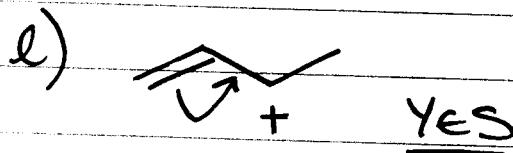
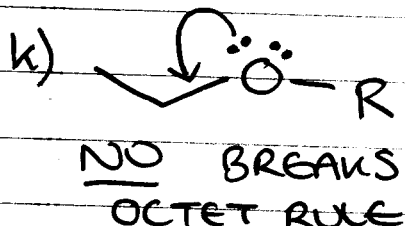
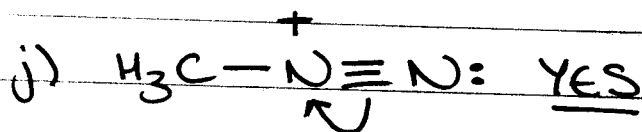
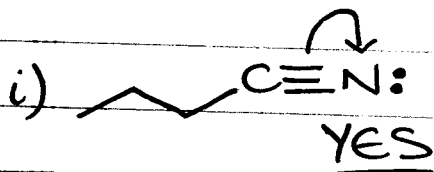
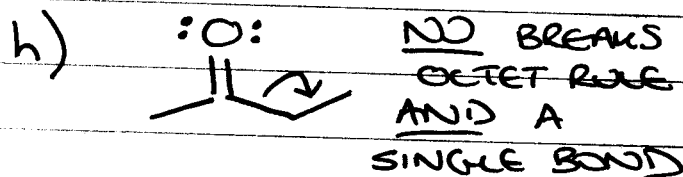
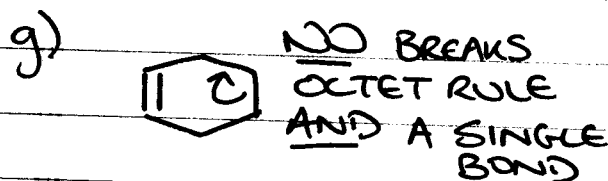
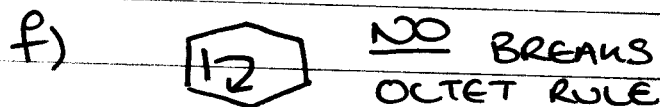
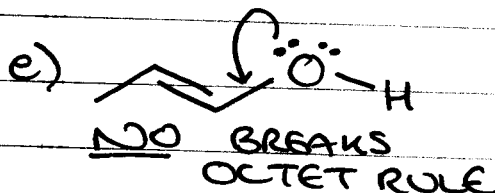
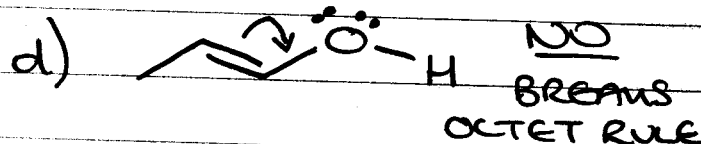
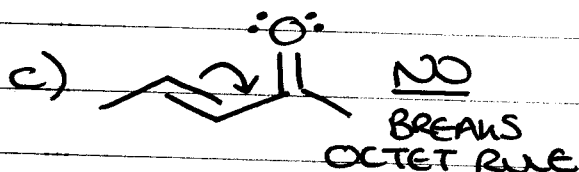
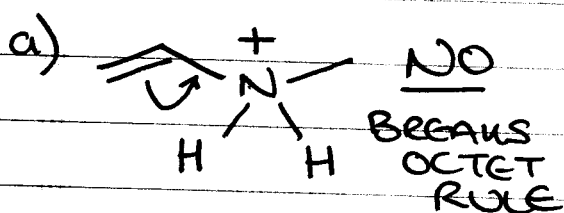


