1. Multiple Choice (10 points)
Directions: Circle the letter next to the best answer, or write in the answer on the line provided.

1. Which of the following is a statement?
   a. “Pick up your clothes.”
   b. “Let’s make a sand castle.”
   c. “Are we going there?”
   d. “He said no.”
   e. Some combination of a-d, namely this:____________________
   f. None of the above.

2. A sound argument is one that is valid and
   a. has at least one true premise
   b. is accepted by most reasonable people
   c. has all true premises
   d. has all true premises and each premise is a well-known truth
   e. Some combination of a-d, namely this:____________________
   f. None of the above.

3. A conditional is false just in case
   a. It’s conjuncts are both false.
   b. At least one of its disjuncts are false.
   c. It’s antecedent and consequent are both false.
   d. The right side and the left side differ in truth value.
   e. Some combination of a-d, namely this:____________________
   f. None of the above.

4. An argument is true
   a. If and only if it is valid.
   b. Just in case it is sound.
   c. Provided that all of its premises are true.
   d. Provided that its conclusion is true.
   e. Some combination of a-d, namely this:____________________
   f. None of the above.

5. Modus tollens has the following form:
   a. If A, then B; B; so A.
   b. If A, then B; A; so B.
   c. If A, then B; not-A; so not-B.
   d. If A, then B; not-B; so not-A.
   e. Some combination of a-d, namely this:____________________
   f. None of the above.
2. The Counterexample Method (10 points)

Directions: Using the scheme of abbreviation provided, state the form of the argument. Then use the counterexample method to show that it is invalid. It is best to employ terms whose interrelations are well known, such as “cat,” “dog,” “collie,” “mammal,” and “animal”; or, “square,” “triangle,” “3-sided,” “4-sided,” “plane figure,” and “geometrical figure”. If you must, you can use fire and air and the like.

If Amanda drops in five 3-pointers every game for the rest of the season, then the Vikings are going to the Regionals. So, if Amanda doesn’t drop in five 3-pointers every game for the rest of the season, then the Vikings aren’t going the Regionals. (A = Amanda drops in five 3-pointers every game for the rest of the season; R = the Vikings are going to the Regionals)

3. The Famous Forms Method (10 points)

Directions: Using the scheme of abbreviation provided, state the form of the argument. Then use the famous forms method to argue that it is valid.

If Earth is just one of thousands of planets inhabited by persons, then human beings really aren’t very special. If human beings really aren’t very special, then the Judeo-Christian religious tradition is false. So, if Earth is just one of thousands of planets inhabited by persons, then the Judeo-Christian religious tradition is false. (E = Earth is just one of thousands of planets inhabited by persons; H = Human beings are very special; J = the Judeo-Christian religious tradition is true)

4. True or False (5 points)

Directions: Circle the letter next to the best answer, or write in the answer on the line provided.

1. T F In A • B, the capital letters are called disjuncts.
2. T F If the atomic statement A is true and B is false, then the compound statement A ↔ ~B is false.
3. T F The statement [(A v B) • A] → B is a tautology.
4. T F A negation is false just in case its atomic statement is false.
5. T F The statement “If Jones did it if and only if his fingerprints are on the weapon, then either Smith was in Maui or Brown was in Australia” is best translated as a material conditional.
5. Symbolizing (10 points)
Directions: Each of the following is a single compound statement. Translate each one into symbols, using the scheme of abbreviation provided.

1. The claim that if environmental factors can force a population of moths to change its color in less than five generations, then environmental factors can force a population of amoebas to evolve into human beings in several millions of generations is true only if there is an evolutionary pathway between phyla. (M = Environmental factors can force a population of moths to change its color in less than five generations; H = Environmental factors can force a population of amoebas to evolve into human beings in several millions of generations; P = There is an evolutionary pathway between phyla)

2. If morality is relative only if logic is too, and logic is not relative, then morality is not relative. (M = Morality is relative; L = Logic is relative)

6. Determining Truth Values (10 points)
Directions: Circle T (true) or F (false) depending on which is the truth value of the following compound statements. Make the following assumptions: A is true, B is true, C is false, D is false.

1. \[ \neg (A \land C) \]
2. \[ \neg (C \lor B) \iff [D \land \neg (A \lor B)] \]

7. Complete Truth Tables (10 points)
Directions: Construct a complete truth table for the following argument and then circle V (valid) or I (invalid) depending on whether it is valid or invalid. If the argument is invalid, place a star next to all of the rows that demonstrate its invalidity. For our purposes a complete truth table will have, at least, a truth value assigned for each premise, logical operator, and conclusion of every row.

\[ (A \land B) \lor (A \land \neg B), A \rightarrow \neg B :. \neg B \]

8. Abbreviated Truth Tables: Invalidity (10 points)
Directions: Construct an abbreviated truth table beneath the following argument to show that it is invalid.

\[ R \leftrightarrow \neg Q, R \lor Q, R \lor P :. (P \land Q) \rightarrow R \]

9. Abbreviated Truth Tables: Validity (20 points)
Directions: Construct an abbreviated truth table beneath each of the following arguments to show it is valid.

1. \[ B \leftrightarrow A, \neg A \lor C, \neg C :. \neg B \]
2. \( A \lor B, \quad B \rightarrow (C \leftrightarrow D), \quad \neg A \lor (C \leftrightarrow D) \quad \therefore \quad C \leftrightarrow D \)

10. **Logically significant categories (5 points)**

**Directions**: Circle the best answer from amongst those provided.

The statement \((R \land \neg R) \rightarrow S\) is a

a. logical equivalence  
b. contradiction  
c. tautology  
d. contingent statement  
e. some combination of a-d, namely ___________________

f. none of the above

**Extra Credit (10 points)**

**Directions**: Using the scheme of abbreviations provided, show whether the following argument is valid or invalid using an abbreviated truth table.

If the interplay of random (genetic) variation and natural selection is the primary mechanism behind the differentiation of phyla and other broad taxa, then there existed a vast number of transitional organisms. If there existed a vast number of transitional organisms, then there now exist fossils of clear cases of some transitional organisms. If there now exist fossils of clear cases of transitional organisms, then we have discovered some of them. We have not discovered clear cases of transitional organisms. So, it is false that the interplay of random (genetic) variation and natural selection is the primary mechanism behind the differentiation of phyla and other broad taxa.

(I = The interplay of random (genetic) variation and natural selection is the primary mechanism behind the differentiation of phyla and other broad taxa;  
T = There existed a vast number of transitional organisms;  
N = There now exist fossils of clear cases of some transitional organisms;  
D = We have discovered fossils of clear cases of some transitional organisms.)