21002: Quantum Mechanics and Applications

2014-15 First Semester (July – November 2014)

Quiz 1

Name: _____ Roll No. _____

Date: 08/08/2014 Time: 20 min. Total points: 8

1. Light of wavelength 600 nm is incident on Potassium metal surface. The workfunction of Potassium is 2.3 eV. Calculate the kinetic energy of emitted electrons. (2 points)

2. Calculate the de Broglie wavelength of an electron accelerated by 10 kV potential. (2 points)

3. Is the following statement true or false? Justify your answer. (2 points)
   For all quantum mechanical states, $|\Psi(x,t)|^2 = |\psi(x)|^2$.

4. Classify the following as linear or non-linear operators. (2 points)
   (a) $4x\frac{d}{dx}$ (b) $(\quad)^3$ (c) $e^{(\quad)}$ (d) $\int \quad dx$

Useful data

Speed of light, $c = 3.0 \times 10^8$ ms^{-1}

Planck's constant, $h = 6.626 \times 10^{-34}$ Js

Mass of electron, $m_e = 9.109 \times 10^{-31}$ kg

1 eV = 1.602×10^{-19} J

Charge on electron, $e = 1.602 \times 10^{-19}$ C

`Rydberg Constant = 1.097373157×10^7 m^{-1}