## EXTRA PROBLEMS: RESONANCE

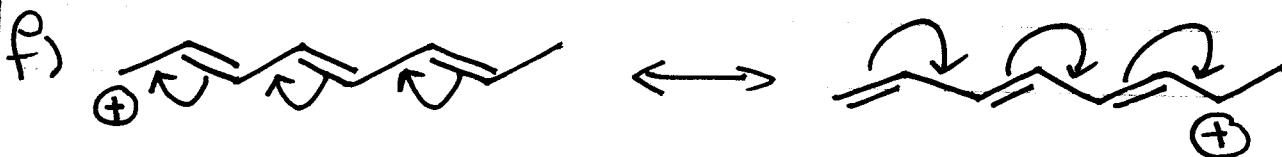
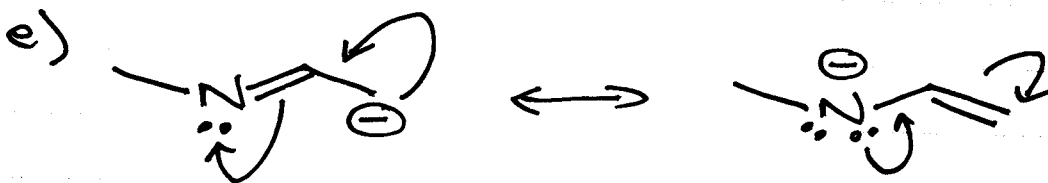
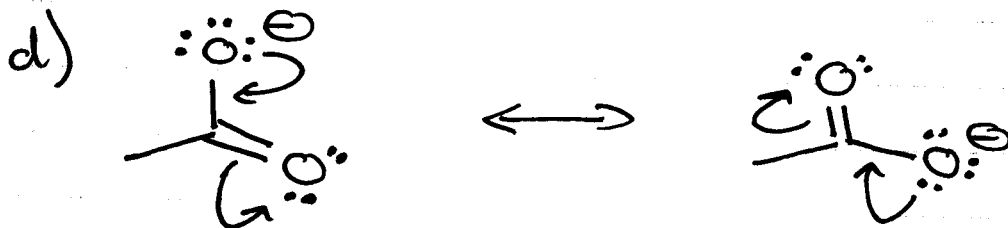
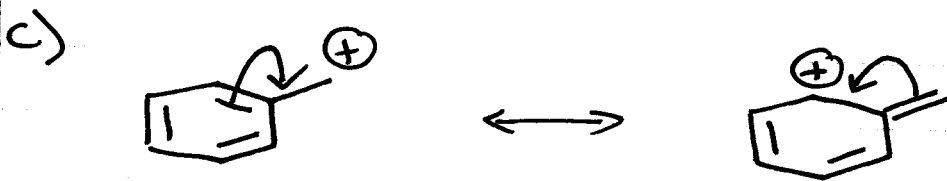
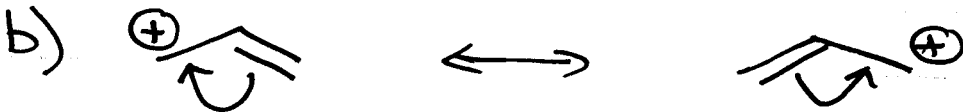
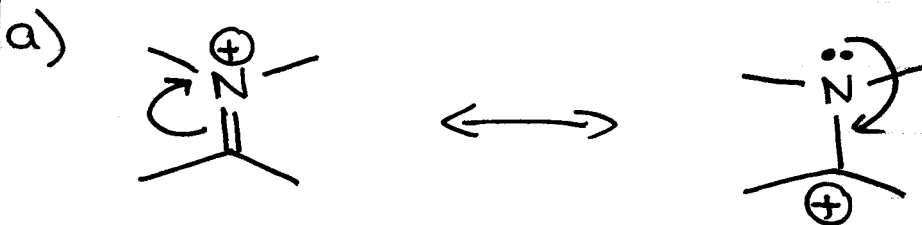
(TAKEN FROM "Organic Chemistry as a Second Language"  
by David R Klein

① FOR EACH STRUCTURE DRAWN BELOW,  
DOES THE ARROW RESULT IN A REASONABLE  
RESONANCE CONTRIBUTOR? IF NOT, WHY NOT?

