Assignments for preparing the lectures and the exam Philosophy of Engineering: Science

Philosophy of Engineering: Science.

The questions cover what you need to understand and/or know for the exam as to these materials:

Assignment 1:

- Ladyman Introduction (pp. 1-8).
- Ladyman Chapter 1.
- Ladyman Chapter 2 with focus on 2.1 (pp. 31-40).

Important note: Sometimes it is helpful to browse the internet in order to find additional information on a topic, or nice examples etc. However, be careful. Only use sources from a philosophical background. Wikipedia articles oriented at philosophical topics often are OK. Another, more thorough source is the Stanford Encyclopedia of Philosophy and other internet encyclopedias on philosophy. Through the UT library, you can get access to the Routledge encyclopedia of philosophy[1] (however, this CDROM does not always function properly). If you are interested in original sources Google books can be used. When using other sources, check whether it is an academic or educational philosophy (of science) entry. You can see this, for instance, by checking whether the www address contains **.edu**.

Note 2. Related to the former note: In this class you will learn some so-called 'technical terms.' These are terms in the philosophy of science that have a specific meaning that

[1]


titellijst | **titelgegevens** | zoekgeschiedenis — eerste | vorige | 3 | 4 | 5 | 6 | 7 | **8** | 9 | 10 | 11 | 12 | 13 | volgende

resultaten zoeken [en] (Alle woorden) routledge encyclopedia | 18 treffers

Titel:	**Routledge encyclopedia** of philosophy CD-ROM / gen. ed. Edward Craig ; consultant ed. Luciano Floridi
Auteur:	Edward Craig (1942-); Luciano Floridi (1964-)
Jaar:	1998
Uitgever:	London [etc.] : **Routledge**
Medium/omvang:	1 CD-ROM
Formaat:	13x15 cm
Bijlage:	user guide
ISBN:	0-415-19608-6 (user guide), 0-415-16916-X (CD-ROM)
Samenvatting:	Electronische versie van de gedrukte tien-delige engelstalige gelijknamige encyclopedie op het gebied van de filosofie (1998).
Trefwoord:	Filosofie; Encyclopedieën (vorm), Philosophy
URL:	http://www.utwente.nl/ub/en/services/MAIN/spec/rep.html
Uitleenindicatie:	uitleenbaar
Leeninformatie:	Meerdere delen. Klik op 'Verwant' voor een overzicht.

may differ from its ordinary meaning in all day life or its specific meaning in other scientific fields. By the way, the use of technical terms that have different meanings in different fields is not specific for philosophy – think for instance of the term 'operator', which has different meanings in mathematics, chemical engineering and telecom. Examples of terms with a specific meaning in the philosophy of science are: induction (which has a different meaning in mathematics), logic, truth, and realism.

Note 3. The assignments are exercises that aim to prepare you for the lectures and for the final exam. When doing these assignments, you will find that not all answers can be found in Ladyman or study materials provided so far – they will be addressed in the lecture after your submission. In some cases, you aim to think about the question yourself and formulate an answer; otherwise, you just write: 'not in book'. It is recommended to bring your own answers to the lectures and develop them further during or right after class – in that manner, you will be well prepared for the final exam.

Note 4. Please copy the questions and numbering in your assignments. Try to be concise and adequate in your answers. Several questions overlap. This is because the questions aim to have a didactical structure that guides you in thinking through the materials. At the exam, less background information will be provided.

Assignment 1. Scientific Reasoning and Scientific Methodology

1) Philosophers in the past have aimed to articulate scientific methods for attaining true (or reliable) knowledge. Proper scientific reasoning is an important part of scientific methods:
    a. Explain the difference between the use of the three (technical) terms: true/false, valid/invalid, sound/unsound.
    b. What is deductive reasoning? Give an example from science of a deductive argument.
    c. What is inductive reasoning? Give an example of an inductive from science argument? Explain from a logical point of view why induction as a scientific method is problematic.
    d. What is abductive reasoning (also called IBE – inference to the best explanation)? Give an example from science of an abductive argument. Explain from a logical point of view why abduction as a scientific method is problematic.

2) Explain of the following examples: Which of the **Conclusions** in Examples 1-8 is a **law of nature**? If so, has this law been **proven**? If so, has/can it been proven

by this kind of inductive reasoning? If not, how has/can it been proven? Give arguments for your Yes and No's. Suggestion: you can discuss them in a mutual comparison! Note that this question is not about 'correct' answers, but about presenting good reasons!

