**PHYS 232 Assignment # 2 Due Monday 2/3/2020**

**Name:**

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| --- | --- | --- | --- | --- | --- | --- |
| 1a | 1b | 1c | 1d | 1e | ترتيب | Total |
| 20 | 20 | 10 | 20 | 20 | 10 | 100 |
|  |  |  |  |  |  |  |

1. Assume the Sun is an ideal blackbody radiator at a temperature of 6000 K. Part of sunlight is emitted as ultraviolet (UV) and X-rays.

1. What is the wavelength range of UV and X-rays? Give a scientifically reliable reference for your answer (NOT from the internet). Document the reference correctly (see below). (20%)

The ranges may vary slightly from one reference to another. In the following calculation use 3 nm < λ < 400 nm for UV rays and 3 pm < λ < 3 nm for X-rays.

1. Integrate Wien’s exponential law to estimate the percentage of power in sunlight that is emitted as UV + X-rays. (20%)

1. Give a quantitative explanation why we can use Wien’s exponential law instead of the exact Planck formula in (b) above.

(10%)

1. Actually the ozone layer in the Earth’s atmosphere absorbs all X-rays and also absorbs UV-rays with wavelengths less than 300 nm so the percentage of power in sunlight reaching the Earth as UV + X-rays is only 10%. Assume sunlight falls on a metallic surface on Earth that has a work function such that all ultraviolet rays can eject electrons. Assume also that the metallic surface reflects 95% of the energy and that the average wavelength of ultraviolet light reaching the Earth is 350 nm. Calculate the photocurrent that results if the metallic surface has an area of 1 cm2.

(20%)

1. What is the work function and threshold frequency for the metal in part (d) above?

(20%)

**How to document references**

If the reference is a book you must give:

Author name(s), Book name (Publisher, Place of publication, Year of publication)

For example:

R.M. Dreizler and E.K.U. Gross, Density functional theory (Springer, Berlin, 1990).

If the reference is an article in a journal you must give:

Author name(s), Journal name Volume (Year of publication) first page-last page

For example:

R.N. Schmid, E. Engel and R.M. Dreizler, Physical Review C 52 (1995) 164-169

**10%** for good hand-writing and clear and well-organized solutions.

**You are expected to work alone. Academic honesty is very important. Cheating will make you lose grades.**