SL & HL Answers to questions on the mole and Avogadro's constant

1. i. 5 atoms (four H atoms and 1 C atom); 1 molecule.
ii. 3.01×10^{24} atoms (or 5 moles); 6.02×10^{23} molecules (or 1 mol).
iii. 3.01×10^{23} atoms (or 0.500 mol); 6.02×10^{22} molecules (or 1.00×10^{-1} mol)

2. i. (22.99 + 35.45) g = 58.44 g
ii. 0.0200 x [(6 x 12.01) + (12 x 1.01) + (6 x 16.00)] g = 3.60 g (to 3 significant figures)
(Note that as the mass was given to 3 significant figures the answer should also be to the same number of significant figures.)
iii. 3.62 x (24.31 + 16.00) = 146 g (to 3 significant figures)

3. i. 32.1 g (to 3 significant figures)
ii. 3.01×10^{22} = 0.0500 mol of Fe^{2+} ions.
Mass of Fe^{2+} ions = 0.0500 x 55.85 g = 2.79 g
iii. 1.204×10^{24} = 2.000 mol of H_2O.
Mass of water = 2.000 x [(2 x 1.01) + 16.00] g = 36.0 g
(Note that even though the amount was given to four significant figures the relative atomic mass of hydrogen is only given to three significant figures so the answer should only be given to three significant figures too.)

4. i. 1.00 mol
ii. 3.00 mol
iii. 1.000×10^{-2} mol (or 0.01000 mol)

5. i. $3 \times 6.02 \times 10^{22} = 1.81 \times 10^{23}$ (or 3.00×10^{-1} mol)
ii. 1.20×10^{24} (or 2.00 mol)
iii. $21 \times 0.02000 \times 6.02 \times 10^{23} = 2.53 \times 10^{23}$ = (or 4.20×10^{-1} mol)

6. i. 3.01×10^{21} (or 5.00×10^{-3} mol)
ii. 6.02×10^{23} (or 1.00 mol)
iii. 6.02×10^{22} (or 1.00×10^{-1} mol)