SAMPLE ESSAY 1: PHILOSOPHY & SOCIAL SCIENCE

(1ST YEAR)

Before you read the essay …

This is a very nice essay but it could be improved! Read it through, bearing in mind the comments in the red boxes, and think about roughly what kind of mark you would give it and why. There are some general comments and an indicative mark at the end – see if you agree.

In case you don't know anything about the subject-matter, here's a very brief preamble on the topic to give you some context. The question asks what distinguishes a scientific theory from a pseudo-scientific theory. So, on the one hand, we have theories that uncontroversially count as 'scientific': Newton's laws of motion, Einstein's Theory of Special Relativity, any mainstream theory in chemistry or biology, etc. On the other, we have theories that are (arguably) 'pseudo-scientific': astrology, homeopathy, Marxism, Freudian psychoanalysis, … . What marks the first category out from the second?

Note two things. First, standard 'criteria of demarcation' – e.g. Popper's famous criterion, discussed in the essay – typically seek to differentiate the scientific from the non-scientific. But a criterion of demarcation, thus understood, does not suffice to differentiate science from pseudo-science. While pseudo-science is, by definition, non-science, plenty of non-scientific theories don't count as pseudo-science. (Think of pretty much any theory you have studied in philosophy. It's not a scientific theory, nor does it pretend to be.) So even if we find a viable criterion of demarcation that differentiates science from non-science, we need to do a bit more work if we're to differntiate science from pseudo-science.

Second, the essay makes quite a lot of (very good) use of the idea of 'necessary and sufficient conditions'. A *necessary* condition for F is a condition something *must* satisfy in order to be an F. For example, being made of flesh and blood is a necessary condition for being a cat. (If something's not made of flesh and blood – e.g. it's made of metal and wiring – it can't be a cat. It could be a robot cat, but a robot cat isn't a cat.) A *sufficient* condition for F is a condition such that, if something satisfies it, it's *guaranteed* to be an F. So being made of flesh and blood is clearly not a *sufficient* condition for being a cat, since plenty of things (you, for example) are made of flesh and blood and are not cats.

What distinguishes a scientific theory from a pseudo-scientific theory?

The way in which we can distinguish a scientific theory from a pseudo-scientific theory is by identifying the criterion (or criteria) which are both necessary and sufficient for a theory to be considered scientific. Popper described this as the criterion of demarcation; it is what distinguishes a scientific theory from other "metaphysical", non-scientific theories (Popper, 1935, p. 11). Once we have a plausible criterion of demarcation, we must then examine why the theories we regard as pseudo-scientific fail to satisfy this criterion. Finally we will also need to explain why it is that these pseudo-scientific theories are distinct from other non-scientific theories. This is the process I intend to follow in order to provide a successful account of the distinction between scientific and pseudo-scientific theories. My account will show why an effective distinction will need to take into account the social and historical context of a theory in order to adequately explain its pseudo-scientific status.

To begin with I shall need to identify a plausible criterion for demarcation. The best place to start would be with Popper's suggestion, falsification (Popper, Science as Falsification, 1963). He argues that good scientific theories make risky predictions; in other words, predictions which could easily turn out to be false. What distinguishes science from non-science is its ability to make predictions which could conceivably turn out to be false. These predictions are shown to be false through rigorous empirical testing whose aim is to falsify the theory. If the predictions made by a theory are shown to be false then the theory has been falsified and is discarded. If the theory survives this testing process then its survival can be used as corroborating evidence in favour of the theory. However, we can never be certain of a theories truth, all we can really say of a successful theory is that it has yet to be falsified.

This notion of falsification initially seems to provide a plausible explanation for why the pseudo-scientific theories are considered unscientific. Popper claims that they fail to fulfil the condition of falsifiability because the predictions they make are so vague that they cannot be shown to be false through empirical testing. An example of this would be the predictions made by horoscopes in the pseudo-scientific doctrine of astrology. Suppose that my horoscope predicts that "interacting with authorities will prove challenging this week", there are numerous ways in which this prediction can be shown to be true. The vague use of the term "authorities" could apply to an institution or an individual with genuine power over me or it could also apply to someone who is an authority on a given subject, such as a doctor. The prediction would therefore seem to carry very little risk as it would be almost impossible for it to be false. This makes the theory itself unfalsifiable, and thus not scientific.

Helen 7/10/13 17:38
Comment [1]: This is very nice and clear. It also notes that in order to distinguish between scientific and pseudo-scientific theories, it isn't enough to distinguish just between scientific and non-scientific theories – which a lot of people forgot about!

