

**Exercise 4**

1. Compare the following phenol manufacturing processes using the appropriate green chemistry metrics and using the green chemistry principles: benzene sulfonation, benzene chlorination, Hock process
2. Discuss the advantages of the following alternative processes in terms of greenness: Solutia and ExxonMobil processes

Chemical	MW
Benzene	78.1
Phenol	94
NaHSO <sub>3</sub>	104
Na <sub>2</sub> SO <sub>3</sub>	126
SO <sub>2</sub>	64.1
NaOH	40
H <sub>2</sub> O	18
Cl <sub>2</sub>	70.9
HCl	36.5
NaCl	58.4
propene	42.1
oxygen	32
acetone	58.1
N <sub>2</sub> O	44
N <sub>2</sub>	28
Hydrogen	2
H <sub>2</sub> SO <sub>4</sub>	98.1
Cyclohexanone	98.1