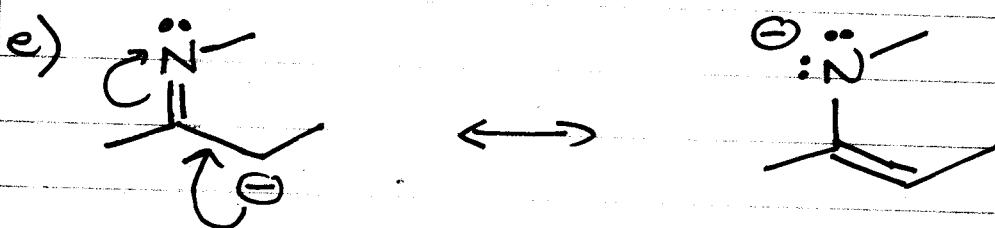
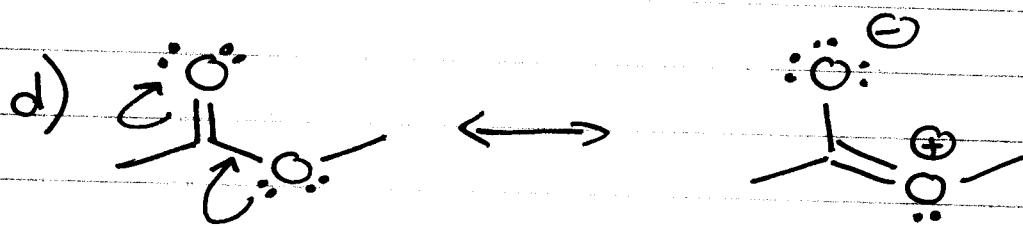
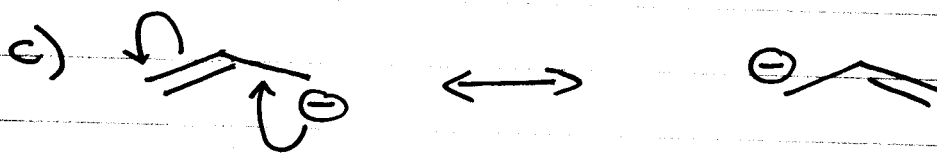
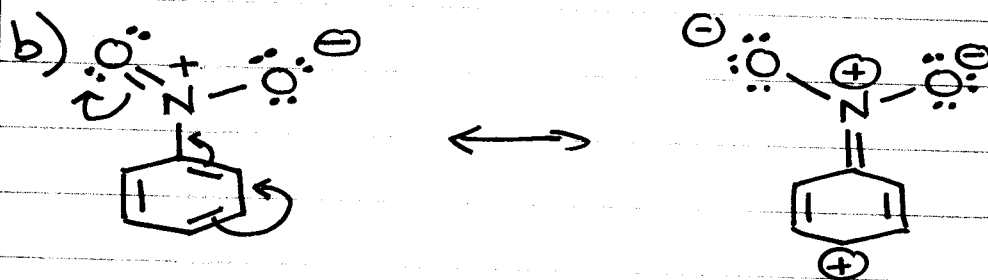
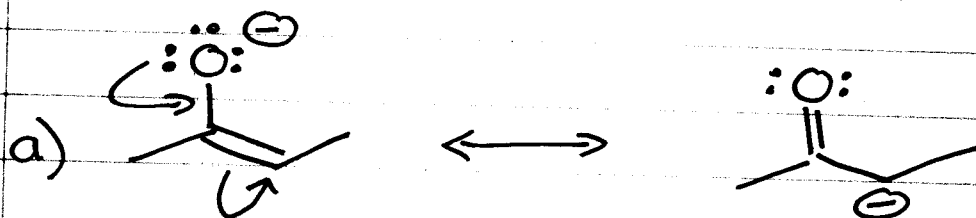


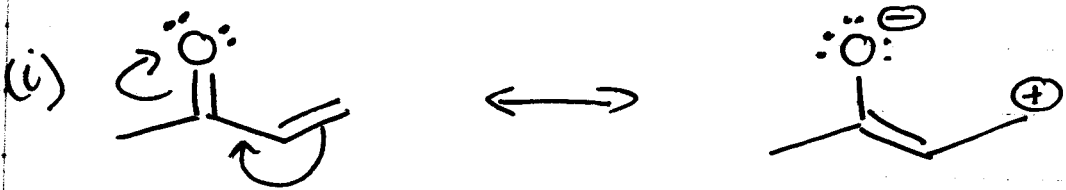
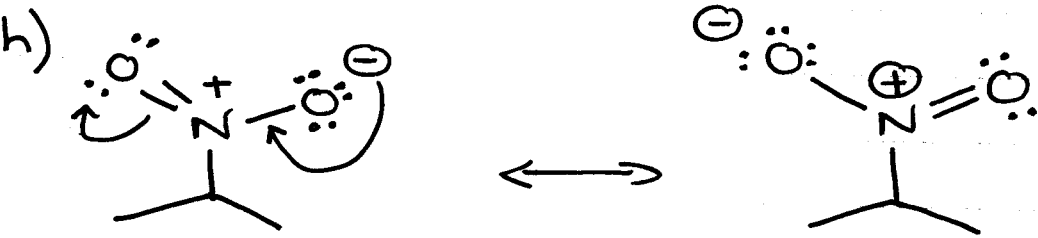
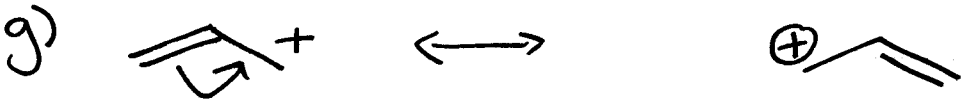
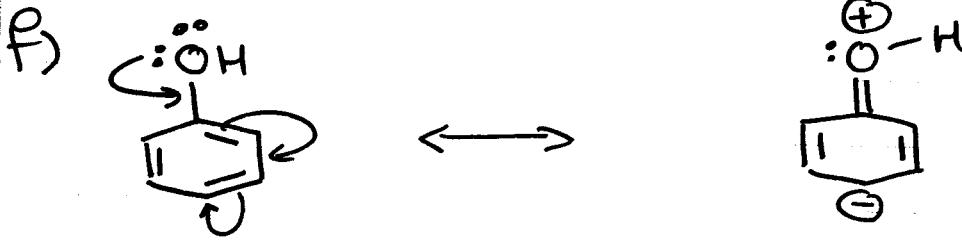
2

