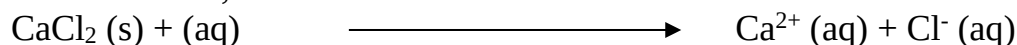


SIGN

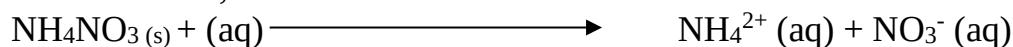
Instructions:

Item 1:

For reaction A,



For reaction B,



Task

(a) Help the scientists determine the enthalpy change for each reaction. **(06 scores)**

[illegible]

[illegible][illegible]

[illegible]

Mr. John is an intern chemist at NanoSense Technologies, a company that develops sensors to detect toxic gases. The research team is investigating halogen elements to select the most suitable one for detecting Compound X, a gas known to donate electrons during reactions. The sensor works by using a material that can attract and accept electrons from this gas. A higher electron affinity means the material can interact more strongly with the gas, causing a measurable change in electrical resistance. To help choose the best halogen, the team collected data on the first electron affinities of selected halogens using photoelectron spectroscopy. Mr. John is however stranded with analysis of data.

Element	Atomic number	Electron affinity (kJ/mol)
Fluorine	9	-328
Chlorine	17	-370
Bromine	35	-348
Iodine	53	-320

As a chemistry learner;

- _____

(e) Based on the results above, explain which element would be the most suitable for the gas sensor's active surface? **(03 scores)**

(f) If period two elements were used for the investigation, explain how the investigated periodic trend varies among these elements. **(05 scores)**

ITEM 3

Peter is part of an innovation team at VoltLine Electronics, designing conductive metal traces for printed circuit boards (PCBs). These conductors must allow easy removal of electrons to ensure smooth current flow without unnecessary energy loss. Your team investigates the first ionization energy of Period 3 elements, because this property determines how easily a material loses an electron. To select the best candidate element, Peter carried out photoelectron spectroscopy to measure the first ionization energy of selected elements and the following data was obtained though he has failed to analyze it.

Table 2 shows the First Ionization Energy Data for Period 3 Elements

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Atomic Number	11	12	13	14	15	16	17	18
First Ionization Energy (kJ/mol)	496	737	577	786	1012	999	1255	1521

Task

As a chemistry learner;

(a) Present the information on a suitable table for proper analysis. **(05 scores)**

(b) Explain the variation of first ionization energy across the investigated elements. **(05 scores)**

(c) Identify and explain any two abnormalities from the graph. **(05 scores)**

(d) Which element(s) would be best suited for making electrical conductors? Justify based on ionization energy. **(04 scores)**

(e) How does low ionization energy support efficient current flow in a circuit? **(04 scores)**

END

WISH YOU SUCCESS.