Physics II
Set no. 6

1. What is the value of de Broglie wavelength in the case of an electron with kinetic energy 120 eV ?

2. The missile of a mass 40g is moving at a speed of 1000 m/s. What is the value of de Broglie wavelength corresponding to this missile ?

3. The speed of an electron moving along X axis, measured with precision of 5%, equals to $2.05 \cdot 10^6$ m/s. What is the minimal value of position uncertainty if we want to measure it simultaneously ?

4. The wavelength of sodium D line (sodium doublet) is 590 nm. What should be the value of electron's kinetic energy if its de Broglie wavelength equals to the one emitted by sodium ?

5. Let's imagine the baseball game in a different universe where Planck's constant equals to 0.60 J·s. What is the position uncertainty of a ball which weights 0.5 kg and moves at a speed of 20 m/s along X axis if the speed uncertainty is 1 m/s ?

6. The position uncertainty of an electron in a given state is $5 \cdot 10^{-10}$ m. What is the corresponding momentum uncertainty in this state ?

7. What is the momentum and de Broglie wavelength of a proton accelerated in an electric field with the voltage 50 kV (assume that at the beginning the proton is not moving).

8. Proton and α particle are moving in a vacuum with the same speed. What is the relation between de Broglie wavelengths which correspond to these two particles ?

9. The mass of a proton is about 1840 times larger than the electron's mass. If both particles are accelerated by the electric field to the same speed, then de Broglie wavelength:
a) takes the same value for both particles
b) is larger for proton
c) is smaller for electron
d) is smaller for proton

10. The smallest energy of a light flux that human eye reacts to is 0.8·10−17 J. At the same time the human eye is the most sensitive to green light (λ = 555 nm). What is the number of green light photons which correspond to the boundary of eye's sensitivity ?

11. The energy of a photon with the wavelength λ is equal to E in a vacuum. Please calculate the energy of another photon with the same wavelength λ in the environment with refractive index n.