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Electrical conductivity of solutions lab report

This preview shows pages 1-2 of five pages. You're reading free preview page 3 in this preview not displayed. Objectives Observe the conductivity of substances in different aqueous solutions Determination is a strong or weak electrolyte for interpreting the chemical reaction by observing the conductivity of the aqueous solution. Electrical conductivity is based on electron flow. Metals are good electrical wires because they allow electrons to flow through all material. Thus, electrons flow like a sea of electrons through metals. By comparison, distilled water is very bad for the electrical conductive operator because very little electricity flows through the water. Highly ionized substances are strong electrolytes. Strong acids and salts are strong electrolytes because they ionize (dissociating or separating) in a solution. The ions carry the electric charge through the solution, thus creating an electric current. If sufficient, the current shall light up on the electrical conductivity meter on one or both of the lady's or both of the vehicles shown on the right. Mildly ionized substances are weak electrolytes. Weak acids and bases are classified as weak electrolytes because they do not completely separate in the solution. Substances that do not control electrical current are called electrolytes. Non-electrolytes do not ionize; they do not contain portable ions. There is no illumination of the electric current because there is no ion to carry the electric current. The table below lists examples of strong, weak and non-electrolytes. Strong Acids Hydrochloric acid \(\ce{HCl}\) (aq) Hydrobromic acid \(\ce{HBr}\) (aq) Hydroiodic acid \(\ce{HI}\) (aq) Nitric acid \(\ce{HNO3}\) (aq) Sulfuric acid \(\ce{H2SO4}\) (aq) Perchloric acid \(\ce{HClO4}\) (aq) Chloric acid \(\ce{HClO3}\) (aq) Strong Bases Sodium hydroxide \(\ce{NaOH}\) (aq) Potassium hydroxide \(\ce{KOH}\) (aq) Calcium hydroxide \(\ce{Ca(OH)2}\) (aq) Barium hydroxide \(\ce{Ba(OH)2}\) (aq) Soluble Salts Sodium chloride \(\ce{NaCl}\) (aq) Potassium carbonate \(\ce{K2CO3}\) (aq) Copper(II) sulfate \(\ce{CuSO4}\) (aq) Weak Acids Acetic acid \(\ce{HC2H3O2}\) (aq) Carbonic acid \(\ce{H2CO3}\) (aq) Citric acid \(\ce{C6H8O7}\) (aq) Phosphoric acid \(\ce{H3PO4}\) (aq) Weak Bases Ammonia \(\ce{NH3}\) (aq) Ammonium hydroxide \(\ce{NH4OH}\) (aq) Magnesium hydroxide \(\ce{Mg(OH)2}\) (aq) Most other bases Slightly Soluble Salts Silver chloride \(\ce{AgCl}\) (s) Calcium carbonate \(\ce{CaCO3}\) (s) Barium sulfate \(\ce{BaSO4}\) (s) Distilled water \(\ce{H2O}\) (l) Methanol \(\ce{CH3OH}\) (aq) Materials and Equipment conductivity meter , washing bottle with distilled water, large beaker for rinsing/waste, small beakers, Kimwipes, solid sodium chloride, solid calcium carbonate Solutions: acetic acid, aluminium nitrate, ammonium hydroxide, calcium hydroxide, citric acid, ethanol, hydrochloric acid, magnesium hydroxide, magnesium sulphate, nitric acid, potassium iodide, sodium chloride, sodium hydroxide, sucrose Safety Be nitric acid, sulphuric acid and concentrated acetic acid. Although low in concentration, some people may have extreme skin sensitivity. If you get tingling or discolouration of the skin, rinse immediately in large amounts of water for 15 minutes. Inform your instructor as soon as possible. Personal protective equipment is required: labcoat, goggles, closed toeshoe The meter has a 9V battery and two parallel copper electrodes. Use a washing bottle with distilled water and a large beaker marked with waste to rinse the copper electrodes with distilled water. Dry using Kimwipe tissue. If this option is checked, the lights should not be lit. If necessary, repeat rinsing and drying. Note Do not leave the printed circuit board in water. Only copper electrodes should be rinsed with water. Place the meter so that the circuit board is facing upwards (the battery is below). Always place the meter so that the printed circuit board does not get wet. On this side is a guide to possible conductability measurements: Scale Red LED Green LED conductability 0 off low or none 1 dim off low 2 medium off medium 3 bright twilight high 