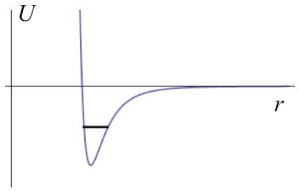
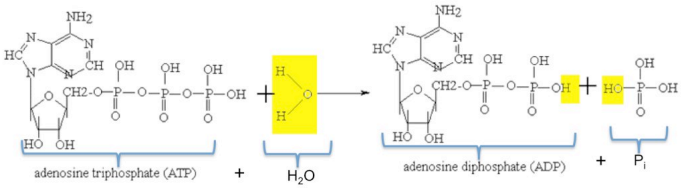
NAME_____ **POINTS**_____

Physics 132 **Dr. E. F. Redish**
Spring 2012 **Exam 1**

4. (10 points) Two students discussing the process of ATP hydrolysis (ATP + H_2O → ADP + P_i) make the following comments: **Justin**: "The O-P bond in ATP is called a 'high-energy bond' because the energy *released* when ATP is hydrolyzed is large. That released energy can be used to do useful things in the body that require energy, like making a muscle contract." **Kim**: "I thought chemical bonds like the O-P bond in ATP could be modeled by a potential energy curve like this (she draws the picture at the right), where *r* is the distance between the O and the P. If that's the case, then breaking the O-P bond in ATP would require me to *input* energy. I might not have to input *much* energy to break it, if that O-P happens to be a weak bond, but shouldn't I have to input at least *some* energy?" How did Kim infer from the PE graph that breaking the O-P bond requires an input of energy? Who's right? Or can you reconcile their statements? (The chemical structures of this process are given if you find that useful.) *Note: This is an essay question. Your answer will be judged not solely on its correctness, but for its depth, coherence, and clarity.*





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