

PHIL 2070 Answer key to quiz 4

1. Science proceeds rationally, Popperians claim, by rejecting all and only those hypotheses that have been falsified. Woodward and Goldstein identify a logical problem –the Quine Duhem problem – with this method. Briefly explain what the problem is.

This is the problem discussed in class: Falsificationism requires that a prediction can be derived from the hypothesis in question. If that prediction is falsified, then the hypothesis is supposed to be rejected. However, in order to derive a prediction from a hypothesis one typically requires a set of background assumptions or what are also called auxiliary hypotheses. For example, in order to derive a prediction P about the ways you expect cells to behave under hypothesis H, you typically must rely on a bunch of other assumptions about cell mechanics, the optics of the microscope, the way that cells behave in a lab vs in situ. And so on. So the logical structure of hypothesis testing is not simply

If H then P.

Test P.

If not-P, then not-H.

Instead, the logical structure of hypothesis testing looks more like this :

If H and A1 and A2 and A3... then P.

Test P.

If not P, then either not-H or not-A1 or not-A2 or not-A3...

Notice that in the second scenario it is possible to hold on to one's cherished hypothesis (H) and abandon one of the auxiliaries (A1...) in the face of negative experimental evidence (not-P).

As far as students answers are concerned, they should receive full marks for saying both that (1) deriving predictions requires making auxiliary (background) assumptions and (2) that in the face of failed predictions (however that is put) it is possible to hold on to one's cherished/favored hypothesis and let go of one of the auxiliaries. Part marks only for one of those . As always, I leave it up to TA's discretion to decide whether the student answers are correct.

2. According to Woodward and Goldstein, why does falsificationism assign the wrong motives to scientists?

Two main ideas here: (1) falsificationism requires that scientists are disinterested or not motivated by personal gain. (2) There are several reasons why this could be viewed as wrong, and I am willing to accept any answer that is sensible. For example, on an ideal distribution of scientific resources, it is good to have some scientists challenging received views. Sometimes

this strategy has a large payoff for society. In order to motivate scientists to take such risks, we need to reward them with fame and glory in and when they succeed. A related point is that we wouldn't want scientists to dispassionately abandon a hypothesis with the first sign that it has been falsified. Some of the most important scientific discoveries have required tenacity in the face of apparently conflicting evidence. Students should receive one point for roughly getting the implication of falsification and another point for a plausible critique.

3. According to Woodward and Goodstein, for what purposes is the peer review process appropriate? Under what conditions is peer review flawed? (2)

Peer review is appropriate, they claim, for most small projects and almost all scientific journals. In these cases, having peers blindly evaluate the quality of each others' work is a good way of separating sense from nonsense. The key point here is that these are cases in which competition among scientists is not so intense. Students should receive one point for identifying either scientific journals or small grants as an appropriate context for peer review. Or, they can receive a point for saying that it is appropriate in cases where competition is modest and resources are not overly scarce.

Peer review is less useful in cases where there is a conflict of interest. Conflict of interest arises when resources are scarce. Scarcity arises in competition over large research grants or space in highly prestigious journals. In these cases reviewers are motivated to use the anonymous system of peer review for personal gain. For example, by rejecting a competitor's good research or stealing their ideas. These problems are worsened in highly specialized fields where there are fewer experts and competition is even more intense.

"The pages of prestigious journals and the funds distributed by government agencies have become very scarce resources in recent times. The fundamental problem in using peer review to decide how these resources are to be allocated is obvious enough: There is an intrinsic conflict of interest. The referees, chosen because they are among the few experts in the author's field, are often competitors with the author for those same resources." (21).

Regarding student answers, I am happy if they identify even one of these factors motivating a conflict of interest. For example, they might say that peer review breaks down when there is a conflict of interest for the reviewer. Or, they might say that it fails when resources are a scarce, when there are few available experts, etc.

4. Eileen Crist mentions three options for any species whose survival is threatened by climate change: migration, phenotypic plasticity (acclimation) or evolution. Why are options 1 and 3 unavailable for most species under current conditions? (2)

She suggests that migration is not an available option for most species because of ways that human development has modified the landscape. Many species cannot simply migrate to new, more suitable locations because their pathways are blocked (for example by large cities) or the

available habitat has been converted to human use. Crist also notes that some habitats, like mountain tops, are limited in available space. (if students get any of these points it is good for one mark).

The reason that species cannot adapt to climate change by an evolutionary process is because the change is happening too quickly. Evolutionary change typically requires genetic change. Arguably, most species lack adequate genetic diversity to adapt to large scale changes. Genetic change cannot keep up with climate change. Therefore, species are unable to adapt to such rapidly changing environments. Again, any answer along these lines is good for a second mark.

5. State one reason why Crist thinks that some attempts to prevent global warming could worsen the problem of biodepletion (biodiversity loss). (2)

Many of the geo-engineering proposals offered as means to mitigate climate change are (a) a potential waste of money that could be used more effectively to directly conserve habitat, or (b) could potentially cause more harm to biodiversity than climate change itself. As Crist puts it, these solutions often involve countering one form of pollution with another. The following quote really captures her criticism:

“Even if they work exactly as hoped, geoengineering solutions are far more similar to anthropogenic climate change than they are a counterforce to it: their implementation constitutes an experiment with the biosphere underpinned by technological arrogance, unwillingness to question or limit consumer society, and a sense of entitlement to transmuting the planet that boggles the mind.” (50).

So, one acceptable answer is that some of the putative solutions for reducing co2 emissions are themselves potentially quite harmful to biodiversity. It is also fine for students to point out that the implications of some of these techno-solutions are not very well worked out. So we might be substituting one problem for another.

Another acceptable answer is that none of the current proposals, according to Crist, address the real problem which is humans' attitude of domination over nature. Most technological solutions, she claims, embody this attitude of human arrogance.