4 very bright medium very high Note Turn the meter on and dipped copper electrodes to test conductability. After each test, rinse thoroughly with distilled water and dry with Kimwipes. Turn off the meter between uses. Place 5 ml of distilled water in a small clean beaker. Test and record your results. Place 5 ml of tap water in a small, clean beaker. Test and record your results. Place about 0,2 g of solid sodium chloride (\(\ce{NaCl}\)) in a small clean beaker and test conduction. Add 5 ml of distilled water to sodium chloride; test the conductive of the solution. Discard the solution in the sink and rinse in the beaker. Place about 0,2 g of solid calcium carbonate (\(\ce{CaCO3}\) in a small clean beaker and test conduction. Add 5 ml of distilled water to calcium carbonate; test the conductive of the solution. Discard the solution in the washbasy and rinse in the beaker. Use each of the following 5 ml in a 100 ml beaker to test the cases. Be sure to rinse and dry the electrodes between the tests, using your washing bottle waste beaker and Kimwipes. The solution should be destroyed and the beaker rinsed in the sink during the test period. Dispose of the beaker solution on the bonnet with non-hazardous waste. acetic acid, 0.1 M \(\ce{HC2H3O2}\) aluminium nitrate, 0.1 M \(\ce{Al(NO3)3}\) ammonium hydroxide, 0.1 M \(\ce{NH4OH}\) (aq) calcium hydroxide, saturated \(\ce{Ca(OH)2}\) citric acid, 0.1 M \(ce{C6H8O7}\) ethanol, \(\ce{CH3CH2OH}\) hydrochloric acid, 0,1 M \(\ce{HCl}\) magnesium hydroxide, saturated \({Oh)2}\) magnesium sulphate, 0,1 M \(\ce{MgSO4 }\) nitric acid, 0.1 M \(\ce{HNO3\) potassium iodide , 0.1 M \(\ce{KI}\) sodium chloride, 0.1 M \(\ce{NaCl}\) sodium hydroxide , 0.1 M \(\ce{NaOH}\) sucrose, 0.1 M \(\ce{C12H22O11}\) Solution observations: red LED | green LED conductive Weak or non-electrolytes ionized, partially ionized or non-ionized examples: \(\ce{LiOH}\) (aq), \(\ce{HNO2}\) (aq), methanol (l) red bright, green dim red dim, red red, green field high/low/no strong electrolyte/weak electrolyte ionized/partially ionized/unioned distilled water, \(ce{H2O}\) (l) tap water \(\ce{H2O}\) (l) solid sodium chloride, \(\ce{NaCl}\) (s) sodium chloride solution, \(\ce{NaCl}\) (aq) solid calcium carbonate, \(\ce{CaCO3}\) (s) calcium carbonate solution, \(\ce{CaCO3}\) (aq) acetic acid, \(\ce{HC2H3O2}\) (aq) aluminium nitrate, \(\ce{Al(NO3)3}\) (aq) ammonium hydroxide, \(\ce{NH4OH}\) (aq) calcium hydroxide, \(\ce{Ca(OH)2}\) (aq) carbonic acid, \(\ce{H2CO3}\) (aq) ethanol, \(\ce{CH3CH2OH}}\) hydrochloric acid \(\ce{HCl}\) (aq) magnesium hydroxide, \(\ce{Mg(OH)2}\) (aq) magnesium hydrochloric acid, \(\ce{HCl}\) (aq) magnesium hydroxide, \(\ce{Mg(OH)2}\) (aq) magnesium hydrochloride, \(\ce{HCl}\) (aq) magnesium hydroxide , \(\ce{Mg(OH)2}\) (aq) magnesium sulfaam sulphate, \(\ce{Mg(OH)2}\) (aq) magnesium sulphate, \(\ce{HCl}\) (aq) magnesium sulphate, \(\ce{Mg(OH)2}\) (aq) magnesium hydrochloride acid, \(\ce{HCl}\) (aq) magnesium hydroxides, \(\ce{Mg(OH)2}\) (aq) magnesium sulphate, \(\ce{HCl, \(\ce{MgSO4}\) (aq) nitric acid, \(\ce{HNO3}\) (aq) potassium iodide, \(\ce{KI}\) (aq) sodium chloride, \(\ce{NaCl}\) (aq) sodium hydroxide, \(\ce{NaOH}\) (aq) sucrose, \(\ce{C{C12H22O11}\) (aq) Why should the electrical conductivity electrodes and all beakers be rinsed with distilled water after each control fertility test? Why is distilled water a weaker conductor than tap water? Why does solid sodium chloride act as an electrolyte while aqueous solution \(\ce{NaCl}\) acts as a strong electrolyte? Classify all of the following data as ionized, partially ionized or ionized. Iga ühend kirjutatakse nii, nagu see on olemas vesilahuses, nt \(\ce{NaCl (aq) -> Na^+ (aq) +Cl^- (aq)}\) \(\ce{HCl}\) (aq) – tugev hape \(\ce{Ca(OH)) 2}\) (aq) – tugev alus \(\ce{HC2H3O2}\) (aq) – nõrk hape \(\ce{Ba(OH)2}\) (aq) – nõrk alus keemiline reaktsioon \[\ce{H2SO4 (aq) + 2 NaOH (aq) -> Na2SO4 (aq) + 2 H2O (l)}}]] Kirjutage täielik ioonne võrrand: Kirjutage ioonne netovõrrand: Keemilise reaktsiooni jaoks \[\ce{KNO3 (aq) + NaCl (aq) -> NaNO3 (aq) + KCl (aq)}}\] Kirjutage täielik ioonne võrrand: Kirjutage ioonne kasulik võrrand: võrrand: võrrand:

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