I(1)(3pts):

The number of neutrons is equal to the mass number minus the number of protons (i.e. the atomic number):

$\boxed{1)}$ 13-5=8

2) 13-6=7

3) 14-7=7

4) 14-8=6

I(2)(3pts):

By $\rho = \frac{m}{V}$, we have $\rho \propto m_A$. Therefore, the larger the atomic mass, the larger the density. Hence, $\boxed{4)}$ I_2 has the largest density.

I(3)(3pts):

The number of electrons in a compound is equal to the sum of atomic numbers of atoms.

1) $2 \cdot 6 + 2 \cdot 1 = 14$

2) $7 + 3 \cdot 1 = 10$

$\boxed{3)}$ $3 \cdot 8 = 24$

4) $7 + 2 \cdot 8 = 23$

I(4)(3pts):

Among the four option, only $\boxed{2)}$ has a symmetrical trigonal bipyramidal shape, which made the vector sum of dipole moments zero and cancelled the polorities.

I(5)(3pts):

1) True. Tracking the radioactivity of radioactive carbon nuclii in a fossil can deduce its age.

$\boxed{2)}$ For example, diamond does not conduct electricity.

3) True. The variety of compounds is called carbohydrates.

4) True.

I(6)(3pts):

1) $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$ (photolytic decomposition)

2) $H_2SO_4(aq) + 2NaCl(aq) \rightarrow Na_2SO_4(aq) + 2HCl(g)$ (double displacement)

3) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ (thermal decomposition)

$\boxed{4)}$ $CH_4(g) + 3O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

I(7)(3pts):

1) Excessive water getting into the erythocrytes due to the difference in osmotic pressure makes them explode.

2) The water travel through the semi-permeable membrane so as to balance the osmotic pressure.

$\boxed{3)}$ Is due to the saturated vapour pressure.

4) Due to the difference in osmotic pressure, water in cells are drew out to dilute the sea water which makes one feels thirstier.

II:

(1)(5pts): At the endpoint, excess Ag^{+} ions react with CrO_4^{2-} ions to form $\boxed{\text{reddish brown}}$ Ag_2CrO_4 precipitate.

(2)(5pts): The reaction is given by $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$.

Number of moles of $NaNO_3$ used=$0.1 \cdot \frac{100}{1000} = 0.01\ mol$.

Therefore, the concentration of the diluted sample=$\frac{0.01}{\frac{50}{1000}} = 0.2\ mol/L$.

Before the dilution, the concentration=$0.2 \cdot \frac{500}{100} = \boxed{1.0}\ mol/L$.

III(5pts for (a),(b) and 10pts for (c)):

The equations of combustion of methanol and ethanol are given:

$$CH_3OH + \frac{3}{2}O_2 \rightarrow CO_2 + 2H_2O$$

$$CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$$

Therefore, the heat of combustion of methanol is $394 + 2 \cdot 286 - 230 = 736 \approx \boxed{740}\ J/mol$.

That of ethanol is $2 \cdot 394 + 3 \cdot 286 - 312 = 1334 \approx \boxed{1300}\ J/mol$.

Let x be the weight fraction of methanol, i.e. the weight of methanol is $10x\ g$ and that of ethanol is $10(1-x)\ g$.

Then, the number of moles of them are $\frac{10x}{32}\ mol$ and $\frac{10(1-x)}{46}\ mol$ respectively.

The heat released during combustion$=736 \cdot \frac{10x}{32} + 1334 \cdot \frac{10(1-x)}{46} = 290 - 60x$.

Consider the temperature raised of the water, we have heat absorbed

$=100 \cdot 4.2 \cdot 0.65 = 273$.

Solving $290 - 60x = 273$, we have $x \approx \boxed{0.28}$.

IV(5pts for (a),(b) and 10pts for (c)):

(1): 1mL, i.e. $1 \cdot 1 = 1\ g$ of pure water contains $\frac{1}{16+2 \cdot 1.0} \approx \boxed{0.056}\ mol$ of water molecules.

Moreover, the concentration of water is $\frac{0.056}{\frac{1}{1000}} = \boxed{56}\ mol/L$.

(2): Let x be the mass of $CuSO_4$ in the solution, consider the solubility, we have $\frac{x}{100-x} = \frac{40}{100}$, i.e. $x = \frac{200}{7}$.

Let y be the mass of hydrous crystal obtained, considering the percentage mass, $\frac{160}{160+5 \cdot 18} y = 0.64y$ of $CuSO_4$ and hence $0.36y$ of H_2O are removed from the solution.

Consider the solubility, we have $\frac{\frac{200}{7}-0.64y}{100-\frac{200}{7}-0.36y} = \frac{20}{100}$, i.e. $y \approx \boxed{25}\ g$.

V(1pt each for (1) and 2pts for (2)-(4)):

(1): A: $\boxed{5)}$ (cumene).

During the air oxidation of cumene process, B: $\boxed{1)}$, O_2 is required.

The product of the cumene process is phenol C: $\boxed{8)}$.

Substituting HNO_3 into benzene with H_2SO_4 catalyst gives nitrobenzene D: $\boxed{13)}$.

Reducing nitrobenzene gives aniline E: $\boxed{16)}$.

Diazotiasation of aniline gives F: $\boxed{14)}$, which is unstable in high temperature and will turn to phenol.

Neutralising phenol with NaOH gives G: $\boxed{12)}$.

The diazo coupling of F and G gives H: $\boxed{20)}$.

(2): Reducing nitrobenzene requires $\boxed{1)}$ Sn, or Fe as the reducing agent.

(3): Positive ferric chloride test occurs with tested with phenol, where $\boxed{9)}$ and $\boxed{20)}$ contains one.

(4): Thermosetting resins are produced with $\boxed{\text{Formaldehyde}}$.

Note: Methanal is also accepted.

VI(2pts each):

(1): $\boxed{1)}$ and $\boxed{6)}$.

(2); $\boxed{1)}$.

(3): The lead sulfide test is used to test the presence of S atom in amino acids. Among the five amino acids, $\boxed{5)}$ contains S.

(4): The Xanthoproteic test is used to test the presence of benzene ring in amino acids. Among the five amino acids, $\boxed{4)}$ contains a benzene ring.

(5): Let the five amino acids be A,B,C,D,E.

The dipetitides that can be formed are:

AA, AB, AC, AD, AE, BA, ... , ED, EE,

$5 \cdot 5 = \boxed{25}$ in total.

(6): Denote A, B, and C as the cation, zwitterion and the anion.

The equilibria are:

$A \iff B + H^+$

$B \iff C + H^+$

And the equilibrium consants are $K_C = \frac{[B][H^+]}{[A]}$ and $K\prime_C = \frac{[C][H^+]}{[B]}$.

At the isoelectric point, we have $[A] = [C]$ and hence $[H^+] = \sqrt{K_C \cdot K\prime_C} = \sqrt{10^{-12}} = 10^{-6}$.

Therefore, pH$= -\log 10^{-6} = \boxed{6}$.

VII(2pts each):

(1): $\boxed{\text{Glycerol}}$

Note: Glycerin is also accepted.

(2): Let the soap be $R - COO^-$, then the molecular weight of the oil and fats is $3R + (6 \cdot 12 + 6 \cdot 16 + 5 \cdot 1) = 3R + 173$.

Solving $3R + 173 = 323$, we have $R = 50$.

Therefore, the molecular weight of the soap is $50 + 12 + 2 \cdot 16 + 1 = \boxed{95}$.