Helen 7/10/13 17:40
Comment [2]: Some information about how you're going to get to that conclusion would help – i.e. a quick summary of the argument.

Helen 8/10/13 18:26
Comment [3]: We don't need the title here – just the author and date. And some page numbers!

Helen 7/10/13 17:42
Comment [4]: SPELLING!

Helen 7/10/13 17:48
Comment [5]: Well, that's just *one* possible reason, on Popper's view, why a pseudo-scientific theory might be unfalsifiable. There are others …

However, on closer inspection Popper's thesis, as it is rendered above, fails to provide us with an acceptable distinction between science and non-science. The problem is that most, if not all, pseudo-scientific theories are at least theoretically falsifiable. For example, the above horoscope would be rendered false if I unexpectedly caught the flu and had to spend the entire week in bed with no interaction with any authorities. A more scientific example would be if we decided to test the theory of homeopathy. One of the predictions made by the theory is that a single molecule of snake venom diluted in 1×10^{60} molecules of water will cure someone who was bitten by a venomous snake if they were to drink the solution. This prediction could be easily tested by gathering together two groups of patients who have all been bitten by a venomous snake. One group will be given the homeopathic cure and the other will be the control group and will only be given a placebo. If the group with the homeopathic cure does no better than the control group then the prediction has been shown to be false. This shows how theories which we intuitively regard as pseudo-scientific can be falsified, and therefore they would be considered scientific if we accept Popper's thesis.

Helen 7/10/13 17:59
Comment [6]: This is a minor point, but I doubt any homeopaths would be daft enough to claim that! A (falsifiable) claim that homeopaths have actually made – and there are plenty! -- would work better.

The likely response to this criticism is to say that I have misrepresented what Popper means when he talks of falsification. Rather than falsification being a simple binary property which theories either do or do not possess, Popper instead means for falsification to be understood as a scale. The easier it would be to falsify a theory is the higher up it goes on the scale which gives it a much greater scientific status. The pseudo-sciences and other non-scientific theories are to be found at the lower end of the scale hence their low scientific status.

Helen 7/10/13 17:55
Comment [7]: A nice structure is coming through here. We want to find out the correct criteria for demarcating science from pseudo-science. So we start with a prima facie plausible criterion (Popper's) show that it faces a problem; suggest a fix (in this case, one based on a more charitable interpretation of Popper); and then (in the following paragraph) show why the fix won't work.

The problem with this alteration is that it does not seem to represent our intuitions on pseudo-science; the reason why pseudo-science is so reviled by the scientific community is not because it is less scientific than other theories, but because it isn't scientific at all. The scale needs a non-arbitrary line which divides scientific theories from non-scientific theories. This seems to be difficult, as any point we choose will either be too strong and deny scientific status to theories which we intuitively consider scientific, or it will be too weak and allow some pseudo-sciences to be regarded as scientific. The above example of the homeopathic cure for a snake bite seems just as difficult to falsify as the scientific prediction that an anti-venom serum will cure a snake bite; in fact, any way we test such a prediction is going to be almost identical to the way we test the homeopathic cure. This makes it very difficult to exclude one of these theories without excluding the other. From this we must conclude that falsifiability does not provide us with a suitable criterion of demarcation.

Helen 7/10/13 17:55
Comment [8]: This is a nice point, clearly made.

Helen 7/10/13 17:56
Comment [9]: I think 'easy' would be a better word to use here (since easier t- falsify = more scientific on the view under consideration).

This may not prove to be a great loss as falsifiability itself would not have helped us with the third stage of our inquiry which is to provide a distinction between pseudo-science and other non-scientific theories. A theory being unfalsifiable through empirical testing is not sufficient for it being pseudo-scientific. For instance, there is no way you could go about empirically testing different types of ethical theories, but it seems wrong to describe them

as pseudo-scientific. Any criterion of demarcation which fails to account for this difference cannot help us in distinguishing science from pseudo-science.

The problem faced by Popper's criterion, is highlighted by Grünbaum, who draws our attention to the distinction between the revocable falsifiability of a theory and the willingness of its defenders to accept the theory being falsified (Grünbaum, 1977, p. 347). So far we have focused on the former by discussing how doctrines including astrology and homeopathy could be falsified; but we have not considered the attitudes of those who support a theory which seems to be a far more promising line of inquiry.

