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| CHEMICAL & PROCESS ENGINEERING | | | |
| *Complete 20 stars* | | | |
| Rating | No | Exercises in Chemical & Process Engineering | Sign |
| \* | 1 | Write a brief report on what the terms anodic and cathodic mean |  |
| \*\*\* | 2 | Investigate the different areas on a rusting (corroding) nail. Mix ½ teaspoon (2 grams) of salt (sodium chloride) and 2 teaspoons (5 grams) of gelatine or agar and two drops each of phenolphthalein and bromophenal blue (get these from your teacher) into a cup (150 mls) of hot water and stir until dissolved. Pour into a flat dish over a clean 75mm iron nail. Observe over 3 days and report on colour changes. Try and explain these |  |
| \*\*\* | 3 | Investigate how timber dried. Cut 5 lengths of 250mm and 5 lengths of 100mm off a softwood branch (willow or birch) about 50mm diameter, and strip the bark off. Weigh the 5 long lengths immediately and record their total weight. Repeat with the short lengths. Put them out in a draughty dry place, weighing every day for a week. How much weight due to drying is lost form each lot? Write a report recording your results and saying whether wood dries through the sides or through the cut ends. What can you say about drying along the grain compared to across the grain? |  |
| \*\*\* | 4 | Make up a weak salt water solution, by lacing 1 or 2 teaspoons of salt in 600 mls of water. Taste a small quantity, put into plastic containers and freeze. Rinse off the surface of the ice pieces and then leave to melt. Taste to see if the water is less salty. Do this two more times. Explain how this crystallisation process can be used to take salt out of (desalinate) sea water |  |
| \*\* | 5 | Investigate the difference in mixing between diffusion and stirring. Fill 2 glasses with hot water. Gently lower 2 teaspoons of sugar to the bottom of each cup. After 5 minutes check the sweetness of the top lay by sipping, taking care not to rock the cups. Stir the liquid in one cup for 10 to 20 seconds using a fork. Taste again. Leave the other cup for several hours and taste again.  For an extra star repeat the experiment with water and potassium permanganate crystals, and observe the colour, rather than taste |  |
| \*\*\* | 6 | Make some casein by mixing 20 mls (2 dessertspoons) vinegar with 300ml of low cream (green top) milk. Heat to 50° (hot water temperature) and leave standing for 10 minutes. Filter out the curds through a fine cotton cloth. Dry in an oven at 100°C |  |
| \* | 7 | Find out what LPG and CNG are. For an extra star design a poster showing how they are used |  |
| \*\*\* | 8 | Investigate how the flow rate of salt increases as the hole in a salt shaker is made larger. (Use a hole made in the lid of a jar, and reuse the salt!). Does the height of salt make any difference? Show your results on a chart. |  |
| \*\* | 9 | Find several different types of paper (eg. Newsprint, toilet paper, paper bag, airmail letter etc). Measure and record how hard they are to tear when dry and when wet. If possible, look at each under a microscope and report how they differ. Record your results on a chart |  |
| \*\* | 10 | Try beating some kerosene or turpentine into water with a fork, and measure the time it takes for the liquids to completely separate again. Report on how the vigour, and the length of beating affects the time. Show your results on a graph |  |
| \*\* | 11 | Make a collection of the different plastics you use at home. Glue small samples onto a chart. Label the use of each sample |  |
| \*\* | 12 | Write a report on what dialysis is and how it is used to cleanse the blood of kidney patients. |  |
| \* | 13 | Find out why a pile of weeds just the right size converts to compost faster than a smaller pile or a larger pile |  |

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| \*\*\* | 14 | Find out from the manufacturers how your favourite fruit juice is processed so that it does not ferment. Write a report |  |
| \*\* | 15 | Explain on a poster how instant milk and coffee are made. Look at some of the particles under a microscope and try to explain the shapes that you see |  |
| \*\* | 16 | Look out for reports in the newspaper of new chemical processes being started in New Zealand for high value biological products, and summarise one of these |  |
| \*\* | 17 | Make a collage of newspaper or magazine articles relating to engineers or manufacturing processes |  |
| \*\* | 18 | On a poster describe the processes needed for wool to be fully prepared for carpet and garment manufacture |  |
| \*\* | 19 | Find out what an environmental impact report is, and what type of trained people need to be employed to write such a report for a new chemical or processes industry. Write an advertisement seeking such a person listing the qualifications required |  |
| \*\* | 20 | Wrap some wide plastic sticking tape around a cylindrical plastic bottle, sticky side out, and fasten the bottle upright to a support in the open, such as your clothesline or fence. Mark which direction is north, and after one week gently cut off and study the tape under a magnifying glass or microscope. Count the number of wind-blown particles per cm2 and find from which direction they predominate |  |
| \*\*\* | 21 | “Acidic Soot” found in many cities, often causes nylon stockings to deteriorate. Cut out 5 pieces of good quality (15 denier) nylon stocking and glue each onto a small cardboard frame so that air can pass through the nylon. Count any broken threads (use a magnifying glass), and leave 4 of the samples outdoors, bringing one indoors after each 2 weeks. Plot the broken threads against time on a graph |  |