I(1):

Element with a greater number of protons and a smaller atomic radius has larger electronegativity. Among the four elements, H and F have the smallest atomic radius. Although the atomic radius of F is slightly larger than that of H, it has many more protons than H. Therefore, F $\boxed{(2)}$ has the largest electronegativity.

Note: When compared with period 2 elements, the electronegativity of H is slightly greater than that of B (Boron) but less than other elements with larger atomic numbers.

I(2):

Al_2O_3 $\boxed{(2)}$ can undergo reaction with both acid and base*. Therefore, it is amphoteric.

*$2Al_2O_3 + 6HA \rightarrow 2AlA_3 + 3H_2O$

$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2$

I(3):

1) H-Cl bond is polar.

2) H-O bonds are polar. H_2O molecules are in V-shape, hence H_2O molecules are also polar as the vector sum of dipole moments is not equal to 0.

$\boxed{3)}$ C=O bonds are polar. However, CO_2 molecules are in linear shape, the polarities cancelled out. Therefore, CO_2 molecules are nonpolar.

4) N-H bonds are polar. NH_3 molecules are in the shape of a trigonal pyramid, hence NH_3 molecules are also polar as the vector sum of dipole moments is not equal to 0.

I(4):

1) He is a gas (He is used to fill up balloons)

2) S is a solid (crystal)

$\boxed{3)}$ Hg is a liquid (Hg is the liquid inside thermometer)

4) Pb is a solid

I(5):

1) As Cl has a larger number of electron shells, the atomic radius of Cl is larger than that of F.

2) True.

3) As the atomic radius of Cl is larger than that of F, its electrons are attracted less strongly and can more easily be given out. Therefore, Cl is a strong reducing agent (i.e. a weaker oxidising agent).

$\boxed{4)}$ Both of them can form oxides (OF_2 and OCl_2).

I(6):

$\boxed{1)}$ $AgCl + 2NH_3 + H_2O \to Ag(NH_3)_2OH + HCl$ (double displacement)

2) $H_2SO_4{+}2NaCl \to Na_2SO_4{+}2HCl(g)$ (double displacement, HCl vapourised after heating)

3) $2HCl + FeS \to FeCl_2 + H_2S(g)$ (double displacement, H_2S is a weak acid)

4) $2H_2O_2 \to 2H_2O + O_2(g)$ (decomposition of H_2O_2)

I(7):

1) The predominant bonding force of ionic crystals is ionic bond.

2) False.

$\boxed{3)}$ Those dissociated ions can attract (or repulse) by charges and hence conduct electricity.

4) Ionic crystals are brittle, as the repulsive force due to the same charge will break the crystal easily in case there are any displacements of layers.

II:

(1): There are H^+ ions, OH^- ions and Na^+ ions in the aqueous solution.

As OH^- has the highest reducing power among them, it is oxidised to O_2.

As H^+ has the highest oxidising power among them, it is reduced to H_2.

Therefore, $\boxed{H_2}$ is formed at the cathode.

(2):

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

The half equation at the cathode: $2H^+ + 2e^- \rightarrow H_2$

Therefore, the full equation of the reaction is

$4OH^- + 4H^+ \ (+4e^-) \rightarrow 2H_2O + 2H_2 + O_2 \ (+4e^-)$

When a current of 9.65A flowed for 2 hours, a charge of

$9.65 \cdot 2 \cdot 60 \cdot 60 = 19.3 \cdot 3600 \ C$ passed through the circuit, i.e. $\frac{19.3 \cdot 3600}{96500} = 0.72 \ mol$ of electrons passed through the circuit.

By the equation, the molar ratio $e^- : O_2 = 4 : 1$. Therefore, $\frac{0.72}{4} = \boxed{0.18} \ mol$ of substance formed at the anode.

III:

(1): Referring to the table:

Chemical	N_2O_4	NO_2
Number of moles before equilibrium	1.0	0
Number of moles after equilibrium	$1.0 - \frac{1.2}{2} = 0.4$	1.2

As partial pressure is proportional to molar fraction, we have the partial pressure of $N_2O_2 = 1.00 \times 10^5 \cdot \frac{0.4}{0.4+1.2} = 2.5 \times 10^4 \ Pa.$

(2): Based on (1), we have the partial pressure of

$NO_2 = 1.0 \times 10^5 - 2.5 \times 10^4 = 7.5 \times 10^4 \ Pa.$

Therefore, the pressure equilibrium constant$=\frac{(7.5 \times 10^4)^2}{2.5 \times 10^4} \approx \boxed{2.3 \times 10^5} \ Pa.$

IV:

(1): Under heating, H_2O_2 oxidises Cr^{3+} to CrO_4^{2-} and it itself becomes OH^-.

Therefore, Fe^{3+} is precipitated as $\boxed{Fe(OH)_3}$.

By adding acetic acid, OH^- ions are completely neutralised and H_2CrO_4 formed so that the solution becomes weak acid.

When $Pb(CH_3COO)_2$ is added, precipitation reaction occurs which gives $\boxed{PbCrO_4}$ precipitate.

(2): Similar to a diamond, the number of nearby silicon atoms to one silicon atom is $\boxed{4}$.

The thermochemical equation of formation of SiH_4 is $Si + 2H_2 \rightarrow SiH_4$.

On the product side, 4 Si-H bonds are formed, hence $4 \cdot 318 = 1272\ kJ/mol$ of energy is released.

