1. Let p be the statement "Billy Bob is a chemistry major," and q be the statement "Linda Lou is a Physics major." Write the following statements in symbols.

It is false that Billy Bob is a chemistry major or Linda Lou is Physics major.

- A.  $p \rightarrow q$
- B.  $\sim p$
- C.  $q \leftrightarrow p$
- D.  $\sim (p \vee q)$
- E.  $p \wedge q$
- F.  $\sim q$
- G.  $\sim q \rightarrow p$

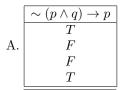
2. Determine if the following sentence is a statement or not.

Who will be president in 2024?

- A. Not a statment.
- B. Is a statement.

3. Fill in the missing values of the following truth table. Note: You may need to include more columns in your truth table to decide the truth values in the right-most column below.

| p             | q | $\sim (p \land q) \to p$ |
|---------------|---|--------------------------|
| T             | T |                          |
| $\mid T \mid$ | F |                          |
| F             | T |                          |
| F             | F |                          |



B. 
$$\begin{array}{|c|c|c|}\hline \sim (p \land q) \to p \\\hline T \\ F \\ F \\ F \end{array}$$

C. 
$$\begin{array}{|c|c|} \hline \sim (p \land q) \to p \\ \hline T \\ T \\ T \\ F \\ \hline \end{array}$$

D. 
$$\begin{array}{|c|c|} \hline \sim (p \land q) \to p \\ \hline T \\ F \\ T \\ T \end{array}$$

|    | $\sim (p \land q) \to p$ |
|----|--------------------------|
|    | T                        |
| Ε. | T                        |
|    | F                        |
|    | F                        |
|    |                          |

|    | $\sim (p \land q) \to p$ |
|----|--------------------------|
|    | T                        |
| F. | T                        |
|    | F                        |
|    | T                        |

|    | $\sim (p \land q) \to p$ |
|----|--------------------------|
|    | T                        |
| G. | T                        |
|    | T                        |
|    | T                        |

$$\text{H.} \begin{array}{|c|c|}\hline \sim (p \land q) \to p\\\hline T\\F\\T\\F\\\end{array}$$

4. Fill in the missing values of the following truth table. Note: You may need to include more columns in your truth table to decide the truth values in the right-most column below.

| p | q | $\sim p \leftrightarrow q$ |
|---|---|----------------------------|
| T | T |                            |
| T | F |                            |
| F | T |                            |
| F | F |                            |



B.  $\begin{array}{|c|c|c|}\hline F & F & F \\\hline F & F & F \\\hline \end{array}$ 

C. 
$$\begin{array}{|c|c|c|} \hline \sim p \leftrightarrow q \\ \hline F \\ T \\ \hline F \\ T \\ \hline \end{array}$$

 $\text{D.} \begin{array}{|c|c|}\hline \sim p \leftrightarrow q \\\hline F \\\hline T \\\hline T \\\hline T \\\hline \end{array}$ 

$$\text{E.} \begin{array}{|c|c|} \hline \sim p \leftrightarrow q \\ \hline F \\ T \\ T \\ F \\ \hline \end{array}$$

 $F. \begin{array}{|c|c|}\hline \sim p \leftrightarrow q \\\hline T \\\hline F \\\hline T \\\hline F \\\hline F \\\hline \end{array}$ 

G. 
$$\begin{array}{|c|c|c|} \hline \sim p \leftrightarrow q \\ \hline T \\ T \\ T \\ T \\ T \end{array}$$

 $\text{H.} \begin{array}{|c|c|}\hline \sim p \leftrightarrow q \\\hline T \\\hline F \\\hline F \\\hline F \\\hline \end{array}$ 

 $5.\ \,$  Determine if the statement is a tautology, a self-contradiction, or neither.

$$(p \to q) \land (q \to p)$$

- A. Tautology
- B. Neither
- C. Self-Contradiction

6. Write the contrapositive of the following statement:

If he graduates, then he will get a good job.

- A. If he doesn't graduate, then he won't get a good job.
- B. If he doesn't get a good job, then he doesn't graduate.
- C. If he gets a good job, then he will graduate.

7. Write the inverse of the statement  $(p \lor \sim q) \to r$ .

A. 
$$r \to (p \lor \sim q)$$

B. 
$$\sim r \rightarrow \sim (p \lor \sim q)$$

$$\mathrm{C.} \sim (p \vee \sim q) \rightarrow \sim r$$

8. Use a truth table to decide if the following argument is valid.

$$p \leftrightarrow q$$

$$\sim q$$

$$\therefore \sim p$$

- A. Valid
- B. Invalid

9. Use a truth table to decide if the following argument is valid.

$$\begin{array}{c} p \leftrightarrow q \\ q \leftrightarrow r \\ \hline \therefore p \land q \end{array}$$

- A. Valid
- B. Invalid

10. Use a truth table to decide if the following argument is valid.

$$\begin{array}{c}
\sim p \lor q \\
q \to \sim p \\
\hline
\therefore p
\end{array}$$

- A. Invalid
- B. Valid

## Answers

- 1. D.
- 2. A.
- 3. E.
- 4. E.
- 5. B.
- 6. B.
- 7. C.
- 8. A.
- 9. B.
- 10. A.