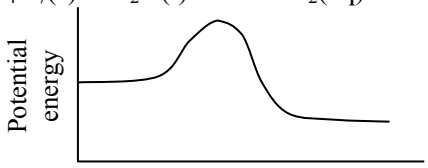
Review: Energy Changes (5), Rates of Reaction (18), Nuclear chemistry (23)

The test

- You will be given a $\Delta H°_f$ table on the test along with a detailed periodic table.
- The format will be similar to past tests with about 20 marks from written questions (mostly covering chapter 5 and 23 material) and 30 from multiple choice questions (mostly covering chapter 18 material).
- Because the end of the chapters tend to tie concepts together, there will be a focus on these concepts/sections.

Review questions

1. Label each example as exothermic or endothermic
   a) $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$ $\Delta H°= -243$ kJ
   b) $H_2B_4O_7(s) \rightarrow B_2O_3(s) + H_2O(l)$ $\Delta H°= 17.5$ kJ
   c) The temperature of water in a calorimeter increases, thus the reaction of the sample in the calorimeter is _____
   d) $H_2B_4O_7(s) + H_2O(l) \rightarrow 4HBO_2(aq) + 11.3$ kJ
   e)



2. 10 grams of CH_4 are burned in oxygen. The 500 grams of water in the calorimeter increases in temperature from 22.0°C to 22.4°C. Calculate the heat of combustion of CH_4 in kJ/mol.
3. Write the complete thermochemical equation for the $\Delta H°_f$ of $Na_2CO_3(s)$
4. Calculate $\Delta H°$ for the reaction $2N_2(g) + 5O_2(g) \rightarrow 2N_2O_5(g)$, given:
   $H_2(g) + ½O_2(g) \rightarrow H_2O(l)$ $\Delta H°= -285.8$ kJ
   $N_2O_5(g) + H_2O(l) \rightarrow 2HNO_3(l)$ $\Delta H°= -76.6$ kJ
   $½N_2(g) + 1½O_2 + ½H_2(g) \rightarrow HNO_3(l)$ $\Delta H°= -174.1$ kJ
5. Determine $\Delta H°$ for the following reaction: $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + H_2O(g) + CO_2(g)$
6. Draw the enthalpy diagram for the reaction: $N_2(g) + 2O_2(g) \rightarrow N_2O_4(g)$ $\Delta H° = 9.67$ kJ
7. Draw the enthalpy diagram for the two-step formation of N_2O_4 if N_2O is an intermediate step. Look up relevant $\Delta H°$ values in your textbook (pg. 169).
8. What differences are there between M-B, Ek, and Ep diagrams (e.g. how do the axes differ)?
9. Draw a M-B (kinetic energy) diagram and show what would happen upon the addition of a catalyst.
10. Draw a Ep (potential energy) diagram.
    a) indicate where the activated complex forms
    b) label the Ea (for both forward and reverse reactions) and the $\Delta H°$ for the reaction
    c) indicate what would happen upon the addition of a catalyst
    d) where on the graph would the fastest moving molecules be found. Explain.
11. Why are chemical reactions usually carried out in solution?
12. List the five factors that affect reaction rate. Explain each with reference to the collision theory.
13. Distinguish between fusion, fission, and radiation.
14. Write the typical nuclear equations associated with Th-228, Pb-202, ^{140}Ba, ^{18}F

Additional practice:

Topic	Page	Questions
q=cmΔT, calorimetry	174	5.38, 5.39, (5.40), 5.41
Standard heats of formation	169	5.66, (practice using compounds from table 5.2)
Hess's Law (adding equations) Enthalpy diagrams	176	Use either Hess's law and/or enthalpy diagrams to solve any of these: 5.59, 5.61, 5.63 (5.60, 5.62)
Hess's Law equation	177	(5.67), 5.68, (5.69), 5.70
Measuring reaction rates	771	18.19, 18.21
Temperature and reaction rate	773	(18.65 – 18.68)
Catalysts	774	(18.92 – 18.94)
Nuclear equations	1001	23.23, 23.25, 23.27 (if you haven't tried them yet)