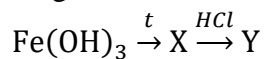1. From the proposed list, select a compound in which there is a donor-acceptor bond.
- NH_3
- K_3PO_4
- $(NH_4)_2HPO_4$
- CH_3Cl
- C_6H_5OH

2. An aqueous solution of what substance colors phenolphthalein in a purple-crimson color?
☐ $FeSO_4$
☐ Na_2CO_3
☐ $NaNO_3$
☐ SO_2
☐ $KClO_4$

3. Identify the substance Y in the following scheme of interconversions:
$$Fe(OH)_3 \xrightarrow{t} X \xrightarrow{HCl} Y$$

☐ Fe_2O_3
☐ $FeCl_3$
☐ $FeCl_2$
☐ Fe_3O_4
☐ $Fe(OH)_3$
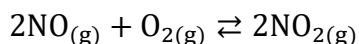
4. Indicate a pair of substances belonging to the same homologous series?
☐ CH_3NO_2 and CH_3NH_2
☐ CH_3OH and CH_3COOH
☐ $CH_3CH_2CH_2OH$ and CH_3OH
☐ CH_3Cl and CH_3Br

5. Choose all substances which can react with aqueous solution of NaOH:
☐ butane
☐ benzene
☐ trihydroxypropane
☐ ethanol
☐ phenol

6. Nitrogen (II) oxide and oxygen were mixed in a constant volume reactor. The following equilibrium was quickly established:
$2NO_{(g)} + O_{2(g)} \rightleftarrows 2NO_{2(g)}$
What is the initial concentration of O_2 if the equilibrium concentrations of O_2 and NO_2 are 0.15 and 0.18 mol/l, respectively?
Round your answer to two decimal places (Answer example: 0.15)

7. Choose the weak acids (multiple correct answers):
☐ KOH

☐ HCl
☐ H_2SO_4
☐ CH_3COOH
☐ H_2S
☐ NaBr

8. Which manipulations would shift the chemical equilibrium of the reaction $2CO_{(g)} + O_{2(g)} \rightleftarrows 2CO_{2(g)} + 566kJ$ to the left? (multiple correct answers)
☐ the pressure increase
☐ the reduction of pressure
☐ the oxygen adding
☐ the CO_2 adding
☐ the heat
☐ cooling

9. What substances are oxidizing agents? (multiple correct answers)
☐ Zn
☐ PbO_2
☐ KJ
☐ Na_2S
☐ HNO_3

10. Choose all elements and ions with the $3d^{10}4s^24p^6$ configuration of external electron level:
☐ Ar
☐ Kr
☐ Ni
☐ Sr^{2+}
☐ Sc^{3+}
☐ Br^-
☐ Fe^{3+}
☐ I^-

11. Choose all ions with the $3d^54s^04p^0$ configuration of external electron level:
☐ Zn^{2+}
☐ Ni^{2+}
☐ Mn^{2+}
☐ Cr^{3+}
☐ Fe^{2+}
☐ Fe^{3+}
☐ Co^{3+}
☐ Cl^-

12. 200 g of 55% (w/w) solution was prepared by dissolving salt in hot water. When the solution was cooled, 50g of an anhydrous salt precipitated in the solution. Calculate the mass fraction of salt in the solution above the precipitate. Give your answer as a percentage to the nearest integer. (Answer example: 20)