Surname and Name   Matriculation No.
……...   …...........................

1) The oxidation number of an atom is
      the number of electrons gained or lost upon bond formation   [   ]
      its charge   [   ]
      its first ionization energy   [   ]
      its redox potential   [   ]

2) Adding fructose to a water solution of calcium chloride causes:
      lowering the vapor pressure of the solution   [   ]
      lowering the boiling point of the solution   [   ]
      lowering the osmotic pressure of the solution   [   ]
      increase of the freezing temperature   [   ]

3) In the equilibrium $CH_3COOH + H_2O \rightleftharpoons CH_3COO^- + H_3O^+$ the Brönsted-Lowry acids are:
    CH_3COOH and H_3O^+   [   ]
    CH_3COOH and H_2O   [   ]
    CH_3COOH and CH_3COO^-   [   ]
    H_3O^+ and CH_3COO^-   [   ]

4) A solution of glucose and a solution of sodium sulphate of the same molal concentration:
    have identical colligative properties   [   ]
    have the same osmotic pressure   [   ]
    different colligative properties   [   ]
    have the same freezing temperatures   [   ]

5) Which of the following compounds is an anhydride?
    $CH_3CH_2-O-COCH_3$ [   ]
    $CH_3CO-O-COCH_3$ [   ]
    $CH_3CH_2-O-CH_3$ [   ]
    $CH_3-CO-CH_3$ [   ]

6) A metal is an element that:
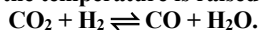   **donates electrons**   [   ]
    donates protons   [   ]
    tends to accept electrons   [   ]
    tends to accept protons   [   ]

7) Draw the chemical formula of each compound indicating all the atoms, bonds and charges (when applicable): phosphatidic acid, phenol, furan, nitric acid (Lewis structure)

8) 10 mL of a 25% (weight/weight) solution of ammonia (density=0,91 g/mL) are diluted with distilled water, reaching a final volume of 500 mL. Calculate the pH of the solution ($K_B = 1,8 \cdot 10^{-5}$ M).

9) Calculate the osmotic pressure at 30 °C of a solution prepared by mixing 150 mL of 0.2 M nitiric acid with 250 mL of 0.12 M Na OH.

10) A 1 liter reactor contains 0.7 M carbon dioxide M and 0.8 M dihydrogen. The following equilibrium is established when the temperature is raised to 400°C (Volume is constant).
$CO_2 + H_2 \rightleftharpoons CO + H_2O$.
Calculate the K_C at 400 °C, knowing that when the equilibrium is achieved the concentration of CO is equal to 0.5 M.

11) Bromophenol blue is a weak acid with $pK_A = 3.9$, it is used as pH indicator since it is red in its indissociated form and blue in the dissociated one. After adding bromophenol blue at a very low concentration to a solution of unknown pH, the red form is predominant over the blue one with a ratio equal 6.4 : 1. Calculate the pH of the solution.