Solutions (Truth Tables)

1) 16 rows, 5 columns
(4 atoms → 2^4 rows)
($\neg q$, $\neg s$, $P \vee \neg q$, $(P \vee \neg q) \rightarrow r$, $((P \vee \neg q) \rightarrow r) \wedge$

2)

P	q	r	$\neg r$	$\neg P$	$(q \wedge \neg P)$	$\neg r \rightarrow (q \wedge \neg P)$
0	0	0	1	1	0	0
0	0	1	0	1	0	1
0	1	0	1	1	1	1
0	1	1	0	1	1	1
1	0	0	1	0	0	0
1	0	1	0	0	0	1
1	1	0	1	0	0	0
1	1	1	0	0	0	1

It is a contingency. because it can be both true and false, depending on the truth values of the atoms

3)

P	q	$\neg P$	$\neg q$	$(P \wedge \neg q)$	$((P \wedge \neg q) \vee \neg P)$	$\neg((P \wedge \neg q) \vee \neg P)$
0	0	1	1	0	1	0
0	1	1	0	0	1	0
1	0	0	1	1	1	0
1	1	0	0	0	0	1

It is a contingency because it can be both true and false depending on the truth values of the atoms.

4) Given, $p \to T, (1)$

$q \to T, (1)$

$r \to F, (0)$

$s \to F, (0)$

$\therefore \neg((0 \vee 1) \wedge (\neg(0) \vee \neg(1)))$

$= \neg((1) \wedge (1 \vee 0))$

$= \neg(1 \wedge 1)$

$= \neg(1) = 0$

$\therefore$ The truth value is False.

5)

a	b	c	$\neg a$	$(\neg a \vee b)$	$((\neg a \vee b) \wedge c)$	$(((\neg a \vee b) \wedge c) \leftrightarrow b)$	$((((\neg a \vee b) \wedge c) \leftrightarrow b) \to a)$
0	0	0	1	1	0	1	0
0	0	1	1	1	1	0	1
0	1	0	1	1	0	0	1
0	1	1	1	1	1	1	0
1	0	0	0	0	0	1	1
1	0	1	0	0	0	1	1
1	1	0	0	1	0	0	1
1	1	1	0	1	1	1	1

6)

a	b	$\neg a$	$(\neg a \to T)$	$(\bot \vee b)$	$(\neg a \to T) \leftrightarrow (\bot \vee b)$
0	0	1	1	0	0
0	1	1	1	1	1
1	0	0	1	0	0
1	1	0	1	1	1

It is a contingency, because it can be both true and false depending on the truth values of the atoms.

7)

a	b	$\neg b$	$(a \leftrightarrow \bot)$	$(T \leftrightarrow \neg b)$	$(a \leftrightarrow \bot) \wedge (T \leftrightarrow \neg b)$
0	0	1	1	1	1
0	1	0	1	0	0
1	0	1	0	1	0
1	1	0	0	0	0

It is a contingency because it can be both true and false depending on the truth values of the atoms

8)

p	q	$\neg q$	$(p \to q)$	$\neg(p \to q)$	$(p \wedge \neg q)$	$\neg(p \to q) \to (p \wedge \neg q)$
0	0	1	1	0	0	1
0	1	0	1	0	0	1
1	0	1	0	1	1	1
1	1	0	1	0	0	1

It is a tautology.

9)

p	q	$\neg p$	$(\neg p \rightarrow q)$	$(p \vee q)$	$((\neg p \rightarrow q) \leftrightarrow (p \vee q))$	$\neg((\neg p \rightarrow q) \leftrightarrow (p \vee q))$
0	0	1	0	0	1	0
0	1	1	1	1	1	0
1	0	0	1	1	1	0
1	1	0	1	1	1	0

It is a contradiction