2) DRAW THE CURVED ARROWS ON EACH STRUCTURE THAT CONVERTS EACH CONTRIBUTOR INTO THE OTHER

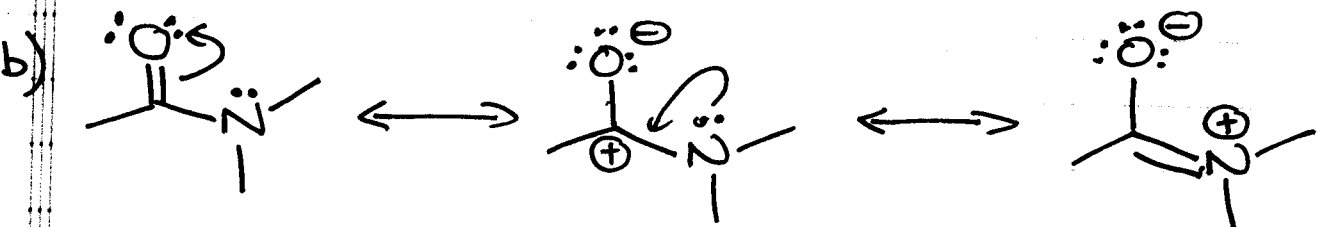
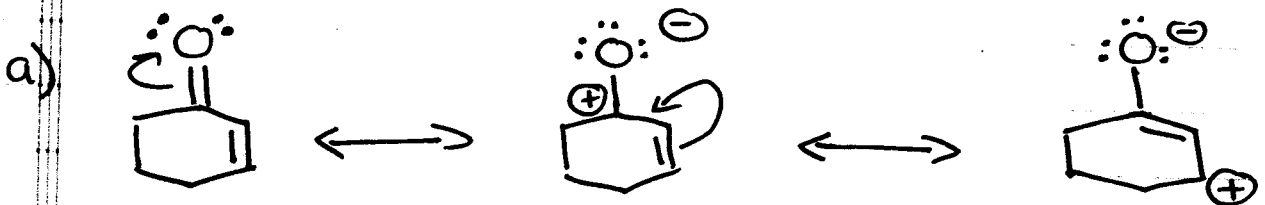


3) DRAW THE RESONANCE STRUCTURES THAT YOU GET WHEN THE ELECTRONS MOVE AS SHOWN BY THE ARROWS (INCLUDE FORMAL CHARGES)

