. What is the maximum velocity of the electrons ejected when light of wavelength 200. nm shines on a copper plate?

- 4.67×10^{4} m/s
- 1.97×10^{4} m/s
- 1.48×10^{6} m/s
- 1.34×10^{6} m/s
- 6.22×10^{5} m/s

---

34. Question DetailsChang10 7.TB.022. [1135414]

Electrons can be used to probe the arrangement of atoms on a solid surface if the wavelength of the electrons is comparable with the spacing between the atoms. Which of the following electron velocities would be appropriate for use in this application if the atoms are separated by 0.320 nm?

- 3.00×10^{8} m/s
- 2.27×10^{6} m/s
- 8.06×10^{3} m/s
- 1.24×10^{3} m/s
- 4.41×10^{6} m/s

35. Question DetailsChang10 7.TB.023. [1134614]
A single pulse of a laser yields an average of 5.00 × 10^{18} photons with λ = 633 nm. If melting ice to water at 0°C requires 6.01 kJ/mol, what is the fewest number of laser pulses need to melt 10.0 g of ice?

- 3830
- 38300
- 212
- 3340
- 2120

36. Question DetailsLairdUChem1 1.EOCP.023. [941752]
Consider the following energy levels of a hypothetical atom.

E_4 _____ -1.0×10^{-19} J

E_3 _____ -5.0×10^{-19} J

E_2 _____ -10×10^{-19} J

E_1 _____ -15×10^{-19} J

(a) What is the wavelength of the photon needed to excite an electron from E_1 to E_4?
142 nm

(b) What is the energy (in joules) a photon must have in order to excite an electron from E_2 to E_3?
5.00e-19 J

(c) When an electron drops from the E_3 level to the E_1 level, the atom is said to undergo emission. Calculate the wavelength of the photon emitted in this process.
199 nm

37. Question DetailsChang10 7.TB.015. [1135301]
The second line of the Balmer series occurs at a wavelength of 486.1 nm. What is the energy difference between the initial and final levels of the hydrogen atom in this emission process?

- 4.09 × 10^{-22} J
- 2.44 × 10^{18} J
- 4.09 × 10^{-28} J
- 4.09 × 10^{-19} J
- 1.07 × 10^{-48} J

38. Question DetailsChang10 7.TB.014. [1135602]
Calculate the wavelength of the light emitted by a hydrogen atom during a transition of its electron from the n = 4 to the n = 1 principal energy level. Recall that for hydrogen E_n = -2.18 × 10^{-18} J($1/n^2$)

- 82.6 nm
- 365 nm
- 6.8 × 10^{-18} nm
- 97.3 nm
- 0.612 nm

39. Question DetailsChang10 7.TB.013. [1135763]
Calculate the frequency of the light emitted by a hydrogen atom during a transition of its electron from the n = 4 to the n = 1 principal energy level. Recall that for hydrogen E_n = -2.18 × 10^{-18} J($1/n^2$)

- 2.06 × 10^{14} /s
- 1.03 × 10^{8} /s
- 3.08 × 10^{15} /s
- 1.35 × 10^{-51} /s
- 8.22 × 10^{14} /s

Assignment Details

Submissions Allowed: **5**

Category: **Homework**

Code:

Locked: **Yes**

Author: **Hammond, Nicholas (** hmnd@bu.edu **)**

Last Saved: **Sep 29, 2010 07:18 PM EDT**

Permission: **Protected**

Randomization: **Person**

Which graded: **Last**

Feedback Settings

Before due date	**After due date**
Question Score	Question Score
Assignment Score	Assignment Score
Publish Essay Scores	Publish Essay Scores
Question Part Score	Key
Mark	Question Part Score
Add Practice Button	Solution
Help/Hints	Mark
Response	Add Practice Button
Save Work	Help/Hints
	Response