1. (a) ~ 90 GPa; (b) 350 GPa; (c) 530 GPa; (d) 0.062 in strain after fracture (after unloading from the end point);
   (e) transverse train, by diametrical extensometer;
   (f) plot plastic strain vs stress in log-log scale, and the slope gives the exponent;
   (g) compute the area under the diagram by integration;
   (h) ~ 0.03;
   (i) 515 MPa. Work hardening.

2. (a) Above 650°C, single liquid phase; between 580°C and 650°C, liquid phase and α-phase; between 500°C and 580°C, single α-phase; below 500°C, α and θ phases.
   (b) About 96% α-phase (2% Cu) and 4% θ-phase (52% Cu).
   (c) Slow cooling forms large precipitates with large spacing, medium cooling forms small precipitates with close spacing, and fast cooling forms supersaturated solid solution with no precipitates. Medium cooling results in highest strength due to precipitate hardening, slow cooling is next, and fast cooling results in lowest strength because of limited solution hardening.
   (d) Quench from solid solution phase, reheat to an intermediate temperature (~150°C) for a long period. During aging, θ-phase precipitates out and strengthen the alloy.

3. (a) First stage: primary creep, decreasing creep rate; second stage: steady-state creep, constant creep rate; third stage: tertiary creep, increasing creep rate;
   (b) Measure steady-state creep rate at (1) constant temperature but different stress to determine n and (2) constant stress but different temperature to determine Q. Combine them to determine A. At least three experiments: (T₁, σ₁), (T₁, σ₂), and (T₂, σ₁);
   (c) 10784 K-hr;
   (d) 20 hours at 1000°C, and forever at 25°C.

4. (a) \( \sigma = E \varepsilon + \eta \frac{d\varepsilon}{dt} \);
   (b) \( D_c = \frac{1}{E} (1 - e^{-t\varepsilon/\eta}) \);
   (c) 69 secs;
   (d) The relaxation modulus is E (constant, no relaxation);
   (e) Thermoplastics: linear polymers, no cross linked chains; thermosets: network polymers, heavily cross-linked; elastomers: almost-linear polymers, with occasional cross links. Thermosets are closest to the Kelvin model.