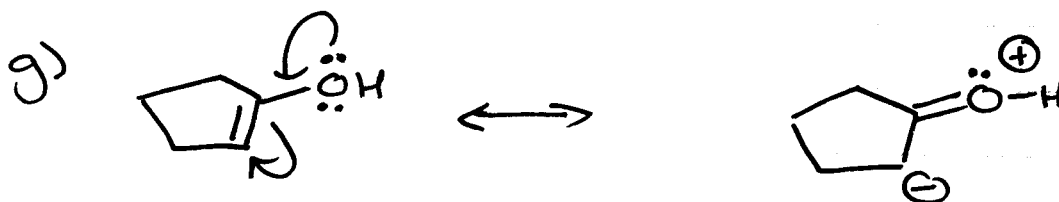
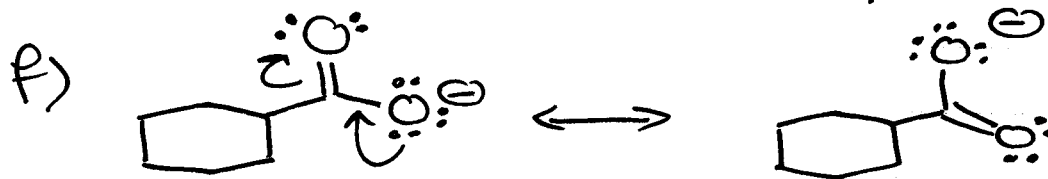
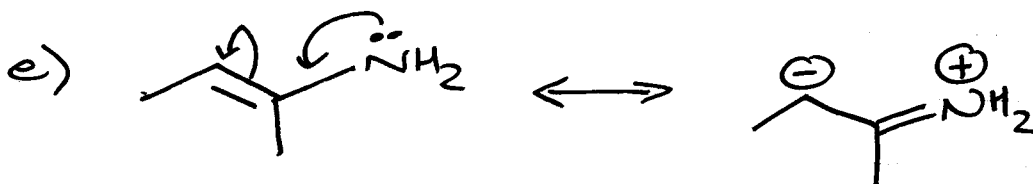
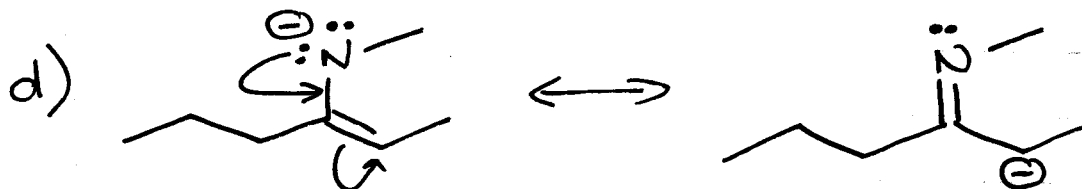
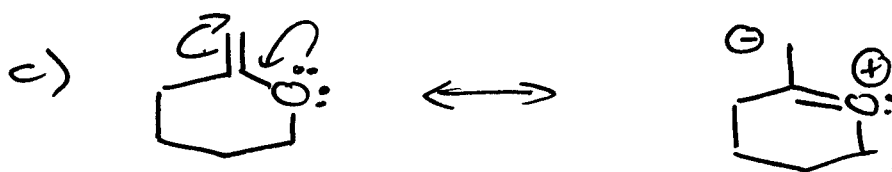
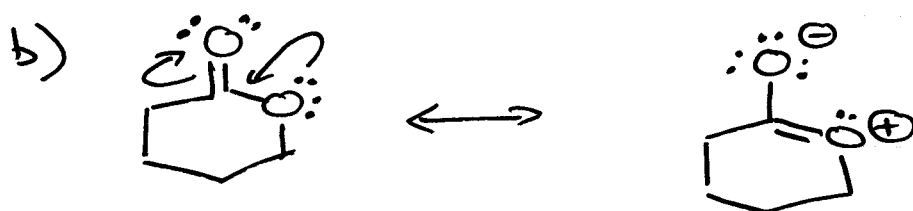
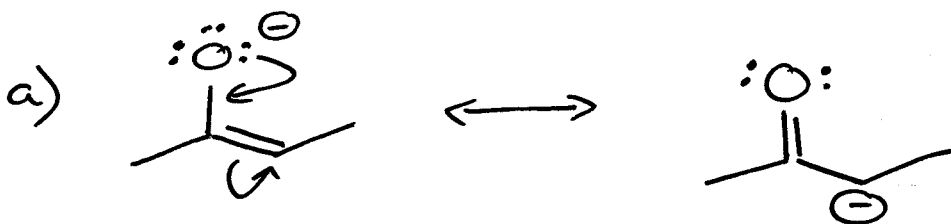




