I(1):

The oxidation number of NH_4^+ is $+1$.

As the oxidation number of H atoms in NH_4^+ are $+1$, the oxidation number of N atom is $+1 - 4 \cdot 1 = \boxed{-3}$.

I(2):

In the laboratory, SO_2 is formed by reducing H_2SO_4 $\boxed{(6)}$.

Among the other options, only Na_2SO_3 $\boxed{(3)}$ can act as a reducing agent for the reduction.

Note: The overall reaction is $Na_2SO_3 + H_2SO_4 \rightarrow SO_2 + Na_2SO_4 + H_2O$.

I(3):

The melting point of a compound is determined by the strength of the intermolecular force. We have the strength of covalent bond>ionic bond>van der Waals' force.

The intermolecular force of each substance is given as:

A: covalent bond

B: van der Waals' force

C: ionic bond

Combine the above, we have the order of melting points: $\boxed{A > C > B}$

I(4):

The formation of the coordinate bond (dative coordinate bond) required a molecule with lone pair electrons and a molecule with vacant site in the outermost electron shell.

Here Fe^{2+} acts as the latter role.

Among options (1) to (6), only CH_4 $\boxed{(1)}$ contains no lone pair electrons and hence no coordinate bond can be formed.

I(5):

Note that the final volumes of the three cases are the same (25 ml).

As pH decreases with $[H^+]$, we are going to compare the final values of $[H^+]$ of the three cases. Compare the number of moles of H^+ ion in the solution mixtures will also do as they have the same volume.

The equations are given by:

A: $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

B: $2HCl + Na_2CO_3 \rightarrow 2NaCl + H_2O + CO_2$

C: $HCl + NaOH \rightarrow NaCl + H_2O$

Refer to the table:

Reaction	A	B	C
Initial number of moles of H^+	$2 \cdot 0.1 \cdot \frac{15}{1000} = 3 \times 10^{-3}\ mol$	$0.1 \cdot \frac{15}{1000} = 1.5 \times 10^{-3}\ mol$	$0.1 \cdot \frac{15}{1000} = 1.5 \times 10^{-3}\ mol$
Initial number of moles of bases	$0.1 \cdot \frac{15}{1000} = 10^{-3}\ mol$	$0.1 \cdot \frac{15}{1000} = 1.5 \times 10^{-3}\ mol$	$0.1 \cdot \frac{10}{1000} = 10^{-3}\ mol$
Final number of moles of H^+	$3 \times 10^{-3} - 10^{-3} = 2 \times 10^{-3}\ mol$	Around 0 mol	$1.5 \times 10^{-3} - 10^{-3} = 5 \times 10^{-4}\ mol$

Therefore, the pH values are in the order $\boxed{B > C > A}$.

Note: The number of moles of H^+ dissociated from water (10^{-7} mol) is neglected.

I(6):

By reaction A, we have H^+ can oxidise Sn. By reaction B, we have Sn^{4+} can oxidise H_2.

Therefore, we have the electrochemical series (increasing oxidising power and decreasing reducing power):

Oxidising agents		Reducing agents
Sn^{2+}	$\Longleftrightarrow$	Sn
H^+	$\Longleftrightarrow$	H_2
Sn^{4+}	$\Longleftrightarrow$	Sn^{2+}

Hence, the order of oxidising power is $\boxed{Sn^{4+} > H^+ > Sn^{2+}}$.

Note: The answer is very wrong. If the oxidising power of Sn^{4+} is greater than that of Sn^{2+}, then an aqueous solution of Sn^{2+} ions will undergo redox automatically and form Sn metal, which is absurd.

I(7):

By Henry's law, the solubility of gas in $\boxed{\text{liquid}}$ is directly proportional to the pressure.

Therefore, solving $28/1.0 = x/4.0$, we have $x = \boxed{112\ ml}$.

Note: The answer (or the wording of question) is wrong, unless it is asking for "how much oxygen can be dissolved per atm" instead, then the answer will be constant 28 ml.

I(8):

By $pV = nRT$, we have $n = \frac{pV}{RT}$.

Therefore, the total number of moles of N_2 in two containers$=\frac{5 \cdot 2 + 10 \cdot 3}{298R} = \frac{40}{298R}\ mol$.

After the cock is open, the total volume becomes $2 + 3 = 5\ l$. Therefore, the pressure becomes $\frac{\frac{40}{298R} \cdot 298R}{5} = \boxed{8\ atm}$.

II:

The reactions are:

$Ca + 2H_2O \rightarrow \boxed{Ca(OH)_2} + H2$ (Displacement)

$Ca(OH)_2 + H_2SO_4 \rightarrow \boxed{CaSO_4} + 2H_2O$ (Neutralisation)

$Ca(OH)_2 + 2Cl_2 \rightarrow CaOCl_2(\boxed{\text{bleaching powder}}) + H_2O$ (Redox)

$Ca(OH)_2 + CO_2 \rightarrow \boxed{CaCO_3} + H_2O$ (Precipitation)

$CaCO_3 + CO_2 + H_2O \iff \boxed{Ca(HCO_3)_2}$ (Equilibrium of decomposition of $Ca(HCO_3)_2$)

$CaCO_3 + 2HCl \iff \boxed{CaCl_2} + H_2CO_3$ (Equilibrium of dissociation of weak acid H_2CO_3)

$CaCO_3 \rightarrow \boxed{CaO} + CO_2$ (Thermal decomposition of $CaCO_3$)

$CaO + 3C \rightarrow \boxed{CaC_2} + CO$ (Industrial method for producing CaC_2)

III:

(1): The half equation at the anode is $4OH^- \rightarrow 2H_2O + O_2 + 4e^-$

The half equation at the cathode is $Cu^{2+} + 2e^- \rightarrow Cu$

Therefore, the overall equation is

$2Cu^{2+} + 4OH^-(+4e^-) \rightarrow 2Cu + 2H_2O + O_2(+4e^-)$

As $0.16g = \frac{0.16}{32} = 0.005\ mol$ of O_2 is formed, $0.005 \cdot 4 = 0.02\ mol$ of electrons are passed through the solution.

