

SUPPLEMENTARY MATERIAL TO  
**University students' scientific knowledge levels regarding  
chemical reaction arrows and electron arrows**


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**APPENDIX-1: CHEMICAL REACTION AND ELECTRON ARROWS DIAGNOSTIC  
TEST (NEXT PAGE)**

**Table S-I.** Write the names of the arrows given in the table below and explain in what  
sense/function they are used in chemical reaction formulas and the movement of electrons?

	Arrow name	Are you sure?	Function	Are you sure?
1a	$R \longrightarrow P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1b	$R \longleftarrow P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1c	$R \rightleftharpoons P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1d	$R \rightleftharpoons P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1e	$R \rightleftharpoons P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1f	$R \rightleftharpoons P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1g	$\longleftrightarrow$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1h		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure

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1i		<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1i	$R \cdots \cdots \rightarrow P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1j	$R \xrightarrow{\#} P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure
1k	$R \xrightarrow{\times} P$	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure	<input type="checkbox"/> I am sure <input type="checkbox"/> I am not sure

R= Reactants; P= Products