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|  | **Materials Needed**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Test kit: pH, chlorine, alkalinity | Sterile sample tubes | Growth medium (agar) | 500 ml glass beaker | 250 ml distilled water | Streaking rod | Petri dishes (14) | | Car | Gas | Gloves | Aprons | Safety goggles | Matches or striker | Garbage can | | Thermometer | Bunsen burner | Sink | Pools to test (6) | Autoclave | Sink | Water from various pools | | Scale | Weigh boat | Glass rod | Hot plate |  |  |  |   **Introduction to Procedure:**   1. First we talked to Pool Time in Pleasanton to find what the appropriate tests to measure the quality of pool water. We were told that we needed to test pH, chlorine, total alkalinity, and temperature. 2. We then chose six pools in Pleasanton, which were to be the "subjects" of our tests. These pools were: Amador Valley High School, Pleasanton Valley Swim Club, Laguna Oaks, Golden Eagle Community Pool, and the Aquatic Center. 3. Next, we created a spreadsheet (shown in our "results" section), in order to record the pH, chlorine, total alkalinity, and temperature levels for each pool on each given day. The spreadsheet also had space to record the weather conditions each day, to see if weather is an important factor in water quality. 4. Then we bought an Aquality, Mark IV Test Kit. This kit was approximately $20, and included the chemicals. No additional chemicals will be needed. The chemicals included in the kit include color-coded reagents for pH, chlorine, and total alkalinity. In addition the test kit included large and small plastic vials, with corresponding color-coded charts. This allowed us to take accurate readings for each test.   **Procedures: (The following should take place every day you test)**  **The solutions used in this experiment are produced by Guardex, and labeled, 4-In-1 Test Kit**  **I. Testing For pH (degree of acidity or alkalinity):**   1. Fill large tube with pool water to the upper mark. 2. Add 1 drop if solution number 4 (chlorine neutralizer) and swirl to mix. 3. Add five drops of solution number 2 (phenol red) and swirl to mix. 4. Compare the color with the pH color standards. Matching colors will indicate the pH of your pool water. 5. Record these results into the spreadsheet. Continue this process until you have tested each pool ten times on different days.   **II. Testing for Chlorine:**   1. Fill the small tube to the mark with pool water. 2. Add 1 drop of solution number 4, and swirl to mix. 3. Add five drops of solution number 1(orthotolodine) 4. Place cap on tube and invert several times to mix. 5. To obtain free chlorine reading, math the colors within 10 seconds. The result is read in parts per million (ppm). A continuous development of color indicates combined chlorine. The reading at 5 min. will give total combined chlorine. A large difference between the readings indicates a need for superchlorination. 6. Record the results in the spreadsheet, and continue process for every pool. Continue until each pool has been tested 10 times on different days.   **III. Testing for Total Alkalinity:**   1. Rinse large tube with pool water and fill to the lower line. 2. Add one drop of solution number 4 (neutralizer) and swirl to mix. 3. Add one drop of solution number 5 (buffer) and swirl to mix. 4. Add solution number 3 (titrant) by drops, swirling between drops until color changes from purple to a permanent clear or yellow. 5. Calculation: multiply the number of drops by 10 to determine the total alkalinity. Example: 7 drops=70ppm(parts per million is expressed as calcium carbonate).   **Testing Water Samples for Bacteria:**  **I. Making the Agar Gel:**   1. Label 2 petri dishes for each pool name, and two for control. 2. Add 5.75g agar to 400mL-glass beaker. 3. Measure out 250ml of distilled water into 400mL beaker. 4. Place beaker on hot plate and stir while heating. Heat until powder completely dissolves. 5. Heat until solution boils - maintain boiling for 3 - 5 minutes. 6. Allow 10 to 15 minutes to cool. 7. Pour enough mixture into the petri dishes to cover the bottom of the dishes. 8. Let cool until the agar solidifies. Place in refrigerator to speed up process. 9. Discard the excess mixture in the sink with running water.   **II. Streaking the Agar Gel:**   1. Line up the corresponding petri dishes, by pool, in rows. 2. Place the water samples from the pools next to the matching petri dishes(i.e. Amador petri dishes next to Amador water sample) 3. Put on safety goggles, and sterile gloves. 4. Take out the Bunsen burner and place cord onto gas nozzle. Turn lever, allowing gas to flow. 5. With the matches or the striker, light the top of the burner, until a flame burns on it's own. 6. Take the streaking rod and hold the metal tip into the flame until it turns red. (This sterilizes the tip). 7. Dip the end of the streaking rod into a water sample and establish a bacterial growing ground with the streak plate method: Lift lid carefully to a 45 degree angle and lightly streak the streaking rod back and forth evenly across the entire surface of the petri dishes. Be sure to swab the bacteria to the edges of the dish. 8. Rotate the petri dishes 45 degrees and swab at right angles to the first streak. 9. Replace lid of petri dish. 10. Continue process for each of the 14 petri dishes, sterilizing the streaking rod with each new water sample. 11. For a control, take off glove, and lightly press thumb pad onto the agar in the 13th and 14th petri dishes (labeled control) Replace lids. 12. After all samples have been completed, sterilize rod, and turn off Bunsen burner by shutting off the gas valve. 13. Remove the tube from the gas nozzle and replace Bunsen burner where it belongs. 14. Rinse out beakers, and replace them where they belong. 15. With a wet rag, wipe down the lab station.   **III. Growing Bacteria:**   1. Place each of the matching petri dishes on top of another. 2. Carefully place the dishes into the autoclave, and clamp the door shut. 3. Leave samples in the heat locker for at least 2 days, to allow for bacterial growth. 4. After 2 days, remove the bacteria, and open the lids. 5. If bacteria are present, white dots (colonies of bacteria) should be seen in the petri dishes. 6. Write down which pools grew bacteria, and specify the number of colonies per petri dish. 7. Scrape the agar into the garbage can, and rinse out the petri dishes with soap and water. 8. Remove the labels from the bottom of the dishes. 9. Put the dishes back where they belong. |

*This Web Site is Best viewed with 256 or more colors.*

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