(1)
P_1: Yesterday the clock stroke every hour
P_2: Today the clock stroke every hour
P_3: In the last 3 weeks the clock stroke every hour
.
P_n: ...

C: Tomorrow the clock will strike every hour

(2)
P_1: Raven 1 is black
P_2: Raven 2 is black
P_3: Raven 3 is black
.
P_n: ...

C: All ravens are black

(3)
P_1: The day before yesterday the sun rose
P_2: Yesterday the sun rose
P_3: Today the sun rose

C: The sun rises every day

(4)
P1: Iron conducts electricity
P_2: Copper conducts electricity
P_3: Gold conducts electricity
.
P_n: ...

C: All metals conduct electricity

(5)
P_1: Aspirin relieved the head-ache of my neighbor
P_2: Aspirin relieved the head-ache of my mother
P_3: Aspirin relieved the head-ache of my friend
.

P_n: ...

C: Aspirin relieves head-ache of humans

(6)
P_1: My neighbor drank alcohol and got drunk
P_2: My uncle drank alcohol and got drunk
P_3: Our prime minister drank alcohol and got drunk
.
P_n: ...

C: People who drink alcohol get drunk

(7)
P_1: Humans have a liver
P_2: Dolphins have a liver
P_3: Mice have a liver
.
P_n: ...

C: All mammals have a liver

(8)
P_1V_1 (at T_a) = k
P_2V_2 (at T_a) = k
P_3V_3 (at T_a) = k
.
P_n: ...

C: PV = k(T)
Boyle's gas law

3) Inductive inference is important in scientific research, especially in experimental research (see examples given on the slides).
    a. Present and explain an example of how inductive reasoning works (as a scientific method) in scientific research.
    b. Why is inductive inference problematic? Can you explain why scientists should be very cautious in applying this way of reasoning (what can go wrong if they do)?
    c. What is: 'The problem of induction' as explained in Ladyman – What is Hume's argument (try to really understand what his problem was!)?
    d. Do you think that there is a solution to this problem? How would you solve it in practice?

4) In the 17th and 18th century modern science emerged. There were two different ideas about the solid ground of knowledge; in other words, different basic ideas as to how knowledge can be justified: Rationalism and Empiricism.
    a. Present a thorough description of rationalism and empiricism, and explain the controversy. Which are the differences in their basic presuppositions about the foundation of knowledge in Rationalism and Empiricism.
    b. Given an example of scientific knowledge that has been produced by the empirical method (e.g., the method that Francis Bacon proposed). Present a clear description of how the knowledge of your example supposedly must have been produced according to the empirical method.
    c. Give two examples of fundamental principles (i.e., principles that cannot be attained or proven by an empirical method).
    d. How (according to the Rationalists) do scientists find these principles?
    e. How are these principles used in science? Present an example (e.g., by using the examples in c).

5) David Hume was an empiricist. He used the empiricist epistemology to think through causality:
    a. What does 'epistemology' mean?
    b. Describe the empiricist epistemology: Which are the basic presuppositions about the solid ground of knowledge they adopted? What is meant by 'the solid ground of knowledge'?
    c. Most of us believe that there is a difference between causal relations and mere regularities in nature (also see Q.2 above). Using his presuppositions, Hume analyzed how we attain knowledge of causal relations. What according to Hume is the wrong idea most people have about the character of a causal relationship?
    d. What according to Hume is the proper description of a causal relation (i.e., a description that follows from strictly following the empiricists presuppositions)?
    e. Can the outcome of Hume's analysis distinguish between a causal relation and a mere regularity? Explain, e.g., by discussing what is the commonly accepted difference between regular and causal events, and what is the difference that follows from Hume's view.
    f. Do you think that scientists can do without the distinction that we usually make between mere regularities and causal relations (e.g. give an example where the notion of causality is used and could be discarded, or, where on the contrary, it is a notion that they really need).
    g. In current philosophy of science, one of the proposed solutions is the so-called the *manipulationist account of causality* [2]. Roughly, the idea is that

[2] For instance on the manipulationist account of causality (by Jim Woodward, 2003): http://plato.stanford.edu/entries/causation-mani/ and

we know of causal relationships in case of (physical) interventions such as in experiments. Does this solve the Hume's problem? Please explain how you would understand this manipulationist (or 'interventionist') account of causality, and why or why not it solves the problem.

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http://www.strevens.org/research/expln/WoodwardThings.pdf and http://public.econ.duke.edu/~kdh9/Source%20Materials/Research/Cause_and_Counterfactuals.pdf (these materials are only provided as voluntary material for those who are interested!, not part of the exam).