

Philosophy 1103: Introduction to Philosophy of Science

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Solutions to Practice Quiz 5

Total: 40 marks

1. Laws of nature are often said to be ‘nominally necessary’, but not ‘logically necessary’.

- (i) What is meant by “logical necessity?” Your answer should include one example of a logically necessary statement. [2 marks]

A statement is logically necessary if a rational thinker can see that it is true, simply as a matter of logic, without requiring any information.

E.g. “Either the earth is flat, or it isn’t”

- (ii) What is meant “nomic necessity”? [2 marks]

It is the kind of necessity that laws of nature have (whatever that is).

- (iii) Illustrate the difference between logical and nomic necessity by writing one statement that is nominally necessary but not logically necessary. [2 marks]

Light travels at 299,792 kilometres per second, in a vacuum.

2. Judge John E. Jones wrote in a 2005 judgement:

While supernatural explanations may be important and have merit, they are not part of science. This self-imposed convention of science, which limits inquiry to testable, natural explanations about the natural world, is referred to by philosophers as “methodological naturalism” and is sometimes known as the scientific method.

- (i) Define what is meant by a ‘natural explanation’, and by ‘methodological naturalism’. [2 marks]

A natural explanation is one that appeals only to natural causes, i.e. ones that can be understood in terms of physics, chemistry, biology, etc.

‘Methodological naturalism’ means only using natural explanations in your scientific work.

- (ii) Philosophers are often sceptical of the idea that there is such a thing as “the scientific method”, as different branches of science use (somewhat) different methods. Nevertheless, summarise some key features of science that separate it from non-scientific theorizing. [3 marks]

In my view, science must make (reasonably) robust and precise predictions of empirical data, ideally before it's observed. So scientific theories can't be too flexible.

- (iii) In the text above, Jones seems to assume that testable explanations must also be natural. However, there seem to be examples of supernatural theories that are empirically testable. Describe one such case (it can involve either real or fictional data). [3 marks]

Lyell's version of creationism made predictions that Darwin tried to verify during his voyage on the Beagle. But he abandoned it when the data didn't fit. Lyell also dropped the theory, for the same reason.

- (iv) Jones also seems to assume that supernatural hypotheses must be believed (if at all) on the basis of authority and revelation (i.e. religious leaders and holy books) rather than empirical evidence. Is this always the case? Explain your answer. [2 marks]

It is often the case, but need not be so in principle. E.g. if the Galapagos and Cape Verde had similar species, different from both America and Africa, Darwin would have had empirical evidence for a supernatural theory.

3. In his *Origin of Species*, Charles Darwin argued for both evolution, or ‘transmutation’, and the theory of natural selection.

- (i) Explain the difference between a kinematic theory and a mechanical theory. [2 marks]

A kinematic theory describes how something moves (or changes) over time, whereas a mechanical theory says why (it provides a cause).

- (ii) Is the theory of evolution a kinematic or a mechanical theory? How about the theory of natural selection? [2 marks]

Evolution is a kinematic theory, whereas natural selection is mechanical.

- (iii) During Darwin's lifetime, were there scientists who believed in evolution but rejected the theory of natural selection? If so, then name some. [2 marks]

Yes, e.g. Mivart, Lyell, Wallace, Huxley.

- (iv) Summarise one argument given by Darwin for evolution. [3 marks]

Island species are similar to those on the nearest mainland, even if the islands have very different climate, soil, geology, etc. This makes sense on the descent-with-modification view, but not on Lyell's creationism.

- (v) Summarise one argument given by Darwin for the theory of natural selection. [3 marks]

The effect of artificial selection (selective breeding by humans) on dogs, pigeons, etc. is easily observed and quite striking. Natural selection should then be capable of bringing about similarly large changes.

4. Judge Jones said that he was not aware of any scientific theory that would seem more plausible to those who believe in God. However, concerning the Big Bang theory, physicist Frank Tipler wrote,

When I was a student at MIT in the late 1960s, I audited a course in cosmology from the physics Nobelist Steven Weinberg. He told his class that of the theories of cosmology, he preferred the Steady State Theory because "it least resembled the account in Genesis".

- (i) Explain why the Big Bang theory (the alternative to the Steady State theory) might seem more plausible to a theist (e.g. a Jew, Muslim, or Christian) than to an atheist like Weinberg. [3 marks]

The Big Bang theory says that the universe has a beginning in time, which better fits the "In the beginning God created ..." of Genesis, than the eternal universe favoured by naturalism.

- (ii) In a similar vein, explain why Darwin's theory of evolution might seem *less* plausible to a theist than to an atheist. [2 marks]

Darwin's theory makes no explicit appeal to a creator. Rather than organisms being directly created by God, they are a product of natural causes. So God's work cannot be observed in his creation.

5. Darwin wrote, "I do not think I hardly ever admired a book more than Paley's *Natural Theology*. I could almost formerly have said it by heart."

- (i) Summarise William Paley's argument for his view that living organisms were made by 'an intelligent Creator'. [3 marks]

Living organisms, like human artifacts (e.g. watches) can only be explained as the work of an intelligent creator. They contain many parts that all work together to carry out some function that we are able to figure out. No other explanation is possible.

- (ii) Summarise Darwin's criticism of Paley's argument, that is based on his theory of natural selection. [2 marks]

Natural selection seems to be able to do the work of a designer, even though it is an unconscious, natural process. Functional improvements will happen by chance, and then nature will select them. No designer is needed.

- (iii) Summarise Mivart's objection to Darwin's theory of natural selection. [2 marks]

It's not clear that selection can produce the functionally integrated systems found in life. An 'incipient stage' of such a system (i.e. one that is partially finished) will not function at all, so it cannot be selected by nature.