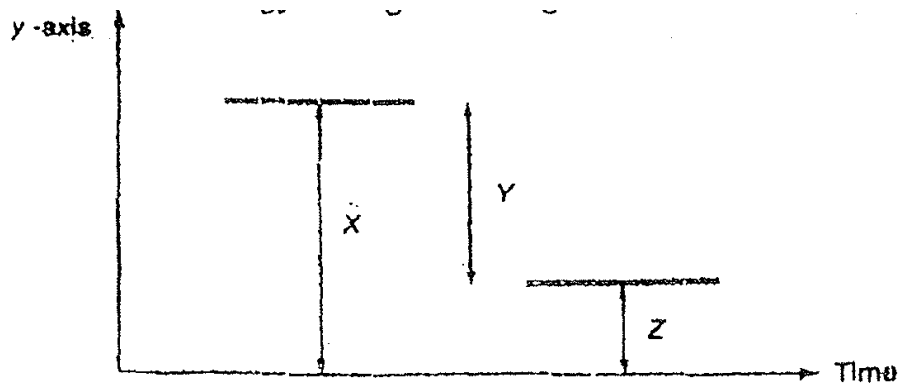


Name: _____ () Class: _____ Date: _____

Write your answers in the spaces provided.

1. The graph shows the energy changes during a chemical reaction.



- a. What is the quantity represented on the y-axis?

- b. What is the appropriate unit for the quantity represented on the y-axis?

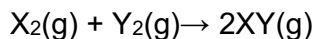
- c. What does X represent?

- d. What does Y represent?

- e. What does Z represent?

- f. Is the reaction endothermic or exothermic?

2. A substance X exists as X_2 molecules, it reacts with a substance Y which also exists as Y_2 molecules. They form a compound XY.



Both X — X and Y — Y bonds are weak but X — Y bonds are strong.

- a. Is the reaction exothermic or endothermic?

- b. Draw an energy level diagram for this reaction.

3. Complete the following table on energy conversions.

Example	Energy Conversion
Electrolysis cell	Electrical → _____
Bicycle dynamo	Kinetic → _____
Photoelectric cell	_____ → Electrical
Dry battery	_____ → Electrical
Fluorescent tube	Electrical → _____

Classify these changes as exothermic or endothermic by putting a tick in the appropriate box.

Change	Exothermic	Endothermic
Freezing of water		
Melting of ice		
Respiration		
Evaporation		
Neutralisation		

4. Methane, ethane and propane are the first three members of the homologous series of alkanes. The table below shows the amount of heat energy released when one mole of each of these alkanes is completely burned excess oxygen.

Name	Molecular Formula	Energy released in kJ/mol
Methane	CH ₄	890
Ethane	C ₂ H ₆	1560
Propane	C ₃ H ₈	2220

- a. Calculate the amounts of energy released by 1.0 g of propane and by 1.0 g of methane when they are completely burned.
- b. Estimate the amount of energy released when one mole of butane is completely burned. Explain how you arrived at your answer.

5. The table below shows some bond energies, measured in kilojoules per mole.

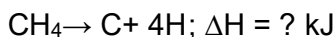
Bond energy is the energy ($\Delta H = +ve$) required to break the bonds between pairs of atoms.

Bond	Bond Energy / kJ/mol	Bond	Bond Energy / kJ/mol
H-H	436	Cl –Cl	242
H-Cl	431	C-H	412
C=C	612	C-C	348
N=N	409	N-N	163

- a. Which of the bonds listed above is the strongest?

- b. Is a double bond between two carbon atoms twice as strong as a single bond? Use the information given above to explain your answer

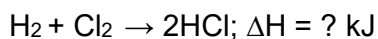
- c. Use the information given to calculate the total energy required to break one mole of methane into atoms.



The energy required is $\Delta H = \underline{\hspace{2cm}}$ kJ.

- d. Bond-making is an exothermic process (ΔH , -ve).

Complete the statements below to calculate the energy change expected from the reaction of one mole of hydrogen with one mole of chlorine to form two moles of hydrogen chloride:



- a. Energy change in breaking the bonds in one mole of H_2 ?

$\underline{\hspace{2cm}}$ kJ.

- b. Energy change in breaking the bonds in one mole of Cl_2 ?

$\underline{\hspace{2cm}}$ kJ.

- c. Total energy change for bond breaking = $\underline{\hspace{2cm}}$ kJ.

- d. Energy change in making the bonds in two moles of HCl ?

$\underline{\hspace{2cm}}$ kJ.

- e. Hence the ΔH of this reaction is =

= $\underline{\hspace{2cm}}$ kJ.