4) DRAW ALL THE REASONABLE RESONANCE STRUCTURES FOR THE COMPOUNDS BELOW

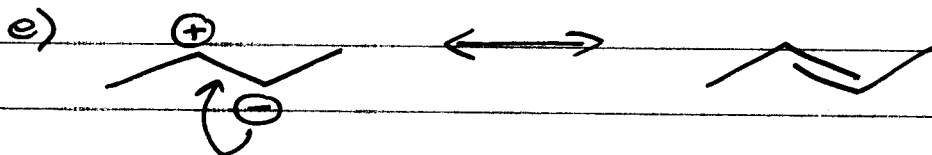
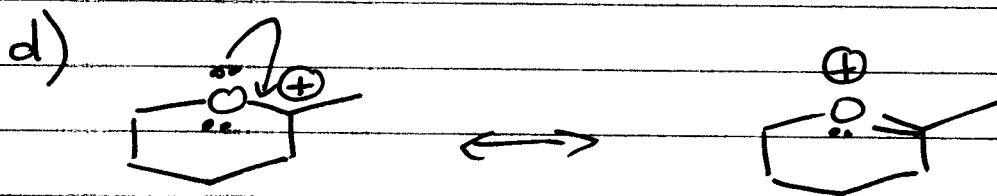
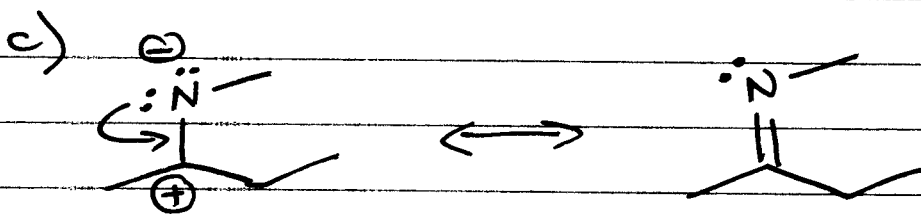
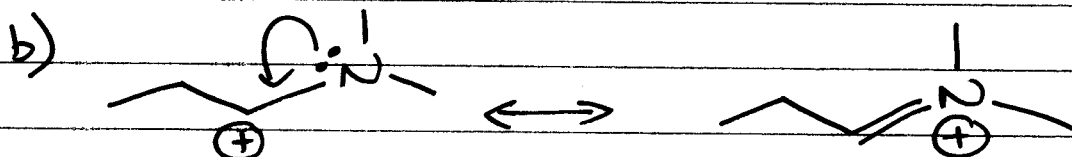
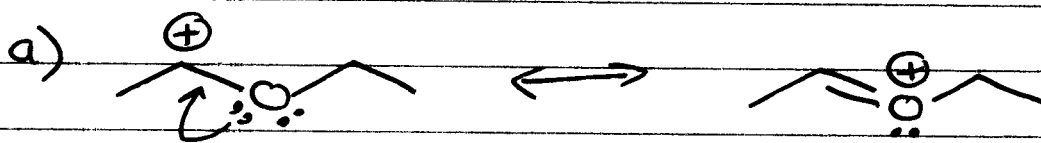


