How do you express your love for someone?



Chocolate?









Soft Toys?



... or Chemistry?







 Dr. Lee Kum Tatt wanted to give his wife a present that would last forever.



It took him 20 long years to fulfil his wish. A gold-plated orchid.



Dr. Lee said, "It was one of those few occasions that a man can do something for his wife and share it with the whole world."



RISIS orchids reaped \$2 million in sales in the first year and sales continued to grow by \$1 million a year.

An excellent example of how ideas and creativity can generate wealth and employment for the nation and people of Singapore.



• The principles of *electroplating* are used to coat the orchid with a layer of gold.





 Problem 1: Flowers do not naturally conduct electricity. What can be done to the orchid to make it conduct electricity?





• Answer: The surface of the orchid is coated with a layer of very *finely powdered copper*. Copper is a good conductor of electricity due to the mobile sea of electrons that form part of the strong metallic bond.





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• Problem 2: Which solution do you suggest should be used for the electroplating process?





 Answer: An aqueous solution containing gold(I) cations (Au⁺(aq)) for example gold(I) nitrate (AuNO₃(aq)).





 Problem 3: During the electroplating process, should the orchid be connected to the anode (+) or the cathode (-)?





 Answer: The orchid should be connected to the negative cathode so that the positive gold(I) cations (Au⁺(aq)) are attracted towards it.





 Problem 4: Which chemical element should the anode be made of?





Answer: The anode should be made of *gold*. Oxidation of the gold anode will produce gold(I) cations (Au⁺(aq)). These will replace the gold(I) cations that are removed from solution as they are reduced at the cathode.





 Problem 5: Write ionic half-equations to describe the chemistry taking place at the anode and at the cathode.





• Answer:

→ Oxidation at the positive anode (made of gold):

Au(s) \rightarrow Au⁺(aq) + e^{-}

→ Reduction at the negative cathode (copper coated orchid): $Au^+(aq) + e^- \rightarrow Au(s)$



 All elements of the system should now be in place to successfully electroplate the copper coated orchid with gold.





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• Anode (oxidation): Au(s) \rightarrow Au⁺(aq) + e^{-}



• Cathode (reduction): Au⁺(aq) + $e^- \rightarrow$ Au(s)



Finally...

Dr. Lee said, "In life, a person has two choices. He can either do what he likes, or he has to learn to like what he has to do."





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