Q1(A):

The oxidation number of MnO_4^- is -1 and that for O is -2. Therefore, the oxidation number of Mn is $-1 + 4 \cdot 2 = \boxed{+7}$.

Q1(B):

In reaction 5, an element (O_2) is involved in the reaction. Hence the reaction $\boxed{(5)}$ must be a redox.

Note: An element has oxidation number 0. Whereas the atoms in a compound have non-zero oxidation number. Hence, the element must have underwent reduction or oxidation.

Q1(C):

The atom with more number of protons and smaller atomic size has the greatest electronegativity value. Hence $\boxed{F}$ has the greatest electronegativity value.

Q1(D):

By recognising the -yne suffix, $\boxed{\text{propyne}}$ belongs to the alkyne group.

Q1(E):

As $\rho = \frac{M}{V} = \frac{m_A}{22.4} \propto m_A$, the higher the molecular mass, the higher the density.

The molecular masses are:

$\boxed{(1)}$: $2 \cdot 35.5 = 71$.

(2): $2 \cdot 16.0 = 32$.

(3): $2 \cdot 14.0 = 28$.

(4): $2 \cdot 1.0 = 2$.

(5): $32.0 + 2 \cdot 16.0 = 64$

Q1(F):

First, an optically active compound is asymmetric. Hence, options (4) and (5) can be rejected.

Checking the remaining options separately, only $\boxed{(2)}$ contains a chiral carbon (the 2nd carbon).

Q2:

(A): As 8.0 mol of HI is formed, 4.0 mol of reactants are consummed, i.e. 2.0 mol of H_2 and 0.5 mol of I_2 are remained.

$K_C = \frac{8.0^2}{2.0 \cdot 0.5} = \boxed{64}$.

(B): Considering the K_C, we have $\frac{x^2}{(2.0-\frac{x}{2})(2.0-\frac{x}{2})} = 64$, i.e. $x = \boxed{3.2\ mol}$.

Q3:

(A): $\frac{\frac{4.0}{23.0+16.0+1.0}}{\frac{1000}{1000}} = \boxed{0.10\ mol/L}$.

(B): pOH$=-\log[OH^-] = -\log 0.10 = 1$.

By pH+pOH=14, pH$=14-1=\boxed{13}$.

(C): Number of moles of OH^- in 20 mL of the solution

$=\frac{20}{1000} \cdot 0.10 = 2 \times 10^{-3}\ mol.$

Number of moles of H^+ in $V\ mL$ of the $H_2SO_4 = 2 \cdot 0.10 \cdot \frac{V}{1000} = 2V \times 10^{-2}$.

Solving $2V \times 10^{-2} = 2 \times 10^{-3}$, we have $V = \boxed{10\ mL}$.

Q4:

(A): When 8.80 g, i.e. $\frac{8.80}{3 \cdot 12.0 + 8 \cdot 1.0} = 0.2\ mol$ of C_3H_8 is combusted, the amount of heat released$=2220 \cdot 0.2 = \boxed{444\ kJ}$.

(B):

$$\Delta H_c[C_3H_8] = 3\Delta H_f[CO_2] + 4\Delta H_f[H_2O] - \Delta H_f[C_3H_8]$$

$$\Delta H_f[C_3H_8] = 3 \cdot (-394) + 4 \cdot (-286) + 2220 = -106\ kJ/mol$$

Therefore, the heat of formation is $\boxed{106\ kJ/mol}$.

Q5:

(A): During the electrolysis, Cu^{2+} ions are reduced to Cu at the cathode and OH^- ions are oxidised to O_2 at the anode $\boxed{(2)}$.

(B): $Q = It = 1.5 \cdot (2.0 \cdot 60 \cdot 60) = \boxed{10800\ C}$.

(C): The half equation at the cathode is $Cu^{2+} + 2e^- \rightarrow Cu$.

As $10800\ C$, i.e. $\frac{10800}{9.65 \times 10^4} \approx 0.1192\ mol$ of electrons has passed through the circuit, $\frac{0.1192}{2} \cdot 63.6 \approx \boxed{3.56\ g}$ of Cu were deposited.

Q6:

(A): Considering the mass percentage of C atom in CO_2, the mass of C atom in the compound=$17.6 \cdot \frac{12.0}{12.0+2 \cdot 16.0} = 4.8\ mg$.

Similarly, the mass of H atom in the compound=$0.8\ mg$.

Then, the mass of O atom in the compound=$12.0 - 4.8 - 0.8 = 6.4\ mg$.

Therefore, the molar ratio $C : H : O = \frac{4.8}{12.0} : \frac{0.8}{1.0} : \frac{6.4}{16.0} = 1 : 2 : 1$.

Hence, the empirical formula of the compound is $\boxed{CH_2O}$.

(B): As the compound is a monocarboxylic acid, it contains one and only one $-COOH$ group. Therefore, the number of O atom in the compoun will be 2.

The molecular formula is hence deduced to be $C_2H_4O_2$.

Hence, the molecular mass of the compound=$2 \cdot 12.0 + 4 \cdot 1.0 + 2 \cdot 16.0 = \boxed{60}$.

Q7:

(A): A amide bond is formed by the condensation of an amide group and a carboxylic group.

The combination of monomers satisfying this condition is $\boxed{(3)}$.

(B): The product of the condensation polymerisation in (A) is $\boxed{\text{Nylon-6,6}}$.