Q1:

$\boxed{Ar}$ is a noble ags.

Q2:

Note that Li, F have the smallest number of electron shells.

Moreover, as F has more outermost shell electrons than Li, the attraction between electrons and the nucleus is strong than that of Li and hence has a smaller atomic radius.

Given the above, $\boxed{F}$ has the smallest atomic radius.

Q3:

(1): Trigonal pyramidal

(2): Bent

(3): Bent

(4): Tetrahedral

(5): Linear

Q4:

A nonelectrolyte cannot conduct electricity after dissolved in water.

(2) to (5) dissociate into ions when dissolved in water and hence are electrolytes.

Only $\boxed{(1)}$ is a nonelectrolyte.

Q5:

(2), (3) and (5) are very soluble in water.

Moreover, H_2S is fairly soluble in water while NO is only slightly soluble in water.

Given the above, $\boxed{NO}$ is the most diffcult one to dissolve in water.

Q6:

$\frac{2 \cdot 16.0}{2 \cdot 12.0 + 4 \cdot 1.0 + 2 \cdot 16.0} \times 100\% \approx \boxed{53\%}$.

Q7:

We have $\rho = \frac{M}{V} = \frac{m_A}{22.4}$.

The volume % of H_2 is equal to the molar % by Avogadro's law.

We have $\frac{2 \cdot 1.0 \cdot x + 2 \cdot 14.0 \cdot (1-x)}{22.4} = 0.670$, i.e. $x \approx \boxed{50\%}$.

Q8:

$\frac{1.33x}{23.0+16.0+1.0} \cdot 1000 = 10.0$, we have $x \approx \boxed{30\%}$.

Q9:

At 353 K, consider the solubility, $\frac{x}{250-x} = \frac{51}{100}$, there are $x \approx 84.44\ g$ of KCl in the solution.

Then, consider the solubility at 273 K, $\frac{84.44-x}{250-84.44} = \frac{28}{100}$, $x \approx \boxed{38\ g}$ of KCl is crystallised out.

Q10:

As the formation of 3.00 L, i.e. $\frac{3}{22.4}\ mol$ of HCl releases 12.4 kJ of heat, the formation of 1 mol of HCl releases $\frac{12.4}{\frac{3}{22.4}} \approx \boxed{+93\ kJ/mol}$ of heat.

Q11:

Number of moles of H^+ ion=$8.0 \times 10^{-3} \cdot \frac{100}{1000} = 8 \times 10^{-4}\ mol$.

Number of moles of OH^- ion=$1.0 \times 10^{-2} \cdot \frac{50}{1000} = 5 \times 10^{-4}\ mol$.

After neutralisation, $3 \times 10^{-4}\ mol$ of H^+ ion is remained and the volume of the solution becomes 150 mL.

Therefore, $[H^+] = \frac{3\times10^{-4}}{\frac{150}{1000}} = 2 \times 10^{-3}\ mol/L$ and

pH=$-\log[H^+] = 3 - \log 2 \approx \boxed{2.70}$.

Q12:

By $pV = nRT$, $2.43 \cdot \frac{600}{1000} = \frac{m}{12.0+2\cdot16.0} \cdot 0.082 \cdot 350$, i.e. $m \approx \boxed{2.2\ g}$.

Q13:

As $Cr_2O_7^{2-}$ has the oxidation number of -2, Cr has the oxidation number of $\frac{7 \cdot 2-2}{2} = \boxed{+6}$.

Q14:

The half equations are:

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

$H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$

The overall equation is $2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 5O_2 + 8H_2O$.

Number of moles of $MnO_4^- = 0.020 \cdot \frac{12.0}{1000} = \frac{2}{5} \cdot M \cdot \frac{10.0}{1000}$, i.e. $M = \boxed{0.060\ mol/L}$.

Q15:

The half equation at the anode is $2Cl^- \rightarrow Cl_2 + 2e^-$.

$Q = It = 15 \cdot 60I = 900I\ C = \frac{900}{9.65 \times 10^4} I\ F$.

Number of moles of $Cl_2 = \frac{315}{22.4 \cdot 1000} = \frac{1}{2} \cdot \frac{900}{9.65 \times 10^4} I$, i.e. $I \approx \boxed{3.0\ A}$.

Q16:

$\boxed{(1)}$: Colourless

(2): Brick-red flame

(3): Yellowish-green

(4): Golden yellow flame

(5): Violet flame

Note: In fact, burning Mg will give a bright white colour. So the flame test is still applicable.

Q17:

$\boxed{Ba}(OH)_2$ is soluble.

Q18:

It is either a alkene or a cyclic alkane.

Alkene: But-1-ene, Cis-but-2-ene, Trans-but-2-ene, Methylpropene

Cyclic alkane: Cyclobutane, Methylcyclopropane

There are $\boxed{6}$ isomers.

Q19:

Consider the weight percentage of C atoms in CO_2, the mass of C atoms in the compound=$17.6 \cdot \frac{12.0}{12.0+2\cdot 16.0} = 4.8\ mg$.

Similarly, the mass of H atoms in the compound is 0.8 mg.

Therefore, the mass of O atoms is 8.8-4.8-0.8=3.2 mg.

The molar ratio $C:H:O = \frac{4.8}{12.0} : \frac{0.8}{1.0} : \frac{3.2}{16.0} = 2:4:1$.

The empirical formula is C_2H_4O.

Solving $n(2 \cdot 12.0 + 4 \cdot 1.0 + 16.0) = 88$, we have $n = 2$.

Therefore, the molecular formula is $C_4H_8O_{\boxed{2}}$.

Q20:

A $-C(OH)HCH_3$ or $-COCH_3$ branch is responsible for a positive result in the iodoform test.

Among the options, only $\boxed{\text{Acetic acid}}$ does not contain such a branch.