A. Which are sentences of TFL and which are not?

1. (P ∨ ¬Q) & R)

2. ((S → T) ∨ ¬(R ↔ S))

3. ((t & s) → (p → r))

4. (R¬ → Q) → R

5. (P ∨ Q & R)

6. ¬(¬R ∨ ¬S) & ¬¬R

B. Identifying the main logical operator

1. ((P & R) ∨ (Q → ¬R))

2. ((Q ∨ R) → T)

3. (¬S → (A & K))

4. ¬(B ∨ (A & ¬C))

5. (A & D) ↔ (¬C → B)

6. (A & (B ∨ C))

7. ((P & Q) & R)

8. (A & B) ∨ (C & (D → G))

9. ¬(A & B)

10. ¬(P & Q) ∨ ¬(Q & R)

11. (((A & ¬C) ↔ (B → ¬A)) ∨ (D & C))

12. (((P ∨ Q) & T) → ((R & ¬P) ↔ (S & ¬T)))

13. ((D ∨ ¬B) & (C → ¬A)) → (A & B)

14. ((C ∨ B) & D) → ((A & ¬C) ↔ (C & ¬D))

15. (¬(P & ¬P) & (P → (Q ∨ ¬Q)))

16. ¬((P ↔ Q) & (R ↔ S)) & ((P ∨ R) ↔ ¬(Q ∨ S))

17. ¬(P → Q) & ((R ↔ S) & ((P ↔ R) ↔ (Q ∨ S)))

18. ¬(((P → Q) & (R & P)) ∨ (R & Q))

19. ¬(¬P & (Q → R)) & ((P & Q) → R)

20. ¬((P & (Q & R)) ↔ ((P & Q) & (¬P & R)))

C. Determining the sentence's truth value.

P is true, Q is false

1. P & Q
2. P ∨ Q
3. ¬(P & Q)
4. Q ∨ (P → Q)

P is true, Q is true, S is false

5. (P & Q) ∨ (Q → S)
6. (S → P) & (Q ∨ S)

P is true, Q is true, S is false, T is false

7. (P & T) ∨ (P & (S → Q))
8. ¬(S ∨ T) & (P → T)

D. Translating

(a) It did not snow in Miami yesterday, or the trial ended in a hung jury.

(b) The trial ended in a hung jury if and only if it did not snow in Miami yesterday.

(c) If the trial did not end in a hung jury, then either it did not snow in Miami yesterday or the elephant is purple.

(d) It is not the case that if the trial ended in a hung jury, then it did not snow in Miami yesterday.

E. Valid or valid?

[P1] If the Office has the envelope, then K is in Milan.
[P2] K is in Milan.
[C] Therefore, the Office has the envelope.

[P1] If the Office has the envelope, then K is in Milan.
[P2] The Office does not have the envelope.
[C] Therefore, K is not in Milan.

[P1] If the Office has the envelope, then K is in Milan.
[P2] The Office has the envelope.
[C] Therefore, K is in Milan.

[P1] If the Office has the envelope, then K is in Milan.
[P2] K is not in Milan.
[C] Therefore, the Office does not have the envelope.