Assignment 5

Due on 2020-03-04, 23:59 IST.

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

1) Which one of the following has lowest energy? 1 point
   (a) Na(1s)  
   (b) Na(2s)  
   (c) Na(2p)  
   (d) Li

   No, the answer is incorrect.  
   Accepted Answer:  
   (b) Na(2s)

2) In a simple harmonic oscillator system if we increase the force constant which of the following will happen? 1 point
   (a) The band will be weaker, potential energy will be higher  
   (b) The band will be stronger, potential energy will be lower  
   (c) The band will be unchanged, potential energy will be the same  
   (d) The band will be stronger, potential energy will be higher

   No, the answer is incorrect.  
   Accepted Answer:  
   (d) The band will be stronger, potential energy will be higher

3) If we change the nuclear mass of a simple harmonic oscillator from m to 4m what will happen to the fundamental vibrational frequency? 1 point
   (a) Increase by 4 times  
   (b) Decrease by 4 times  
   (c) Decrease by 1.7 times  
   (d) Decrease by 2 times

   No, the answer is incorrect.  
   Accepted Answer:  
   (b) Decrease by 4 times

4) Identify the correct statement corresponding to simple harmonic oscillations (v = vibrational quantum number) 1 point
   (a) Energy gap between v = 5 and v = 6 is more than v = 6 and v = 7  
   (b) Energy gap between v = 3 and v = 4 is less than v = 4 and v = 5  
   (c) Energy gap between v = 3 and v = 4 and v = 5 and v = 6 is the same  
   (d) None of the above is true

   No, the answer is incorrect.  
   Accepted Answer:  
   (c) Energy gap between v = 3 and v = 4 and v = 5 and v = 6 is the same

5) Identify the correct statement corresponding to an anharmonic oscillator (v = vibrational quantum number) 1 point
   (a) Energy gap between v = 5 and v = 6 is more than v = 6 and v = 7  
   (b) Energy gap between v = 3 and v = 4 is less than v = 4 and v = 5  
   (c) Energy gap between v = 3 and v = 4 and v = 5 and v = 6 are the same  
   (d) None of the above is true

   No, the answer is incorrect.  
   Accepted Answer:  
   (b) Energy gap between v = 3 and v = 4 is less than v = 4 and v = 5

6) Identify the correct statement 1 point
   (a) First overtone = 3v + 2 and second overtone = 3v + 3  
   (b) First overtone = 3v + 2 and second overtone = 3v + 2  
   (c) First overtone = 3v + 2 and second overtone = 3v + 5  
   (d) None of the above

   No, the answer is incorrect.  
   Accepted Answer:  
   (a) First overtone = 3v + 2 and second overtone = 3v + 3

7) If the fundamental vibrational frequency is at 3000 cm⁻¹, the first overtone will occur at 1 point
   (a) 1200 cm⁻¹  
   (b) 3000 cm⁻¹  
   (c) Less than 3000 cm⁻¹  
   (d) More than 3000 cm⁻¹

   No, the answer is incorrect.  
   Accepted Answer:  
   (c) Less than 3000 cm⁻¹

8) With increase in temperature 1 point
   (a) Intensity of hot band will increase, intensity of overtone decreases  
   (b) Intensity of hot band will decrease, intensity of overtone increases  
   (c) Intensity of cold band will increase  
   (d) Intensity of cold band will decrease

   No, the answer is incorrect.  
   Accepted Answer:  
   (a) Intensity of hot band will increase, intensity of overtone decreases

9) Aldehyde A and B has following properties, identify the ratio of fundamental vibrational frequency (νA/νB): 1 point
   (a) νA = 1600 cm⁻¹, νB = 1610 cm⁻¹  
   (b) νA = 1600 cm⁻¹, νB = 1620 cm⁻¹  
   (c) νA = 1600 cm⁻¹, νB = 1640 cm⁻¹  
   (d) νA = 1600 cm⁻¹, νB = 1700 cm⁻¹

   No, the answer is incorrect.  
   Accepted Answer:  
   (b) νA = 1600 cm⁻¹, νB = 1620 cm⁻¹

10) Which of the following molecules has linear molecule and maximum dipole moment 1 point
   (a) CO2, N2O  
   (b) CO2, N2O, NO2  
   (c) CO2, N2O, NO2, NO  
   (d) None of the above

   No, the answer is incorrect.  
   Accepted Answer:  
   (c) CO2, N2O, NO2, NO