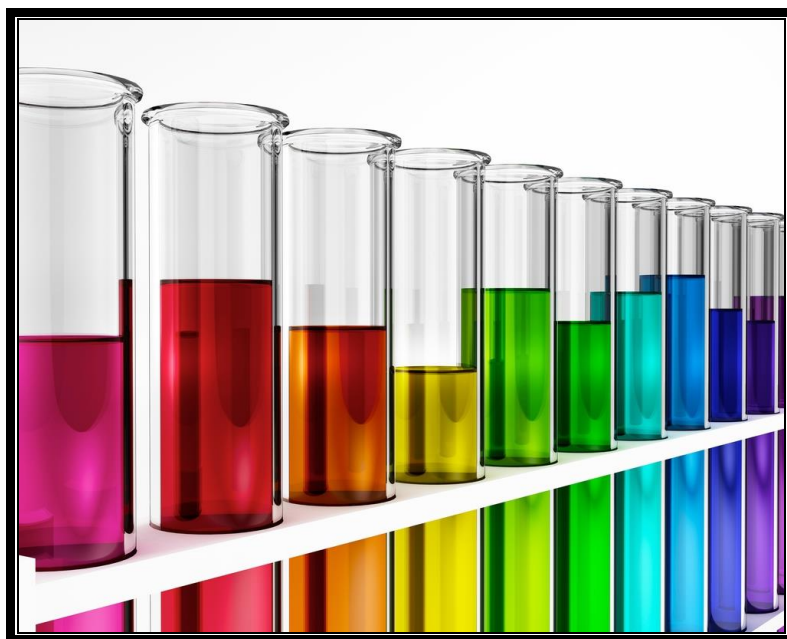


St Modan's High School Chemistry Department



National 5 Chemistry



Open Ended Questions

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1. A student carried out an experiment to investigate the effect of temperature on the rate of reaction. The student concluded

“the only way to increase the rate of reaction is to increase the temperature”.

Using your knowledge of chemistry comment on the accuracy of the student’s statement.

2. Fred says that Lithium chloride is ionic as it is a compound made from a metal and a non-metal.

Using your knowledge of chemistry, explain how Fred could test this hypothesis.

3. Metals

Using your knowledge of chemistry, describe how 4 metals could be placed in an order of reactivity.

4. **Using your knowledge of chemistry**, describe how you could distinguish between a solution that contains ethanoic acid and one which was pure water.

5. A new element is discovered.



Using your knowledge of chemistry explain how you would decide whether it belonged in group 1, group 7 or group 0.

6. Two bottles, containing white powder, have lost their labels. One bottle contains potassium chloride the other contains glucose.

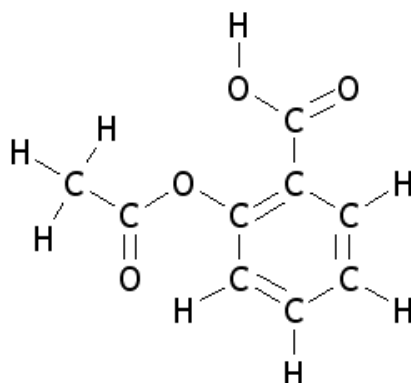
Using your knowledge of chemistry, describe how you would decide which bottle is which.

7. The periodic table of the elements in its current form is an astonishing achievement with major contributions from famous chemists and other important scientists.

The image shows a standard periodic table of elements. It includes all elements from Hydrogen (H) to Oganesson (Og). The Lanthanide series (La to Lu) and Actinide series (Ac to No) are shown below the main table.

Using your knowledge of chemistry, comment on 2 different elements comparing the properties and position of your chosen elements?

8. Aspirin is widely used as a medicine. The structure of aspirin is shown below.



Using your knowledge of chemistry, comment on physical and chemical properties you would expect aspirin to demonstrate.

9. The labels have dropped off three bottles containing organic compounds. The chemistry technician has asked a National 5 chemistry class to identify these compounds.

Using your knowledge of chemistry, comment on how would the class could identify the alcohol, alkene and carboxylic acid.

10. The lithium-ion batteries that power our laptops, smartphones and electric vehicles could produce a greater amount of energy if their graphite electrodes were to be replaced by lithium metal ones.