⑤ LONG PAIR /  $\pi$  BOND RESONANCE  
 DRAW THE APPROPRIATE RESONANCE FORMS  
 FOR THE STRUCTURES BELOW

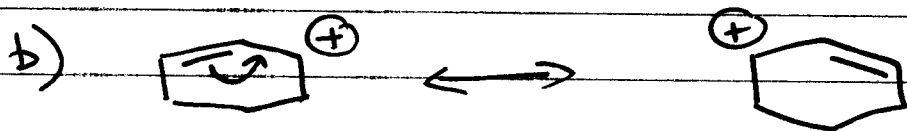
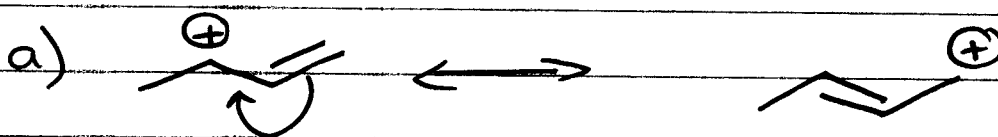


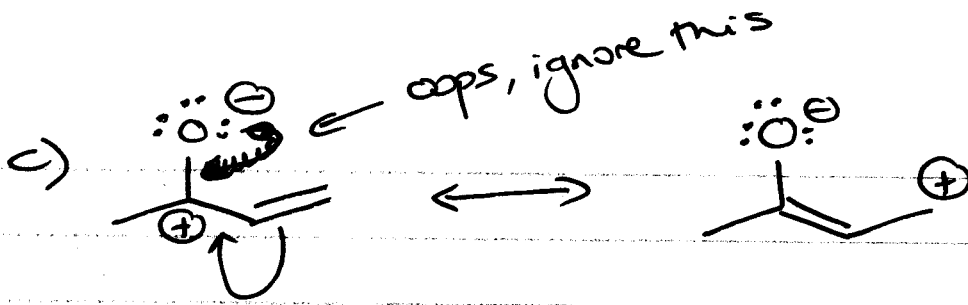
6

6) LONE PAIR / POSITIVE CHARGE RESONANCE

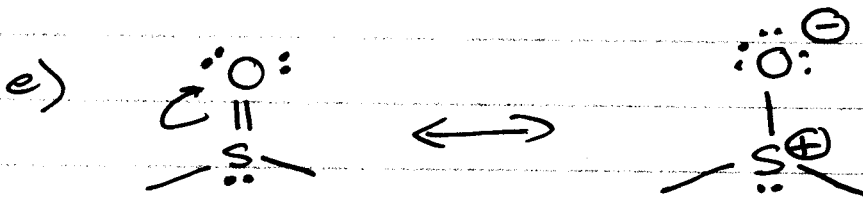
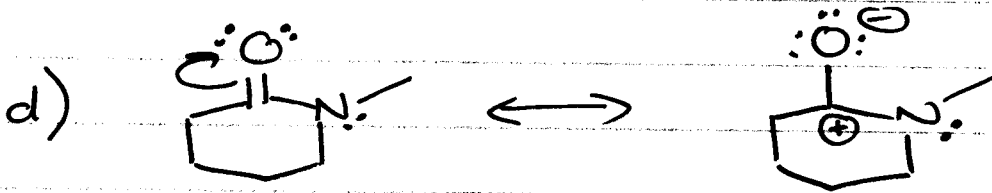
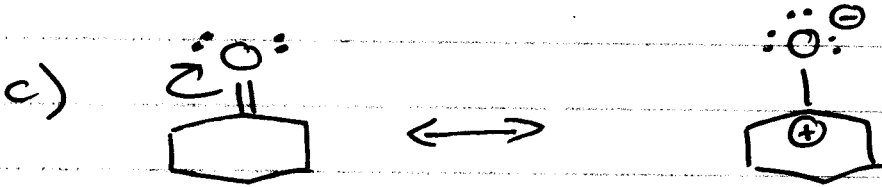
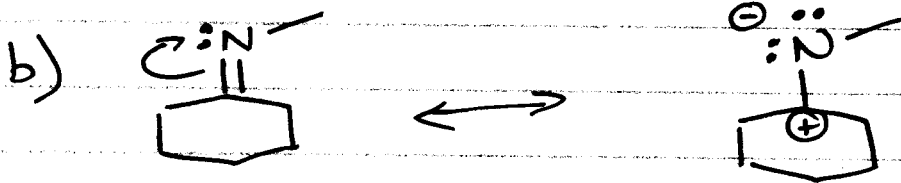
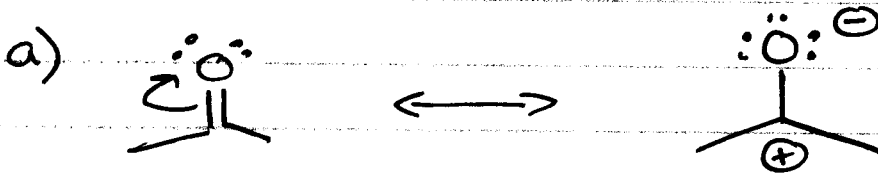


