**Argument:** Two or more declarative sentences/propositions, one or more of which (the premises) are claimed to provide reasons to believe, (or support for), one of the other propositions (the conclusion).

<table>
<thead>
<tr>
<th>Premise Indicators</th>
<th>Conclusion Indicators</th>
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<tbody>
<tr>
<td>Since</td>
<td>therefore</td>
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<tr>
<td>Because</td>
<td>hence</td>
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<tr>
<td>for/for one thing</td>
<td>thus/ergo</td>
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<tr>
<td>for the reason that</td>
<td>so</td>
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<tr>
<td>follows from</td>
<td>follows that</td>
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<tr>
<td>inasmuch as</td>
<td>consequently</td>
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<tr>
<td>as shown by</td>
<td>which entails that</td>
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<tr>
<td>given that</td>
<td>which proves that</td>
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<tr>
<td>seeing that</td>
<td>which implies that</td>
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<tr>
<td>owing to</td>
<td>necessarily</td>
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<tr>
<td>seeing that</td>
<td>must be the case that</td>
</tr>
<tr>
<td>as/as indicated by</td>
<td>which means that</td>
</tr>
<tr>
<td>assuming that</td>
<td>demonstrates that</td>
</tr>
<tr>
<td>considering that</td>
<td>we can conclude that</td>
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<td></td>
<td>as a result</td>
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</tbody>
</table>

**Valid truth-functional argument forms:**

**Disjunctive syllogism:** $p$ or $q$, not $p$, therefore, $q$

**Modus ponens:** If $p$ then $q$, $p$, therefore, $q$

**Modus tollens:** If $p$ then $q$, not $q$, therefore, not $p$

**Chain argument:** If $p$ then $q$, if $q$ then $r$, therefore, If $p$ then $r$

**Constructive dilemma:** Either $p$ or $q$, if $p$ then $r$, if $q$ then $s$, therefore, either $r$ or $s$. 
If and only if argument: p if and only if q, q, therefore p

Invalid truth-functional forms:

p or q, p, therefore not q

Denying the antecedent: If p then q, not p, therefore not q

Affirming the consequent: If p then q, q, therefore p

Some common English expressions and their truth functional equivalents:

p only if q = If p then q, (Another equivalent is: If not q then not p)

p if q = If q then p

p unless q = p or q, (Also: if not q then p) (Also: if not p then q)

p given that q = If q then p

Assuming that p, q = If p then q

Neither p nor q = Not (p or q), (Also,: not p and not q)

Not both p and q = Not (p and q), (Also: not p or not q)

Validity Exercises: Decide for each argument whether it is valid or invalid

1. p unless q, not p, thus, q

2. p if q, not q, thus, not p

3. p or q, q, thus, p

4. If p then q, q, thus, p

5. p only if q, not p, thus, not q
6. not (p and q), not p, thus, q
7. p if and only if q, q, thus p
8. p or q, p, thus, not q
9. p given that q, p, thus, q
10. Neither p nor q, thus, not p
11. p only if not q, q, thus, not p.
12. not p unless q, not q, thus, p.
13. If p then q, If p then r, thus, if q then r.
14. p unless not q, p, thus, q.

For each argument below, put it into standard truth functional form using the suggested letters to represent propositions and then determine whether the resulting argument is valid.

1. George must really love Cheryl. He called her 3 times yesterday, and he would do that only if he was in love with her. (G, C)

2. Anarchy would work if men were angels. Alas, they are not. So anarchy won't work. (A, M)

3. If the lights still work, the battery is not dead. The lights work. Thus, the battery is not dead.

4. Bob will show up unless he is ill. There Bob is now. He must not be ill.

5. The paper turns red if it's dipped in beer. It's turned red. Thus, it was dipped in beer.


7. Oswald killed Kennedy only if Fetzer's ideas are nutty. But Fetzer's ideas are nutty. Thus, Oswald killed Kennedy.