Therefore, $\boxed{0.02\ F}$ of charges are passed through the solution.

(2): $0.005 \cdot 2 = 0.01\ mol$ of Cu^{2+} ions are consumed during the electrolysis.

Originally, there are $0.15 \cdot \frac{200}{1000} = 0.03\ mol$ of Cu^{2+} ions.

Therefore, there are $0.03 - 0.01 = 0.02\ mol$ of Cu^{2+} ions remaining after the electrolysis.

The molarity$=\frac{0.02}{\frac{200}{1000}} = \boxed{0.1\ mol/l}$.

IV:

(1): Adding H_2 into ethyne with a catalyst gives ethene $\boxed{(12)}$, which can undergo addition polymerisation and give polyethene $\boxed{(5)}$.

Adding HCl into ethyne given chloroethene $\boxed{(19)}$.

Adding Br_2 into ethyne gives 1,2-dibromoethene $\boxed{(4)}$.

Adding H_2O into ethyne with a catalyst gives $H_2C = CHOH$ $\boxed{(11)}$ as an intermediate, which is very unstable and will transfer to acetaldehyde $\boxed{(6)}$ immediately. The oxidation of acetaldehyde with $K_2Cr_2O_7$ gives acetic acid $\boxed{(7)}$.

The trimerisation of ethyne gives benzene $\boxed{(17)}$.

Adding HCN into ethyne gives $H_2C = CHCN$ $\boxed{(13)}$.

Adding CH_3COOH into ethyne gives $H_2C = CHOOCCH_3$ $\boxed{(20)}$.

Note: Generally, adding HA into ethyne will give $H_2C = CHA$.

(2): Only aldehydes undergo the silver mirror reaction. Among (1)-(20), $\boxed{(6)}$ and $\boxed{(18)}$ are aldehydes.

(3): $\boxed{\text{White}}$ $(AgC)_2$ precipitate is formed.

(4): $\boxed{\text{Red}}$ $(CuC)_2$ precipitate is formed.

V:

(1): Methanol is a liquid at room temperature. When compared with water, it has weaker intermolecular force as it contains only one hydrogen bond per molecule. Therefore, its melting point should be lower than that of water, which implies it is a $\boxed{\text{liquid}}$ at $0°C$.

(2): Acetic acid is a liquid at room temperature. When compared with water, it has stronger intermolecular force as it contains the same number of hydrogen bonds (two) per molecule but has a larger molecular size than water, which implies it is a $\boxed{\text{solid}}$ at $0°C$.

(3): Acetaldehyde is a liquid at room temperature. When compared with water, it has weaker intermolecular force as it does not contain hydrogen bonds. Therefore, its melting point should be lower than that of water, which implies it is a $\boxed{\text{liquid}}$ at $0°C$.

(4): Acetone is a liquid at room temperature. When compared with water, it has weaker intermolecular force as it does not contain hydrogen bonds. Therefore, its melting point should be lower than that of water, which implies it is a $\boxed{\text{liquid}}$ at $0°C$.

(5): Ethylene is a gas at room temperature. It has a similar molecular size to N2, which is a gas at $0°C$. Therefore, ethylene will also be a $\boxed{\text{gas}}$ at $0°C$.

VI:

(1): Considering the mass of C atom in CO_2, we have the mass of C atom in $X = 26.4 \cdot \frac{12}{44} = 7.2\ g$.

Considering the mass of H atom in H_2O, we have the mass of H atom in $X = 14.4 \cdot \frac{2}{18} = 1.6\ g$.

Therefore, the mass of O atom in $X = 12.0 - 7.2 - 1.6 = 3.2\ g$.

The molar ratio $C : H : O = \frac{7.2}{12} : \frac{1.6}{1} : \frac{3.2}{16} = 3 : 8 : 1$.

Therefore, the empirical equation of X is $\boxed{C_3H_8O}$.

(2): By $pV = nRT$, we have $n = \frac{pB}{RT}$. Therefore, the number of moles of 12.0 g of $X = \frac{6.56 \cdot 1.00}{0.082(127+273)} = 0.2\ mol$.

Therefore, we have $\frac{12.0}{m} = 0.2$, which gives $m = \boxed{60}$.

(3): Solving $n(3 \cdot 12 + 8 \cdot 1 + 1 \cdot 16) = 60$ for an integer n, we have $n = 1$. Therefore, the molecular equation of X is $\boxed{C_3H_8O}$.

(4): Only options (2) and (3) have the molecular formula C_3H_8O.

Moreover, as X is an ether compound, the answer will be $\boxed{(2)}$.