7)  $\pi$  BOND / POSITIVE CHARGE RESONANCE

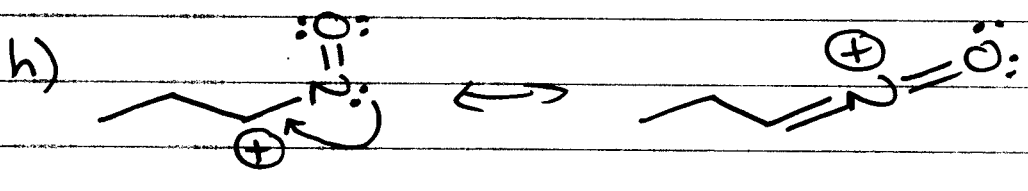
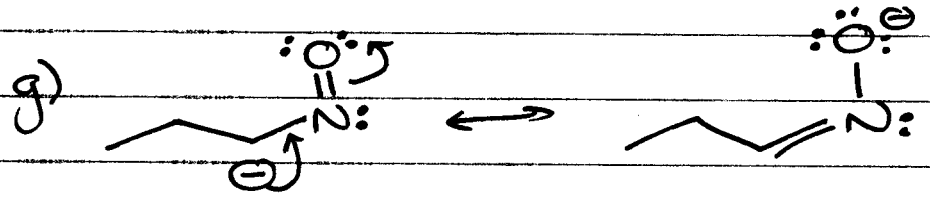
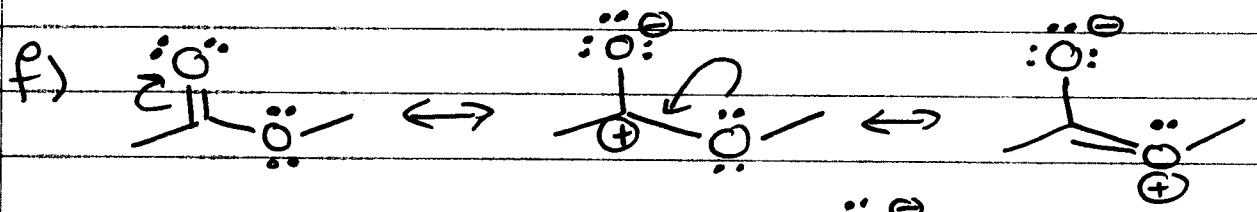
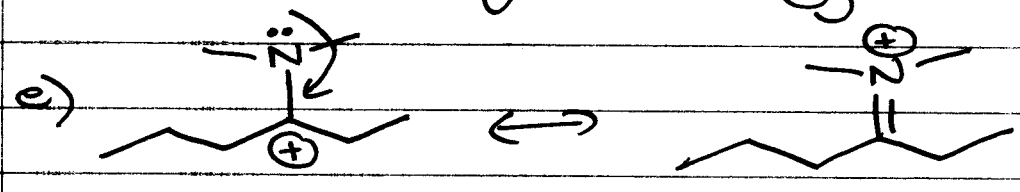
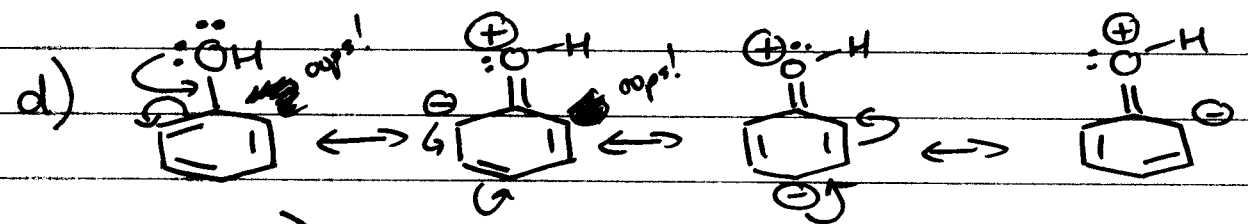
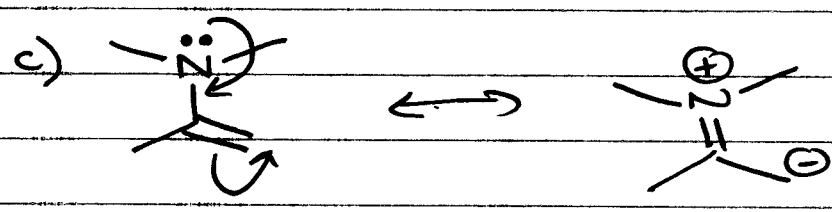
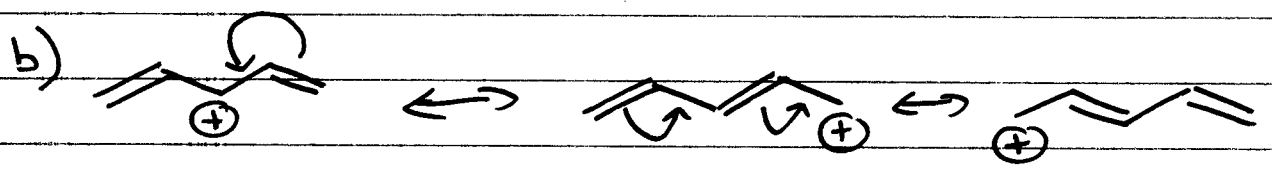
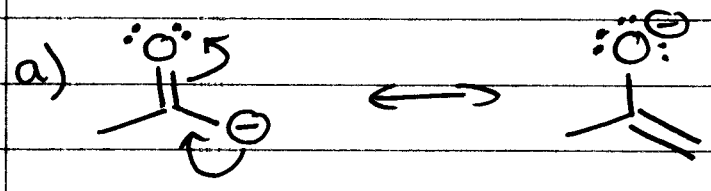




8)  $\pi$  BOND BETWEEN 2 ATOMS

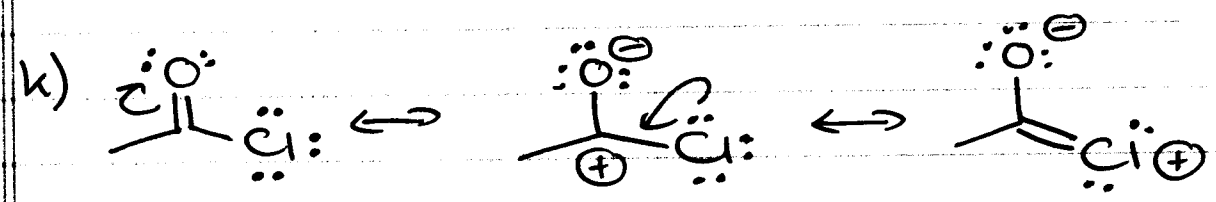
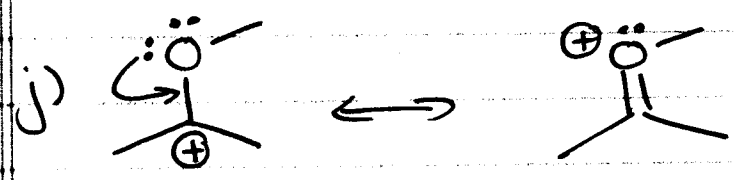


9) DRAW ALL RESONANCE FORMS FOR THE FOLLOWING STRUCTURES





9



10) FOR EACH OF THE FOLLOWING COMPOUNDS, DRAW ALL OF THE SIGNIFICANT RESONANCE STRUCTURES

