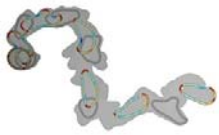
Physics 131- Fundamentals of Physics for Biologists I



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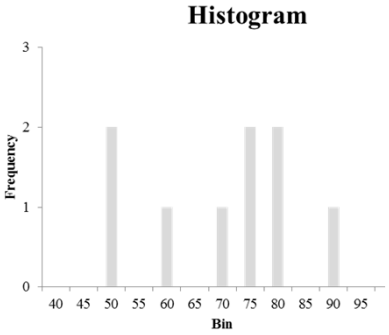
11/12/2012

- **Office hours this week in course center Thursday 9am-10am**
- **Midterm 2**

Midterm 2



A 75
B 60
C 45
D 35

		1	2	3	4	5	1.1	1.2	1.3	1.4	1.5
Average	68.6	15.6	19.4	9.4	9.0	15.1					
Standard Deviation	13.9	5.3	7.8	1.8	1.5	7.1					
Out of	100	25	25	15	10	25	R	R	R	<	<

Principles for #1

- Coulomb's law (as a vector)

$$\vec{F}_{A\to B} = \frac{k_c Q_A Q_B}{r_{AB}^2}\hat{r}_{A\to B}$$

- Geometry – Pythagorean theorem
- Addition of force vectors
  - Add all the forces in each direction

Principles for #2

- As a result of random motion, an initially localized distribution will spread out, getting wider and wider. This phenomenon is called *diffusion*
- The width of the distribution will grow like, i.e. the signal covers twice the distance in four times the time

$$\left\langle \left(\Delta x\right)^2 \right\rangle = 2Dt$$

- If there is signal relay, the signal can cover twice the distance in twice the time!

Principles for #3

- Force due to pressure of surrounding air

$$\vec{F} = p\vec{A}$$

- from experience and measurements on the pictures.
  - Estimation of size (of feet)
  - Estimation of weight (of gecko)
- Balance of forces and N2.

Sample essay

Kenny and Jesse can compromise, because although Kenny makes a good point that random motion suggests equal probability to move in any direction, Jesse's comment that we can look close enough to observe Newton's principles still applies. The catch with random motion is that we cannot use Newtons laws to PREDICT the future positions of a molecule because they move so fast (change direction very quickly) and their interactions – angles that one molecule hits another – are unpredictable.

Thus Kenny and Jesse can combine to say: In a hypothetical situation, if we observe two particles interact, we can measure their forces onto each other through collisions, but it willb e much more difficult to view their interactions on a wide scale. And it would be close to impossible to predict the position of each molecule and interaction down the road.

Principles for #5

- Momentum defined by $\vec{p} = m\vec{v}$
- If two objects interact with each other in such a way that the external forces on the pair cancel, then momentum is conserved.

$$\Delta\left(m_A\vec{v}_A + m_B\vec{v}_B\right) = 0$$

$$m_A\vec{v}_A^{\,i} + m_B\vec{v}_B^{\,i} = m_A\vec{v}_A^{\,f} + m_B\vec{v}_B^{\,f}$$

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