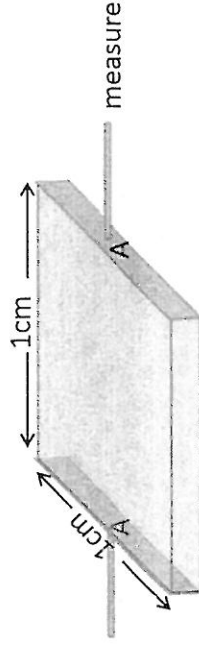


1. Semiconductor
(1). List 5 kinds of semiconducting materials (5%) _____
(2). What is the definition of a semiconductor (10%) _____
(3). Which of the following statements are correct? (multiple choice) (5%) _____
(A). the conductivity of most semiconductors increase with increasing temperature
(B). the conductivity of most metal increases with increasing temperature
(4). How does temperature affect the mobility of most semiconductors? (include the effects of lattice and dopants) (5%) _____
(light)
2. (1). There is a green light laser which emits 532nm photon, what is the energy of each photon in the unit of electronvolt(eV)? _____ eV (10%)
(2). Given $1\text{eV}=1.6 \times 10^{-19}$ Joule, 1 Watt= 1 J/s. How many photons do we expect from a 100 mW green light (532nm) laser within 1 second? _____. (5%)
3. When measuring across the whole width of a $1 \times 1 \text{ cm}^2$ wafer, thickness of $500 \mu\text{m}$, one measures resistance as 1 ohm, what would be the resistivity of this wafer? $\rho = \text{_____} (\Omega \text{ cm})$ (10%)
(We assume that both electrodes (label as A in the figure) are Ohmic contact to the wafer)



- (25%) 4. Explain the following items:
(a) Air mass one (AM1) in solar radiation.
(b) PIN photodiode.
(c) Continuity equation.
(d) The Bridgman technique for crystal growth.
(e) In wafer shaping, what are the purposes for primary flat and secondary flat, respectively?
- (25%) 5. (a) Plot the energy band diagram and charge distributions of an ideal MOS diode in (i) Accumulation, (ii) Depletion, and (iii) Inversion conditions.
(b) Discuss the two possible sources of breakdown in a transistor as the collector-to-emitter voltage is increases.