STUDY GUIDE 05D [SUPERdomain = “The Universe”]

Material from: Vaidman, L. (2022). Why the many-worlds interpretation? Retrieved 3/23/25 from https://arxiv.org/pdf/2208.04618

1.  Know whether or not the author finds the many-worlds interpretation (MWI) by far the **best** interpretation of **quantum** **mechanics**. Know whether or not, as a scientist, the author feels he must always be **skeptical** about his beliefs, so he would also consider the workshop as a success if it will demonstrate **weaknesses** of the MWI and show why the MWI **should** **not** be accepted as a leading interpretation.  Know whether or not we ever observe two **simultaneous** detections of a **single** photon by two detectors.

2.  Know whether or not, when the **wave** **packet** is present in place B, everyone, independently of their preferred interpretation of quantum mechanics, **should** **agree** about the following description of place B at the time. Know whether or not, by placing a detector shortly before location A, we **change** **the** **reality** in B to probability 0 or 1. Know whether or not only the MWI **avoids** action at a **distance** in the physical universe. Know whether or not the MWI is the **most** **economical** quantum theory regarding the theory’s laws.

3.  Know whether or not, although the self-location probability postulate explains the observed **statistics**, it does so without introducing **objective** chance in Nature. Know whether or not the MWI brings back **determinism** to scientific description. Know whether or not we, as agents capable of experiencing only a **single** **world**, have an **illusion** of randomness. Know whether or not the **paradoxes** of the quantum theory are resolved in the framework of the MWI interpretation. Know whether or not the MWI provides **simple** **answers** to almost all quantum paradoxes.

4.  Know whether or not **Schrödinger’s** **Cat** is absurd in one world, but unproblematic when it represents one world with a live cat and a **multitude** of worlds with the cat which died at different times of detection of the radioactive decay. Know whether or not it seems that [**Einstein**] would adopt the MWI, because it resolves two main difficulties Einstein had with quantum mechanics: **randomness** and **action** at a **distance**. Know whether or not the paradoxical behavior of Bell-type experiments disappears when quantum measurement does not have a **single** **outcome**.

5.  Know whether or not the paradox of the amount of information transferred in **teleportation** is resolved by the **nonlocality** of worlds and an observation that the only information remaining to be transferred after the local Bell measurement is the **identity** of the world we are in [2]. Know whether or not, up until … (our present) there is **no** **difference** in our experience between the **single** world of the universe in which quantum mechanics includes **collapses** at every quantum measurement and the corresponding world of the MWI universe. Know whether or not there is **no** **difference** in the description of the past between the MWI and the theory with collapse at every measurement.

6.  Know whether or not, while in the **collapsing** **universe** there is a diachronic identity of the world towards the past and future, in the MWI, there is **no** **diachronic** **identity** towards the **future**. Know whether or not we understand that chancy events are our **illusion** in a deterministic physical universe due to our construction which does not allow the experience of **superpositions**. Know whether or not we care for all future parallel worlds according to their “**measure** **of** **existence**,” which is proportional to the objective probabilities of the **corresponding** possible collapsing worlds. Know whether or not the “world” in [the author’s] MWI is **not** a **physical** **entity**.

7.  Know whether or not a world is the totality of **macroscopic** objects: stars, cities, people, grains of sand, etc., in a definite classically described state. Know whether or not the MWI is “The Theory of the **Universal** **Wave** **Function**”, but the starting point in our description is **our** **world**, not the universal wave function. Know whether or not the MWI believer, being aware of recent quantum measurements, has information about some **parallel** **worlds**. Know whether or not the theory of our brain is not **developed** enough, but the hope is that the wave function of some collective variables of its constituents in three-dimensional space directly corresponds to our **experience**.

8.  Know whether or not the three-dimensional wave function of the collective variables of macroscopic objects is the **bridge** between the world wave function and our experience. Know whether or not the MWI is a **deterministic** theory, but the determinism is manifested on the level of all worlds together. Know whether or not the **complete** knowledge of the wave function of our world, **prior** to a quantum measurement, does not specify a **particular** outcome. Know whether or not the observer does not have a concept of probability of an outcome…but she has a legitimate concept of probability of **self-location** in a world with a particular outcome. Know whether or not the **reluctance** of a human to accept the MWI is **natural**. Know whether or not it is **misleading** to view the universe as a multitude of (countable) classical worlds created by a **magician**.