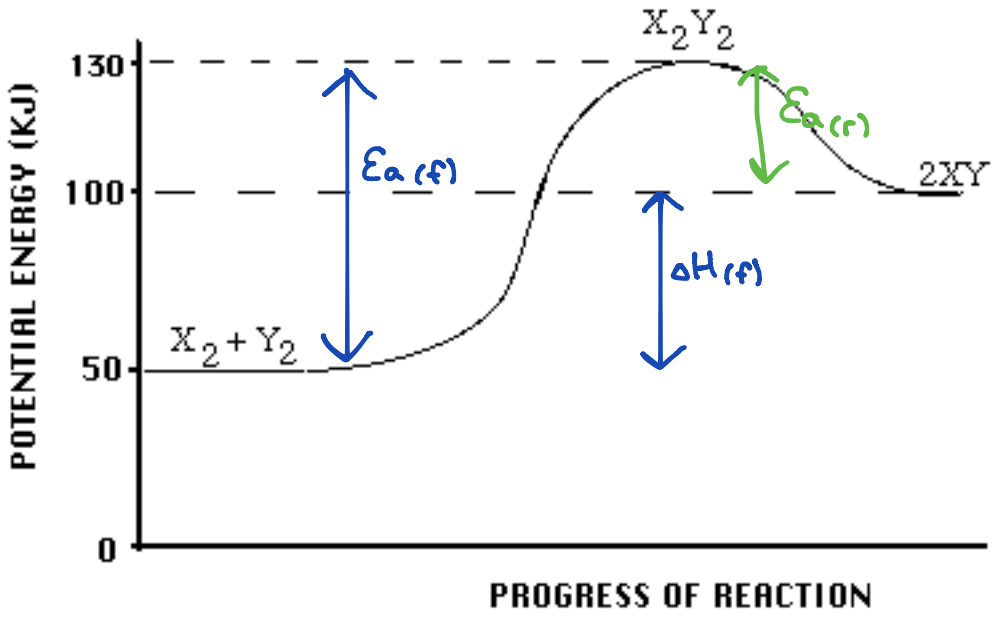
Chemistry 12

Potential Energy Diagrams Worksheet

Name: Key
Date:
Block:

USE THE **POTENTIAL ENERGY DIAGRAM** TO ANSWER THE QUESTIONS BELOW:



1. Is the overall reaction as shown **exothermic** or **endothermic**?

   endothermic

2. What is the **activation energy** for the forward reaction?

   130 - 50 = +80 kJ

3. What is the **activation energy** for the reverse reaction?

   130 - 100 = +30 kJ

4. What is the **enthalpy change of reaction** (ΔH) for the *forward* reaction?

   100 - 50 = +50 kJ

5. What is the **ΔH** for the *reverse* reaction?

   50 - 100 = - 50 kJ

6. Is the ***reverse*** reaction **exothermic** or **endothermic**?

   exothermic

7. Which species forms the ***activated complex***?

   X_2Y_2

8. Which species or set of species has the *highest* **potential energy**?

   X_2Y_2

9. Which species or set of species has the *highest* **kinetic energy**? (lowest P.E.)

   $X_2 + Y_2$

10. Which species or set of species has the ***weakest*** **bonds**? (highest P.E.)

    X_2Y_2

11. Which species or set of species has the ***strongest*** **bonds**? (lowest P.E.)

$X_2 + Y_2$

12. What is **ΔH** for the reaction: $\underset{\text{react.}}{X_2Y_2} \rightarrow \underset{\text{prod.}}{X_2 + Y_2}$?

50 − 130 = − 80kJ

13. Which do you think would be *faster*, the **forward** reaction or the **reverse** reaction? Explain.

Reverse, $E_{a\,(r)}$ is lower than $E_{a\,(f)}$

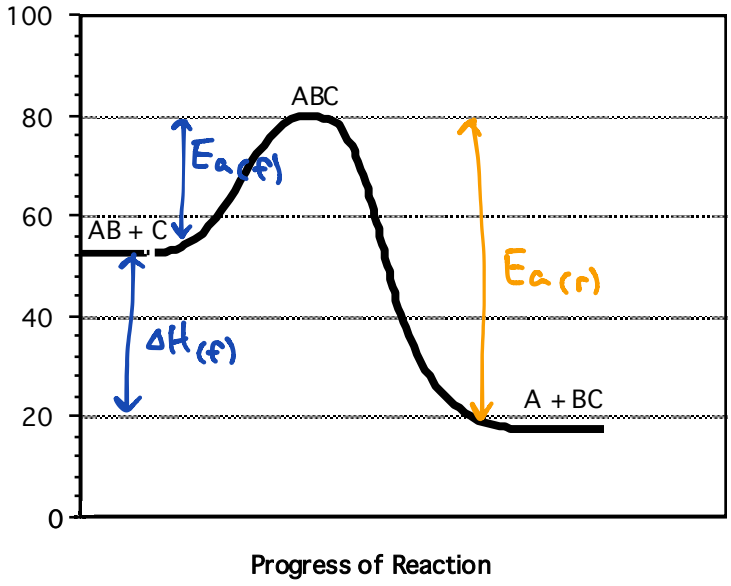
14. Which species or set of species has the ***lowest*** **kinetic energy**? (highest P.E.)

X_2Y_2

15. State the meaning of ***Activated Complex***.

A temporary unstable arrangement of atoms between reactants and products

16. Use the following ***Potential Energy Diagram*** to answer the questions below:



a) Determine the ***Activation Energy*** for the *forward* reaction... 28 kJ

b) Determine the ***Activation Energy*** for the *reverse* reaction.... 64 kJ

c) What is the ***Enthalpy Change*** (**ΔH**) for the *forward* reaction?.. -36 kJ

d) What is the ***Enthalpy Change*** (**ΔH**) for the *reverse* reaction?.. +36 kJ

e) The *forward* reaction is _____exo_____thermic.

f) The *reverse* reaction is _____endo_____thermic.

g) Which species or set of species forms the ***Activated Complex***? ABC

h) Which bond is *stronger*, A--B or B--C?_____B-C_____. Give a reason for your answer.

- It has a lower P.E. (more stable)
- It takes more energy to break B-C

k) The compound "AB" is a gas and the element "C" is a solid. What effect would grinding "C" into a fine powder have on the graph shown here?

None! The positions on the graph depend on bond strength

17. State the meaning of ***Activation Energy***.

The minimum K.E. that reactant molecules must possess to form the activated complex

18. What two requirements must be met before a collision between two reactant particles is ***effective***?

1. Favourable Geometry
2. Sufficient Energy

19. Describe what happens to two reactant particles which collide with *less* energy than the ***Activation Energy***.

Bounce off each other unchanged

20. Burning coal (carbon) is a highly *exothermic* reaction. However coal, in contact with air at room temperature has such a *slow* reaction that it is not noticeable. Explain these two facts with the help of a Potential Energy Diagram.