**PRACTICE MIDTERM EXAM – ANSWER KEY** NAME ______________________________

PHIL 110, SPRING 2014
HAMILTON
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**PART 1:** CIRCLE **TRUE** OR **FALSE** FOR EACH OF THE FOLLOWING STATEMENTS. (*1 point each*)

1. F — If the premises of an argument are all true in some particular world, the argument must be valid and sound for that world.

2. T — The conclusion of an invalid argument may be true in some particular world.

3. T — If an argument is truly sound in some particular world, it must be a valid argument.

4. T — **¬(P ∧ Q) ⇔ ¬P ∨ ¬Q**

5. F — **¬¬¬P ⇔ P**

6. F — **P ∨ Q** is a logical truth.

7. T — If two sentences are tautologically equivalent to each other, then they are logically equivalent to each other.

8. T — The FOL predicate **Larger** is transitive.

9. F — The only way for the complex sentence **P ∧ Q** to be false in some world is for both **P** and **Q** individually to be false in that world.

10. T — The sentence **(¬Cube(a) ∧ Tet(b)) ∨ ¬(Cube(a) ∧ ¬Tet(b))** considered as a whole is a disjunction.

11. T — A truth claim (sentence) is logically possible if it is true in one or more possible worlds.

12. F — The proof rule 'Identity Introduction' is used to assert a new identity statement of the sort **a = b**.

13. T — **SameSize(a,b)** is a logical consequence of **SameSize(b,a)** in virtue of the meaning of the predicate involved.

14. T — The symbol **¬** is a Boolean connective.

15. T — A truth table is able to demonstrate instances of tautological consequence.

16. T — The premise of a subproof requires no justification by a proof rule.

17. F The proof rule 'Disjunction Introduction' is also called 'Proof by Cases.'

18. T A sentence of FOL is demonstrably a tautology if in a truth table the truth-values directly under the sentence's main connective are true in all rows.

19. T Each row of a truth table represents one possible combination of truth-values of whatever distinct atomic sentences are contained within the complex sentence(s) being evaluated in the table.

20. F In the Tarski's World blocks language, '**RightOf**' is a unary predicate.

21. T The following statement is an atomic sentence of FOL: **Between(a,b,c)**

22. F One way to demonstrate that an argument is invalid is to provide a counterexample world in which the premises of the argument are false but the conclusion is true.

23. F The following is a complex sentence of FOL: **SameSize(a ∧ b)**

24. T The following sentence is a contradiction as considered in the blocks language for Tarski's World: **FrontOf(d,e) ∧ SameRow(e,d)**

25. T The following set of four sentences constitutes a contradiction as considered in the blocks language for Tarksi's World: (1) **Larger(a,b)** (2) **Larger(b,c)** (3) **Larger(c,d)** (4) **Larger(d,e)**

26. F Sentences may contradict each other only if each of the sentences individually is a contradiction.

27. F The proof rule **¬Intro** is based on the fact that anything and everything follows from a contradiction.

28. T The proof rule **⊥ Intro** provides a means of flagging a contradiction that has arisen in the course of the proof.

29. F Once a subproof has been discharged, any individual line of that subproof may serve as input to the proof rules that justify subsequent steps of the proof.

30. T One element of a good strategy for tackling proofs is to first think through whether the argument you intend to prove is really valid.

**PART 2: Write a good translation of each of the following sentences into FOL.** (*2 points each*)

31. "*a* is a small cube to the right of *b*"

Translation into FOL: ______Small(a) ∧ Cube(a) ∧ RightOf(a,b)_________________________

**32.** "*a* is neither small nor a tetrahedron, and it's in the same row as *b*"

Translation into FOL: ________¬(Small(a) ∨ Tet(a)) ∧ SameRow(a,b)_______________________

**33.** "*a* and *b* are both in front of *c*"

Translation into FOL: __________FrontOf (a,c) ∧ FrontOf(b,c)_________________________

**34.** "*a* is small, but *b* is not"

Translation into FOL: __________Small(a) ∧ ¬Small(b)________________________________

**Part 3: In the blank next to each of the following four sentences, put the *one capital letter* (from the accompanying diagram) that labels the <u>innermost</u> logical region to which the sentence belongs. *You may use the same letter more than once.*** (*2 points each*)

**A: logical possibility**

**35.** SameSize(b,a) ∨ ¬SameSize(b,a) ___C__

**36.** SameSize(b,a) ∨ ¬SameSize(a,b) ___B__

**37.** SameSize(b,a) ∧ SameSize(a,b) ___A__

**38.** ¬SameSize(a,b) ∧ ¬SameSize(b,a) ___A__

**Part 4: In the box, draw a world that provides a *counterexample* to the following argument. Clearly indicate the sizes of your objects.** (*4 points*)

39. **P1:** Large(a) ∨ Large(b)

**P2:** Large(a) ∨ Large(c)

**Concl:** Large(a) ∧ (Large(b) ∨ Large(c))