An example of a criterion of demarcation which focuses more on the attitudes of the advocates of a theory is provided by Thagard (1978). He identifies three elements that a successful criterion of demarcation needs to take into account: the first is the structure of the theory itself, the second is the nature of the community that supports a given theory, and the final element is the historical context of the theory. The first element has primarily been the focus of several early attempts at providing a demarcation criterion, including Popper's suggestion. Meanwhile, the second and third elements have been largely neglected. Thagard provides two necessary conditions for a theory to be considered pseudo-scientific which incorporates all three elements: firstly, the theory must have faced more problems and been less effective at solving those problems than other theories; secondly, the community who support it make little attempt to solve these problems or fairly evaluate the theory against other theories.

The criteria which Thagard provides give us a reasonable explanation of why pseudo-scientific theories are considered distinct from and inferior to truly scientific theories. One consequence of this is that it makes a theories scientific status completely contingent on its historical context and community of practitioners. As such, a theory which is pseudo-scientific today, may not have been several centuries ago, and may even become scientific in the future. To some this may be problematic; however, as Hansson observes, science is not timeless, theories are always falling in and out of favour so it is not unintuitive to say that a theory which was once scientific could become scientific if its community of practitioners behaved differently (Hansson, 2009, p. 239). Therefore, the criteria that Thagard provides are both clearly necessary for a theory to be considered pseudo-scientific.

Yet despite this it is still insufficient as it only provides us with the criteria for determining weak and unscientific theories. It is perfectly plausible for a weak ethical theory to meet Thagard's criteria and still not be considered pseudo-scientific. This is easily remedied with a third condition which stipulates that a theories community of practitioners not only fail to develop the theory, they also try to give the impression that it is scientific. In other words it is non-science (as defined by the first two conditions) posing as science.

We now have a clear distinction between science and pseudo-science. The former consists of theories that have been constantly developed and refined over time by a group of people

Helen 7/10/13 18:02
Comment [10]: It would help if it was clear that the contrast being made here is between pseudo-science and non-science.

Helen 7/10/13 18:01
Comment [11]: Similarly, it would clarify the situation to say here that it can't help *because* at best it could help us to distinguish science from non-science -- which is not the distinction we're after, given the essay question.

Helen 7/10/13 18:02
Comment [12]: Rogue comma!

Helen 7/10/13 18:04
Comment [13]: It's not clear what this means! That the falsifiability of a theory can be revoked …?

Helen 7/10/13 18:10
Comment [14]: This is ambiguous. Does it mean 'to accept that the theory has been falsified' or 'to accept the theory (which has been falsified)'? A charitable interpretation says it's the former – but it's best to avoid requiring the reader to do the interpreting themselves! (They might not be charitable, after all.)

Helen 7/10/13 18:15
Comment [15]: It would help to say something about *why* this is a more promising line of enquiry, and/or illustrate this with an example, before moving on. Otherwise we just have to take your word for it.

Helen 8/10/13 18:28
Comment [16]: There should really be a page reference here (or perhaps one for each of the three conditions listed, depending on how spread out they are in Thagard's paper.

Helen 7/10/13 18:15
Deleted: as

Helen 7/10/13 18:16
Comment [17]: Again, an example would help to make this claim more convincing.

Helen 7/10/13 18:17
Comment [18]: Again, ambiguous: what does 'this' refer to? Thagard's theory? Or the fact that it gives us 'a reasonable explanation of why ….'?

Helen 7/10/13 18:20
Comment [19]: Typo alert! Unscientific? Pseudo-scientific?

Helen 7/10/13 18:18
Comment [20]: Again, what is 'it' referring to?

Helen 7/10/13 18:21
Comment [21]: It would help to briefly spell out why.

Helen 7/10/13 18:21
Comment [22]: Theory's

Helen 2/11/13 14:00
Comment [23]: This is a nice, clear paragraph that demonstrates an excellent grasp of the logic of the issue.

who are keen to meet any challenges the theory faces. On the other hand, the latter consists of theories which have been slow to develop and meet the challenges posed to them; their supporters do little to remedy the situation. Rather than rigorously testing the theory to discover its faults and fix them, they instead choose to cherry-pick confirming evidence and then claim that this proves that their theory is scientific.

Word Count - 1634

Bibliography

Grünbaum, A. (1977). Is Psychoanalysis a Pseudo-Science? Karl Popper versus Sigmund Freud. *Zeitschrift für philosophische Forschung, 31*(3), 333-353.

