Q1:

$\boxed{Br}$ is a halogen.

Q2:

The element with the largest atomic radius and the smallest number of protons has the smallest electronegativity.

Hence, $\boxed{K}$ has the smallest electronegativity.

Q3:

The higher the group the element belongs to, the more the number of valence electrons.

Hence, $\boxed{F}$ has the most valence electrons.

Q4:

The number of lone pair electrons are:

(1): 2

(2): 0

(3): 1

$\boxed{(4)}$: 4

(5): 3

Q5:

$\boxed{ZnO}$ can react with both acid and base. Hence it is amphoteric.

Q6:

The mass percentages are:

$\boxed{(1)}$: $\frac{2\cdot 12.0}{2\cdot 12.0+4\cdot 1.0+16.0} \approx 54.5\%$

(2): $\frac{2\cdot 12.0}{2\cdot 12.0+6\cdot 1.0+16.0} \approx 52.2\%$

(3): $\frac{2\cdot 12.0}{2\cdot 12.0+6\cdot 1.0+16.0} \approx 52.2\%$

(4): $\frac{12.0}{12.0+4\cdot 1.0+16.0} = 37.5\%$

(5): $\frac{2\cdot 12.0}{2\cdot 12.0+4\cdot 1.0+2\cdot 16.0} = 40\%$

Q7:

(A): By Avogadro's law, the volume percentage is equal to the molar percentage.

$\rho = \frac{M}{V} = \frac{m}{22.4} = \frac{2\cdot 1.0\cdot 30\%+(12.0+4\cdot 1.0)\cdot 70\%}{22.4} \approx \boxed{0.53\ g/L}$.

(B): There are $\frac{3}{22.4}\ mol$ of H_2 and $\frac{7}{22.4}\ mol$ of CH_4.

Therefore, the amount of heat$=286\cdot\frac{3}{22.4}+891\cdot\frac{7}{22.4} \approx \boxed{317\ kJ}$.

Q8:

$\frac{1.12 \cdot 17.0\%}{2 \cdot 1.0 + 32.0 + 4 \cdot 16.0} \cdot 1000 \approx \boxed{1.9\ mol/L}$.

Q9:

Find the amount of $CuSO_4$ by considering the solubility, $\frac{x}{200-x} = \frac{54}{100}$, we have $x \approx 70.13$.

When y g of $CuSO_4 \cdot 5H_2O$ is crystallised out, the amount of $CuSO_4$ and H_2O are decreased by $\frac{64.0+32.0+4 \cdot 16.0}{64.0+32.0+4 \cdot 16.0+5 \cdot 18} y = \frac{16}{25} y$ and $\frac{9}{25} y$ respectively by considering the weight fraction.

Therefore, by considering the solubility, we have $\frac{70.13 - \frac{16}{25} y}{200 - 70.13 - \frac{9}{25} y} = \frac{20}{100}$, i.e. $x \approx \boxed{77}$.

Q10:

Considering the ionisation constant, we have

$$\frac{(1.0 \times 10^{-2} \alpha)^2}{1.0 \times 10^{-2}(1-\alpha)} = 2.7 \times 10^{-5}$$

$$\alpha^2 \approx 2.7 \times 10^{-3} \text{ (with the approximation } 1 - \alpha \approx 1)$$

$$\alpha \approx \boxed{0.052}$$

Q11:

By $pV = nRT$, $p = \frac{\frac{0.96}{2 \cdot 16.0} \cdot 0.082 \cdot 330}{\frac{550}{1000}} \approx 1.5\ atm = \boxed{1.5 \times 10^5\ Pa}$.

Q12:

By Le Chatelier's principle:

As the forward reaction is exothermic, raising the temperature will shift the equilibrium position to the left.

As the number of gas molecules is more in the left hand side, decreasing the pressure will shift the equilibrium position to the left.

Reducing the amount of NH_3 $\boxed{(3)}$ will shift the equilibrium position to the right.

Q13:

The half equations are:

$(COOH)_2 + 2H_2O \to 2H_2CO_3 + 2H^+ + 2e^-$

$MnO_4^- + 8H^+ + 5e^- \to Mn^{2+} + 4H_2O$

The overall equation is

$5(COOH)_2 + 2MnO_4^- + 2H_2O + 6H^+ \to 10H_2CO_3 + 2Mn^{2+}$

Consider he molar ratio $MnO_4^- : (COOH)_2 = 2 : 5$, we have

$5 \cdot 0.020 \cdot \frac{200}{1000} = 2 \cdot \frac{M}{2 \cdot (12.0 + 2 \cdot 16.0 + 1.0)}$, i.e. $M = \boxed{0.90\ g}$.

Q14:

The half equation is $4OH^- \to 2H_2O + O_2 + 4e^-$.

As $Q = 2.0 \cdot 25 \cdot 60 = 3000\ C = \frac{3000}{9.65 \times 10^4}\ F = \frac{3}{96.5}\ F$.

Consider the molar ratio, number of moles of $O_2 = \frac{3}{96.5} \cdot \frac{1}{4} = \frac{3}{386}\ mol$.

Therefore, the volume=$\frac{3}{386} \cdot 22.4 \approx \boxed{0.17\ L}$.

Q15:

$\boxed{NO_2}$ is brown in colour.

Q16:

$\boxed{[Cu(NH_3)_4]^{2+}}$ has a deep blue colour.

Q17:

There are $\boxed{3}$ isomers:

Ethenol, Ethanal, Ethylene oxide

Q18:

A compound contains an aldehyde group gives positive result of Fehling's test.

Therefore, $\boxed{\text{Acetaldehyde}}$ gives positive result.

Q19:

Except $\boxed{N_2}$, all other molecules can undergo addition reaction with ethylene.