On the reactant side, Si crystal is converted to Si atoms, which absorbs 439 kJ/mol of energy. Also, two H-H bonds are broken, which absorbs

$2 \cdot 436 = 872\ kJ/mol$ of energy.

Given the above, during the formation of SiH_4, 439+872=1311 kJ/mol of energy is absorbed and 1272 kJ/mol of energy is released. Therefore, the heat of formation is 1272-1311=$\boxed{-39}$ kJ/mol.

Note: "Heat of formation" here should refer to the heat released during formation, but not the enthalpy change. Therefore, it should take the negative sign.

V:

(1): Consider the mass of C atom in CO_2 formed, we have the mass of C atom in easter B $=7.92 \cdot \frac{12}{12+2 \cdot 16} = 2.16\ mg$.

Consider the mass of H atom in H_2O formed, we have the mass of H atom in easter B $=3.24 \cdot \frac{2 \cdot 1.0}{2 \cdot 1.0+16.0} = 0.36\ mg$.

Therefore, the mass of the O atom in easter B=3.48-2.16-0.36=0.96 mg. The molar ratio C:H:O in ester B=$\frac{2.16}{12.0} : \frac{0.36}{1.0} : \frac{0.96}{16.0}$=0.18 : 0.36 : 0.06=3:6:1.

Therefore, the empirical formula of B is C_3H_6O $\boxed{(1)}$.

(2): Let the molecular formula of B be $C_{3n}H_{6n}O_n$.

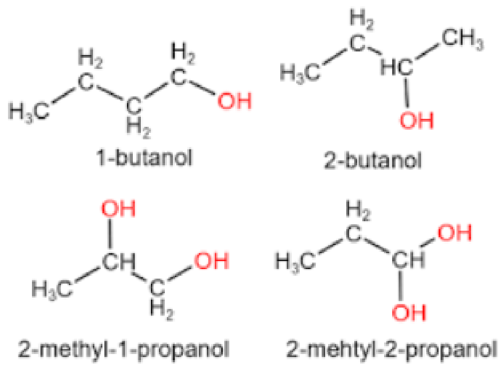
Consider the molecular weight of B, we have $110 < n(3 \cdot 12.0+6 \cdot 1.0+16.0) < 118$.

Therefore, we have $n = 2$, i.e. the molecular formula of B is $C_6H_{12}O_2$ $\boxed{(4)}$.

(3): As A undergoes esterification with acetic acid, it is an alcohol $\boxed{(4)}$.

(4): The carboxylic acid used in the esterification is acetic acid, H_3CCOOH. Therefore, the condensed formula of B is $H_3CCOOC_4H_9$, which suggests the alcohol, A, has a molecular formula of $C_4H_{10}O$ $\boxed{(4)}$.

(5): The number of structural isomers exist for B is equal to the number of structural isomers exist for A. For A, we have 4 structural isomers:



Therefore, there are $\boxed{4}$ structural isomers for B.

VI:

With H_2SO_4 catalyst, $-NO_2$ substituted $-H$ in benzene and gave nitrobenzene $\boxed{(9)}$. Reduced by Sn/HCl, it becomes aniline $\boxed{(1)}$. Undergoing diasotiasation with $NaNO_2/HCl$, it becomes $\boxed{(15)}$. Heat it with water, we get phenol $\boxed{(11)}$.

With Fe catalyst, $-Cl$ substituted $-H$ in benzene and gives chlorobenzene $\boxed{(7)}$. Under high temperature and high pressure, $-OH$ substituted $-Cl$ and on the other hand Na^+ displaced H^+, which turns out giving $\boxed{(14)}$.

Treating benzene with conc. H_2SO_4, we get benzene sulforic acid $\boxed{(8)}$. Neutralise it with $NaOH$, we get $\boxed{(12)}$. Moreover, undergoing alkali fusion, it becomes $\boxed{(14)}$.

For the above two paths, $\boxed{(14)}$ becomes phenol after being treated with acid $(CO_2 + H_2O)$. Or it becomes phthalic acid $\boxed{(5)}$ after $-COOH$ group is substituted $-H$ under high temperature and pressure.

VII:

(1):

$\boxed{1)}$ True

2) False

3) $CaCO_3 + 2H_2O \rightarrow Ca(OH)_2 + H_2CO_3$. No acetylene is formed.

4) False

$\boxed{5)}$ $C_2H_2 + H_2O \rightarrow H_2C = CHOH$. As $H_2C = CHOH$ is very unstable, it turns to H_3CCHO (acetaldehyde) immediately.

6) $C_2H_2 + Br_2 \rightarrow C_2H_2Br_2$. An Additional reaction occurs.

(2):

1) Ketones have a C=O double bond.

2) Aniline contains the benzene ring, which contains C=C double bonds.

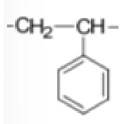
3) Carboxylic acids contain a C=O double bond.

4) Alkenes contain C=C double bond

$\boxed{5)}$ Alkanes contain only single bonds.

(3):

The right-hand side of the repeating unit:



Which is a styrene whose double bond is opened.

Consider the left-hand side of the repeating unit: $-CH_2 - CH = CH - CH_2-$,

before it opens the double bonds, it should be $CH_2 = CH - CH = CH_2$, i.e.

1,3-butadiene $\boxed{(5)}$.

Note: 1,3-butadiene is involved in the synthesis of most of the synthetic gums.