Using your knowledge of chemistry, provide possible reasons for this increase in energy output and comment on the suitability of lithium for electrodes.

11. We are told that radioactivity is dangerous but there are over 200 radioisotopes used on a regular basis in medicine.



Use your knowledge of chemistry, to comment on why radioisotopes can be used in medicine.

12. Aluminium can be extracted from aluminium oxide and iron from iron(III) oxide. Aluminium oxide is more abundant than iron(III) oxide yet aluminium is more expensive than iron.

Use your knowledge of chemistry, to comment on why this is the case.

13. Dentists use an amalgam (an alloy of mercury, silver and tin). A person with an amalgam filling accidentally touched a steel fork against it while eating and immediately felt a sharp pain in the tooth. A dentist said that the pain was caused by an electric current produced in the tooth and would have been more painful if they had touched the tooth with aluminium foil.



Use your knowledge of chemistry, to comment on why this is the case.

14. A farmer tested his soil and found that it was lacking in nitrogen. He was concerned that fertilisers would make the soil too acidic.

Use your knowledge of chemistry, to comment on how the accuracy of the farmers concerns.

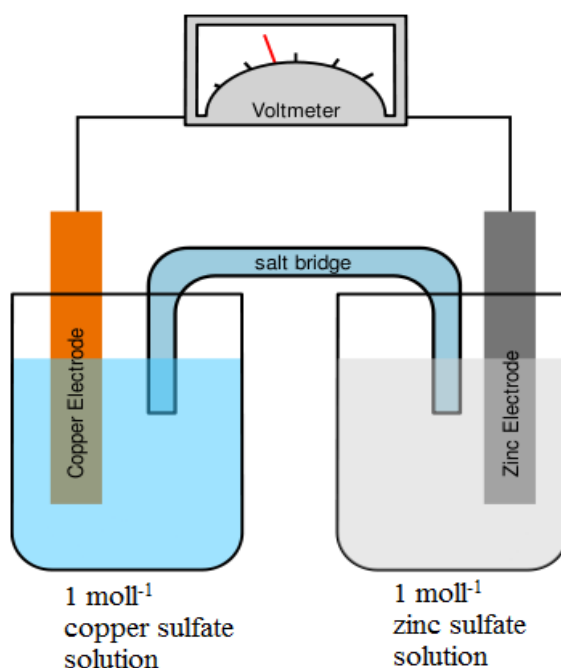
15. The essential elements for plant growth are nitrogen, phosphorus and potassium.

A student was asked to prepare a dry sample of compound containing two of these elements. The student was given access to normal laboratory equipment and the following chemicals:

<i>Chemical</i>	<i>Formula</i>
potassium hydroxide	KOH
water	H ₂ O
nitric acid	HNO ₃
sulfuric acid	H ₂ SO ₄
magnesium nitrate	Mg(NO ₃) ₂
potassium carbonate	K ₂ CO ₃
sodium hydroxide	NaOH
phosphoric acid	H ₃ PO ₄
ammonium hydroxide	NH ₄ OH

Using your knowledge of chemistry, comment on how the student could prepare the dry sample.

16. Electrochemical cells produce a voltage. An example is shown below:



Using your knowledge of chemistry, comment on how the cell could be changed to create a larger voltage.

17. "Burning ethanol as a fuel is better for the environment than burning petrol".

Using your knowledge of chemistry, comment on the accuracy of this statement.

18. A student used a machine called a mass spectrometer to find the molecular mass of chlorine molecules. After looking at his databook he was expecting to get a reading of 71 amu, but his results showed three different masses, 70amu, 72amu and 74amu.

Using your knowledge of chemistry, explain the results and how the student's misconception occurred.

19. A gem smuggler has tried to conceal some uncut diamonds in bags of salt crystals.

Using your knowledge of chemistry, explain how the diamonds could be separated from the salt crystals if they looked very similar and were identical in size and shape, giving details of how their bonding explains their differences in properties.

20. Cars in Scotland rust very quickly when their paintwork is damaged, whereas in the Australian outback they show very little signs of rust even when they are old and badly damaged.

Using your knowledge of chemistry, explain how rusting occurs and why there are these differences.

21. Leicester is a city in England that boasts that it is Britain's first nuclear free zone.

Using your knowledge of chemistry, explain why this is unlikely to be true.