**Assignment due on 09/28/22**

Read *On Scientific Method* by Robert Pirsig

1. Briefly explain inductive and deductive logic and their use by mechanics and by scientists.

Inductive Logic is reasoning from particular experiences to general truths: ex. A car engine only misfiring when a bump is hit

Deductive Logic starts with general knowledge and seeks to arrive at a general conclusion: ex. Inferring the battery is dead if the horn doesn’t work as it runs on electricity

1. According to Pirsig, what is the ‘real’ purpose of the scientific method?

To make sure Nature hasn’t misled you into thinking you know something that you don’t know

3a) Why is it important for mechanics and for scientists to keep careful written records?

So that you know at all times where you are, where you’ve been, and where you’re going and where you want to get. Its also important so you don’t get lost in complicated problems.

3b) Does the physical act of writing words down or drawing something improve thinking? Explain.

In my opinion yes, it allows you to keep track of thoughts you may forget in the moment, and it allows you to organize those thoughts later.

4) Pirsig discusses experiments and demonstrations. How do experiments and demonstrations differ? Have most of your science laboratory experiences involved experiments or demonstrations? Explain.

Demonstrations usually only show how something works or should come out of a certain procedure.

Experiments require testing a hypothesis in a legitimate manner as well as the manipulation of variables so only one thing is tested at a time.

Mostly in a school setting, most science “experiments” are demonstrations as no real hypothesis is being tested, were mostly following steps to achieve a certain outcome

5) Pirsig describes a testing procedure involving a spark plug. If the test is negative (no spark is seen during the test), does this experimental result prove that the spark plug or part of the system upstream of the spark plug must not be working? (Another way to phrase the question: do negative experimental results always refute an hypothesis? A third way to phrase the question: what are the logical inferences from a ‘negative’ experimental result)?

Negative experiments can support Hypothesis, like in this example if the spark plug doesn’t fire after careful testing, the hypothesis, being that the electrical system doesn’t work, is supported

6) Discuss the importance of ‘asking the right questions’ in both diagnosing the problem with a malfunctioning motorcycle and in doing science.

Asking the right questions and the testing of those questions can slowly narrow down what you are trying to find out.

7) Pirsig describes the ‘hierarchy’ and ‘underlying form’. What scientific concept is Pirsig is describing with these terms?

The hypothesis they are creating in their heads based on both the Inductive and Deductive Information available.

8) Pirsig uses diagnosing the problem with a motorcycle as an analogy for the scientific method.

a) Does a motorcycle mechanic need to know how the motorcycle works before she can diagnose the malfunction in the motorcycle?

Yes or at least they must have a general understanding of the motorcycle, while some things might be wired differently from bike to bike, but the framework is very similar.

b) Can scientists do their work without having a theory to guide them? Explain.

While it might be possible to work without a theory, the Scientist at the bare minimum will need a decent hypothesis to test in a legitimate manner. Sometimes theories are not in the purview of the experiment but in a lot of cases there will a theory that can be used to test your hypothesis or vice versa.