Hansson, S. (2009). 'Cutting the Gordian Knot of Demarcation'. *International Studies in the Philosophy of Science, 23*(3), 237-243.

Popper, K. (1935). The Problem of Demarcation. In K. Popper, *The Logic of Scientific Discovery* (Routlege Classics 2005 ed., pp. 10-16). London: Routlege.

Popper, K. (1963). Science as Falsification. In K. Popper, *Conjectures and Refutations* (pp. 33-39). London: Routledge.

Thagard, P. R. (1978). 'Why Astrology is a Pseudoscience'. *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association. 1*, pp. 223-234. Chicago: Chicago University Press.

Helen 7/10/13 18:24
Comment [24]: Having 'it' and 'its' here makes it sound as though there are supporters of pseudo-science per se, which is an odd suggestion!

Helen 7/10/13 18:23
Deleted: it

Helen 7/10/13 18:23
Deleted: its

Helen 8/10/13 18:06
Comment [25]: This is a pretty good bibliography – but not perfect!

Helen 8/10/13 18:01
Comment [26]: Titles of journal articles need to be in inverted commas!

Helen 8/10/13 18:04
Comment [27]: This is just a chapter/section title in Popper's book – it doesn't need listing. (Nor do the page numbers on the next line.)

Helen 8/10/13 18:04
Comment [28]: This wouldn't normally be needed, but because the citation date is given as 1935 (the original publication date), in this case it is needed. It would be equally correct just to list as 'Popper 2005' and skip the bit highlighted here – though less informative.

Helen 8/10/13 18:04
Comment [29]: Same comment as above (ditto the page references).

Helen 8/10/13 18:05
Comment [30]: You don't need to state the publisher/place of publication for journals.

GENERAL COMMENTS

This is a very good essay! Here are its major **strengths**:

Thesis and argument: The question asks what distinguishes science from pseudo-science. We get a clear, concise, direct answer to that question in the final paragraph. And that answer is justified by an argument: we have seen why falsifiability can't be the criterion we're looking for, why we need the criteria that Thagard proposes, and why we also see why we need to add an additional criterion to Thagard's list.

Originality: The level of originality is good. We have a positive proposal at the end for how to improve on Thagard's criteria. The structure of the essay also shows some creativity – it isn't *at all* modelled on the relevant lecture notes. And there are some argumentative moves along the way, and examples, that have clearly come from the author's own head rather than the set tutorial text (the Thagard) or lecture notes.

Notice that the essay clearly distinguishes between the author's own ideas and those garnered from elsewhere. For example at the top of p.4 they explicitly credit to Grunbaum an objection to Popper, and, when endorsing a point made by Hansson later on, they don't just provide a citation for Hansson but explicitly say 'as Hansson observes ….', which makes it clear whose idea this is. This is good practice! Remember, passing off someone else's *ideas* as your own is plagiarism, even if you are not copying or closely paraphrasing their words. (If you are surprised by this, you need to re-read the relevant chapter of the *Study Guide*!)

Structure: The essay is clearly structured. It's clear how each paragraph fits into the overall line of argument, and so it's pretty easy to follow the argument through from beginning to end.

Knowledge and understanding: No glaring errors and shows a good understanding of the relevant issues. It also shows a good grasp of the logic of the issue, in particular through being very clear on the distinction between necessary and sufficient conditions (which play a crucial role in the argument).

Writing style: The essay is easy to understand. A few minor ambiguities aside, the writing is very clear, and there are some nice, clear examples to illustrate some of the points. There are hardly any typos/spelling/grammar errors; again, that makes the essay easy to read and understand.

Some minor, local **weaknesses** are flagged up in the comment-boxes – all of which would be pretty easy to fix. It's worth noticing that I've said in various places that an example or a bit of explanation would help, but that the essay is only just within the word limit (1500 words + 10%). This poses a problem, of course! I would say that the author could have gone a bit more quickly towards the beginning when explaining Popper's criterion of demarcation: this is fairly basic stuff that the author clearly understands, so they didn't need to dwell on it quite so much.

To get a *really* good mark, I think the author could have pretty much just summed up the Popper bit in one sentence (it could just take it for granted that falsifiability is a necessary condition on a theory's being scientific, and take it from there) and then spent more time explaining the problem with Thagard's criteria and their own proposed solution to it.

I would give this essay a **low First**. However, on the tried-and-tested principle that severe punishment is often the only way to get students to learn how to get referencing and bibliography style right (it's not rocket science!), I would take a couple of marks off for the handful of minor referencing-and-bibliography slips.