## p5

### Code

import numpy as np  
   
 force = np.array([11, 7, 8, 10, 9])  
 k = np.array([1000, 600, 900, 1300, 700])  
   
 x = force / k  
 energy = k \* x\*\*2  
   
 a = [round(float(val), 6) for val in x]  
 b = [round(float(val), 6) for val in energy]  
   
 print("(a) Compressions / m:", a)  
 print("(b) Potential Energies / J:", b)

### Output

(a) Compressions / m: [0.011, 0.011667, 0.008889, 0.007692, 0.012857]  
(b) Potential Energies / J: [0.121, 0.081667, 0.071111, 0.076923, 0.115714]

## p6

### Code

import numpy as np
  
import matplotlib.pyplot as plt
  
  
k0 = 1200 # min^-1
  
Q = 8000 # cal/mol
  
R = 1.987 # cal/(mol·K)
  
  
temperatures = np.arange(100, 501, 50)
  
  
k\_values = k0 \* np.exp(-Q / (R \* temperatures))
  
  
plt.figure(figsize=(10, 6))
  
plt.plot(temperatures, k\_values, 'bo-', linewidth=2, markersize=8)
  
plt.title('Reaction Rate Constant vs Temperature')
  
plt.xlabel('Temperature (K)')
  
plt.ylabel('Rate Constant k (min⁻¹)')
  
plt.grid(True, linestyle='--', alpha=0.7)
  
plt.yscale('log')
  
plt.tight\_layout()
  
  
plt.show()

### Output:

