

King Fahd University of Petroleum & Minerals
Physics Department
Phys212- Quiz#3

Name:

Key

ID#:

1. The work function of some metals is listed below. Indicate which metals will show photoelectric effect when light of 300 nm wavelength falls on them.

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
Φ (in eV)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

$$E = \frac{hc}{\lambda} = \frac{1240 \text{ eV}\cdot\text{nm}}{300 \text{ nm}} = 4.13 \text{ eV}$$

Any metal with $\phi < 4.13 \text{ eV}$ will work: Li, Na, K, and Mg only.

2. Consider tungsten (W) metal.

- What is the longest light wavelength that can result in production of a photocurrent?
- What is the maximum kinetic energy of emitted electrons when light of wavelength $\lambda = 200 \text{ nm}$ is used to irradiate a piece of W?
- What is the stopping potential (voltage) for this case ($\lambda = 200 \text{ nm}$)?

a) $K_{\max} = hf - \phi$ λ_0 is when $K_{\max} = 0$

$$\Rightarrow hf_0 = \phi \Rightarrow f_0 = \frac{\phi}{h} = \frac{c}{\lambda_0} \Rightarrow \lambda_0 = \frac{hc}{\phi}$$

$$\lambda_0 = \frac{1240 \text{ eV}\cdot\text{nm}}{4.75 \text{ eV}} = \boxed{261 \text{ nm}}$$

b) $K_{\max} = hf - \phi = \frac{hc}{\lambda} - \phi = \frac{1240 \text{ eV}\cdot\text{nm}}{200 \text{ nm}} - 4.75 = \boxed{1.45 \text{ eV}}$

c) $V_s = \frac{K_{\max}}{e} = \boxed{1.45 \text{ V}}$