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HSC WA 5 Prompt 2 Creative Options

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### A Dialogue on Discovery

***This hypothetical exchange is between two passionate chemists in the early 1700s. At the time, the original Phlogiston Theory had already been stated (in 1669) by Johann Joachim Becher, but had not yet been disproved (by Antoine Lavoisier's Oxygen Theory put forth in the late 18<sup>th</sup> century).***

***[Scene begins with chemist Jean-Bernard manipulating some chemicals in the lab. His partner, fellow scientist and mentor, Henri is looking over him. Jean-Bernard manipulations lead him to the conclusion that mass must be conserved.]***

**Jean-Bernard:** Why look! The mass of the combined chemicals is equal on the scale to the mass of the separated individual chemicals. How fascinating, a discovery if I do say so myself... mass conservation!

**Henri:** How could this be a discovery if you have already identified it as conservation of mass. By pre-identifying a phenomenon, you must already know about it.

**Jean-Bernard:** Hmm, you seem to be correct. I have previously heard of such thing as mass conservation in principle, but nobody has visually seen such an effect in practice. Discovering something seems to presuppose the ability to recognize and perceive it as that something.

**Henri:** Okay, okay, but to begin, this mass conservation demonstration that you did certainly does not qualify as discovery of conservation of mass because many other chemists have seen this effect before. For example, Jean-Bernard, Jan Baptist van Helmont mentions an early version of this law in his published book "Ortus medicinae". I suppose it may be a personal discovery for yourself, but for all purposes, the scientific community has already been informed of this. Jean-Bernard, in order to become successful, we need to contribute something new, something revolutionary, something no scientist has been in touch with before. Do you understand?

**Jean-Bernard:** Fair, I did not realize van Helmont had shown this in his lab before.

***[Jean-Bernard continues to mess around in the lab and mixes household substances he finds around him. He ends up mixing salt with water.]***

**Jean-Bernard:** Oh my! The color of the solution remained nearly the same after I stirred the salt and the water.

**Henri:** Once again Jean, you're late with this one too – many have seen this many times before. Even so, the color remaining the same seems insignificant and much less useful in this experiment than the fact that the salt has in fact dissolved in the water! Why did you not point that out Jean?! You must be able to identify whether something is a discovery based not only on whether it has been previously encountered, but also based on the context. In this case, the color does not seem to provide much to the advancements of chemistry, but salt's solubility in water would, had it not been known already.

**Jean-Bernard:** The color remaining the same is new information and relevant to the experiment though.

**Henri:** True, but then we would have millions of discoveries every day. For example, I could say that I discovered that the color of the tip of this mixing utensil that you hold in your left hand is blue. I suppose that is something new and relevant to your chemical studies, but does it have any major impact?

**Jean-Bernard:** No ...

**Henri:** You must be able to separate the fruitful discoveries from the meaningless ones.

**Jean-Bernard:** I understand.

**Henri:** The one thing we can surely conclude Jean-Bernard is that defining a discovery, whether it be scientific or not, is much more complicated than it originally may seem. We have to separate personal discoveries and discoveries that cover all of humans' knowledge. We have to separate the ones that are relevant to our studies from the ones that are insignificant. We have to separate the ones that can be deemed useful based on the given context from the ones that are not. Let's look at Becher, his student Stahl, and Phlogiston, though I myself am a bit skeptical ... Anyways ...

**Jean-Bernard:** Ah yes, the substance supposed to exist in all combustible bodies, released in combustion. According to Becher and Stahl, metals are compounds containing phlogiston in combination with metallic oxides (calces). Upon ignition, the phlogiston is freed from the metal leaving the oxide behind. When the oxide is heated with a substance rich in phlogiston, the calx regains phlogiston and the metal is regenerated. According to Stahl, phlogiston is a substance that is not able to be put into a bottle, but can be transferred nonetheless.

**Henri:** Very good! I see you are well-read on the matter.

**Jean-Bernard:** With flames being the visible sign of the escape of phlogiston, I suppose then that Becher/Stahl concluded that this phenomenon is relevant and useful to chemical scientific study and assuming nobody else has noted something previously which he himself had not heard about, he deemed it a discovery and then established the phlogiston theory.

**Henri:** Yes indeed, very well said my disciple. Now let us not discuss whether we believe in this 'magical negative weight' [*sarcastically*]. That is a conversation for another time.

**Jean-Bernard:** Yes, yes, I know how you feel about this topic ... Regardless, I think we can conclude that, though complicated to define, a discovery can be (1) personal versus for all humans, (2) something not seen before in practice but potentially hypothesized about, and (3) relevant and useful to the context.

**Henri:** Indeed, though not get myself angered on the subject, Phlogiston qualifies as a discovery. Yet, I believe that it is possible to later disprove a theory based on a previous discovery... Phlogiston theory per se... *[increasing anger in voice]*.

**Jean-Bernard:** I would have to agree with that, yes. A discovery will always remain a discovery, something physically perceived in a lab usually, but a theory, a well-substantiated explanation of some aspect of the natural world based on said discovery or discoveries, can be revised or disproved. So yes, I suppose in the future one could disprove the Phlogiston theory. You can disprove the Phlogiston theory... Get on it!

**Henri:** Well said my friend! Now let's see if we can actually discover something or else we will be stuck in our little lab alone forever.