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| CHEM 3322: Physical Chemistry II | Jonathan Riezman |
| Assignment 1 Part A | 1/31/21 |

1a) 3.3708567 x 10-19 J

b) 5.9332098 x 1020 photons

2a) 7.4245799 x 10-19

b) 4.6340583 eV

3) 3.38945138 m/s

4) Consider a blackbody radiator at temperature T. We know the energy density, is given by

Let then we have and then Substituting these formulae into the original equation we arrive at

where

is a constant. Therefore the energy depends on temperature as T4.

5a) 5.2728591 x 10-26 J

b) 3.17538996 x10-2 J·mol-1

6a) 6329.9109 Å

b) 15798.011 cm-1

c) 299709770 m/s

7a) For X-Rays of wavelength 3.00 x 10-10 m (3.00 Å) incident at an angle of 90° = radians the change in wavelength is described by the equation so the final wavelength of the scattered X-Rays is

b) The initial energy of the incoming X-Ray photon is given by by the same relation we know that the final energy of the scattered photon is and because energy is conserved (even if momentum is not because this is an inelastic collision) we know that the energy lost by the scattered X-Ray photon will be equal to the kinetic energy gained by the scattered electron. Thus we have which is equal to

8a) 20564.546 cm-1

b) 257.26841 cm-1

c) 27419.396 cm-1

d) 109677.5834028 cm-1

e) The Lyman series.