Chalmers throughout uses "P entails Q" as synonymous with the material conditional "P \implies Q". And "P implies Q" is used as synonymous with the claim that the conditional "P \implies Q" is a priori. See p. 209. Both usages are regrettable.

"P \implies Q" is a priori iff it is an epistemic necessity, i.e. in every scenario in which P is true, Q is also true. (This is incorrect! See next paragraph.) Alternatively, there is no scenario in which P is true and \neg Q is true. (Note that if we have gappy scenarios--in which Q or \neg Q don't have truth values--the latter isn't the same as saying "P is true and Q is not true".)

Revision: when the primary intension of P evaluates to the True, it should not be read as "P is satisfied" in that scenario. It should be read as "P is verified" by that scenario, where the latter just means: it would be rational to endorse P. Otherwise we could never have worlds that verify P without also satisfying P (see p 140, bottom). And the primary intensions of a token would never differ from their secondary ones.

"P \implies Q" is a priori iff it is an epistemic necessity, i.e. every scenario that verifies P also verifies Q. In more detail: A sentence token P is epistemically necessary iff the primary intension of P evaluates to the True in all scenarios (T5, p 546). That is, P is epistemically necessary iff for every centered possible word or scenario w*, a complete and semantically neutral description D of w* should lead a subject rationally to endorse P. (This doesn't require that P is satisfied in w*)

Chalmers and Jackson in the original article used the phrase "puts the subject in a position to know that P". But in the worlds in which P is verified but not satisfied, of course the subject does not know that P, since P is not the case. [end of Revision]

"Implies" is a confusing word to use for this relation. To pull it into line with earlier terminology one could say that P "epistemically necessitates" Q. Then we can state some claims from ch 7 as follows (my numbering, not his):

7.1 Microphysics (P, plus some other conjuncts QTI) epistemically necessitates some macrophysical truths M. M are truths such as: that x is a body of water, that y is gold, that z is alive [where x, y, z are things found in particular spatio-temporal regions], that water boils at 100 degrees Celsius at sea level, and that water is found in the oceans (pp 224-5).

7.2 Successful reductive explanation requires the reducing theory epistemically necessitate the reduced theory (see pp. 207, 234).

7.3 P can epistemically necessitate Q even though there are terms in the vocabulary of Q that are not found in the vocabulary of P, and those Q terms are not provided any explicit analyses or definitions in the P vocabulary. (pp. 213, 244)

So these "a priori entailments" are not true in virtue of their logical form. Epistemic necessitation does not require "bridge laws" or even analyses of the vocabulary in the reduced science using the vocabulary of the reducing science.

In ch 10, Chalmers uses "explanatory gap" to mean a failure in explanation (as opposed to the absence of an explanation), and "epistemic gap" to mean a failure in epistemic necessitation. (He also uses "ontological gap" to mean the failure of physicalism, or the demonstration of distinct existences.) But a key claim in ch 10 makes sense given 7.2 above:
10.1 If "P & ~Q" is ideally primarily positively conceivable, then there is an "explanatory gap" between P and Q. If "P" is "physical" then such ipp conceivability shows that "Q is not physically explicable" (see pp 313, 312, 307).

If "P & ~Q" is ipp conceivable, then there is a scenario in which the primary intensions of both P and ~Q evaluate to the True. So "P ⊃ Q" is false in some scenarios, so it is not an epistemic necessity. So P does not epistemically necessitate Q. By 7.2, P cannot explain Q. ( pp 329 ff.)

In ch. 10 Chalmers uses the term "transparent explanation" for those that provide an epistemic necessitation from low-level truths to higher-level truths (pp 313, 329).

Some details on the Chalmers & Jackson argument in ch. 7

P includes all the truths about the fundamental entities of a completed micro-physics (p 209). It also includes all of its fundamental laws.

T is the "that's all" claim, clarified on p. 210: it states that the world in question is a minimal world satisfying P. World w₁ outstrips w₂ iff w₂ is a proper part of w₁ but [redundantly] w₁ is not a proper part of w₂. (Or: w₁ contains a "qualitative duplicate" of w₂ but w₂ does not contain a qualitative duplicate of w₁.) Then w is a minimal world satisfying P iff it does not outstrip any other world satisfying P. [Note they say "satisfy", not "verify".]

I makes the world a centered world: it adds the two claims "I am A" (where A is an identifying description of a person located somewhere in that world) and "The current time is B" (in the reference frame of that person, at least; the framework ignores special relativity).

Q is the conjunction of all "phenomenal truths", where "phenomenal properties" are again thought of as properties of mental states. For any subject conscious at any time in the world w, Q "will specify precisely what it is like to be that subject at that time" (p. 212). (So they won't obviously include claims about appearances of sensible objects like "the distant mountains look blue" but rather what it is like to have the experience of the distant mountains looking blue.) On 221 they suggest that Q contains the complete truth about actual and counterfactual experiences.

M is a claim about macroscopic objects, often put in ordinary language, such as "water covers much of this planet" or "there are many living beings on this planet". It includes "water is H₂O" and "life propagates through replication of DNA" (p. 210) It can also be a particular claim like "the stuff in region x (that filled by Mirror Lake, say) is water" (p 224).

The claim (7.1): that "PQTI ⊃ M" is a priori. A subject can know "PQTI ⊃ M" from the armchair (p 240). PQTI epistemically necessitates M. A centered world satisfying PQTI "puts one in a position to know" M (p. 224), or "suffices in principle for knowledge of M, with no other empirical information required" (p. 225).

Some bullets they are willing to bite:

1. The rafts of conditional abilities on which epistemic necessitation depends vary from person to person, and among different uses of the same name. ("Neptune", p 219). So they're attached to uses of particular tokens, not to language-meaning or the semantics of the language (p. 235).

2. No human could grasp [understand, comprehend] all of P. But that's OK, since the argument concerns what is "knowable in principle" (p 226). In Chalmers-speak, it concerns ideal
conceivability, not prima facie conceivability. A virtual reality supercomputer would allow a human to determine whether the centered world w* verifies M or not (p 226).

3. Some epistemic possibilities dictate "no clear decision" about the application of a concept (p. 236, top). These require additional "terminological stipulations".

4. A sentence that was used to express something that was not a priori can come to be used to express something that is a priori (p 236). But this is OK, since it is "merely terminological".

5. In a centered world satisfying PQTl, a subject can "identify the extension" of concepts found in M (pp. 215, 216 & passim) or "evaluate the concept's extension" (ibid). This one seems optional; I think all they need say is that a subject can determine the truth or falsity of M in that world.