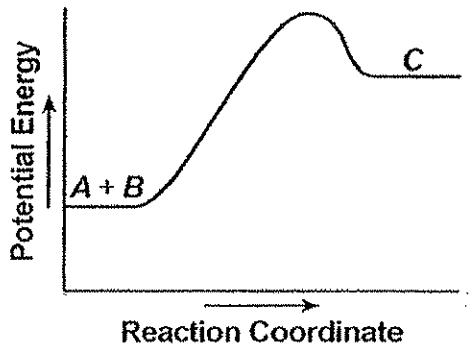
REGENTS CHEMISTRY Kinetics & Equilibrium Practice (2) Name DOLGOS

Version ____ Period ____

1. D
2. C
3. B
4. C
5. B
6. B
7. C
8. D
9. D
10. B
11. D
12. B
13. D
14. B
15. B
16. D
17. C
18. B
19. B
20. B

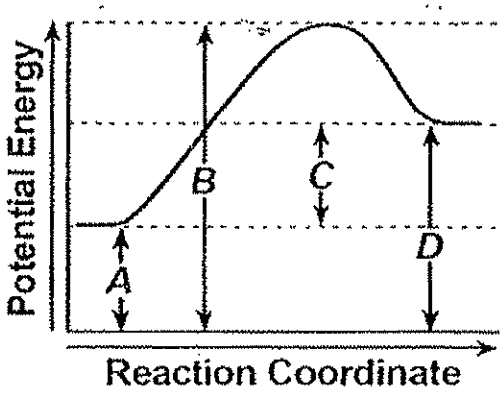
The diagram below represents the changes in potential energy that occur during the given reaction: $A + B \rightarrow C$.



21. Does the diagram illustrate an exothermic or an endothermic reaction? [State one reason, in terms of energy, to support your answer.]

Endothermic => PE products higher than PE reactants

22. On the diagram above, draw a dashed line to indicate a potential energy curve for the reaction if a catalyst is added.



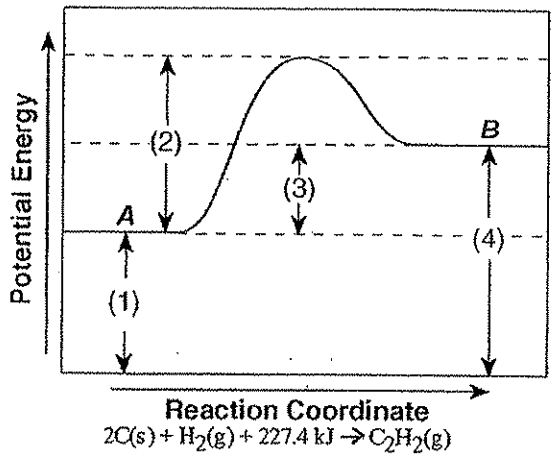
23. Which lettered interval on the given diagram represents the potential energy of the products? D

24. Which lettered interval on the given diagram represents the heat of reaction? C

25. Identify a reactant listed in Table I that could be mixed with water for use in a chemical cold pack.

NH_4NO_3, KNO_3 (possibly NH_4Cl) (find biggest $+\Delta H$)

H_2O

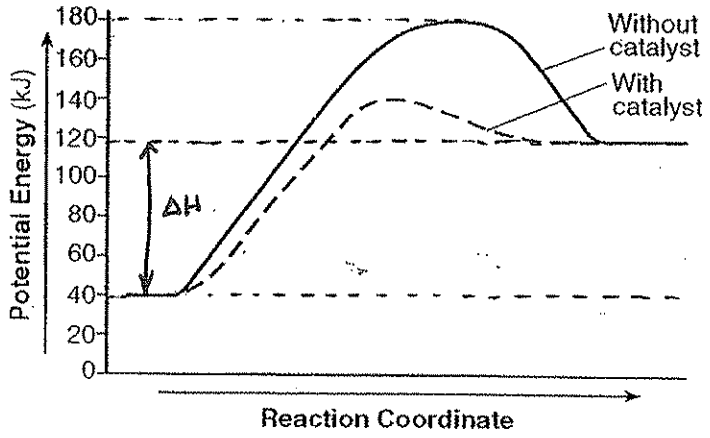


$2C(s) + H_2(g) + 227.4\ kJ \rightarrow C_2H_2(g)$

26. The letter *B* in the diagram represents which chemical formula or formulas in the equation? $C_2H_2(g)$

27. Based on the given information, how many moles of $C_2H_2(g)$ are produced if 682.2 kilojoules are absorbed?

$682.2 \div 227.4 = 3$ $\quad 1 \times 3 =$ **3 moles**



28. What is the heat of reaction for the forward reaction in the potential energy diagram shown? $120 - 40 =$ **80 kJ** $\quad (78-80)$

29. What is the activation energy for the forward reaction with the catalyst in the potential energy diagram shown?

$180 - 40 =$ **140 kJ**

30. Given the balanced equation for an organic reaction between butane and chlorine that takes place at 300°C and 101.3 kilopascals:

$$C_4H_{10} + Cl_2 \rightarrow C_4H_9Cl + HCl$$

Explain, in terms of collision theory, why the rate of the reaction shown would *decrease* if the temperature of the reaction mixture was lowered to 200°C with pressure remaining unchanged.

Lower temp. means slower moving particles w/ less energy which means fewer effective collisions.

31. Given the equation for the dissolving of sodium chloride in water:

$$NaCl(s) \xrightarrow{H_2O} Na^+(aq) + Cl^-(aq)$$

Describe what happens to entropy during the dissolving process shown.

Entropy increases (+ ΔS)

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g) + \text{energy}$$

32. Explain, in terms of Le Chatelier's principle, why the concentration of $SO_2(g)$ in the given equation increases when the temperature is increased.

Temp. ↑ means adding heat. Since heat is a product, the system will shift toward reactants (to the left)

33. Explain, in terms of collisions between molecules, why increasing the concentration of $O_2(g)$ in the equation shown produces a decreases in the concentration of $SO_2(g)$.

More O_2 particles means more collisions which increases the probability of getting effective collisions.

$$2NO_2(g) + 7H_2(g) \rightarrow 2NH_3(g) + 4H_2O(g) + 1{,}127\ kJ$$

34. Explain, in terms of Le Chatelier's principle, why the concentration of $NH_3(g)$ decreases when the temperature of the equilibrium system shown increases.

Increasing heat causes the sys. to shift left which means NH_3 gets used up.

$$2NO_2(g) \rightarrow N_2O_4(g) + 55.3\ kJ$$

35. Explain, in terms of Le Chatelier's principle, why the equilibrium shifts to the right to relieve the stress when pressure on the system shown is increased at constant temperature.

Increasing pressure causes the sys. to shift in direction of fewest moles of (g). 9 moles (g) on left vs. 6 moles (g) on right.