Welcome to the Wonderful World of Waste Michael Pola Envirostore Chemical Consulting

This instalment will look at and address Segregation of your Chemicals in the Laboratory

First of all. what is it and why does it matter to the school laboratory technician?
Its a dangerous goods concern and relates to how you store your chemicals and is really only applicable to any dangerous goods you may have in your school lab and its associated storeroom.
Remember laboratories are subject to two main pieces of legal requirements or legislation. when dealing with chemicals .The Dangerous Goods (storage and handling) Regulations and the Occupational Health and Safety Regulations . The DG one is concerned only with storage and transport. The OH and S one includes within its many regulations the Hazardous Substances Regs which are concerned with ***exposure*** to chemicals, ie when you actually get around to using the chemicals , weighing them out, making up solutions, mixed different ones together to observe a reaction or chemical principal . While there is a bit of overlap between the two Regulations, they require different practices and behaviours and requirements. The Hazardous Substances for example, include requirements having Safety Data Sheets, a chemical register and undertaking risk assessments and applying risk controls. You should all be familiar with these . Dangerous goods is applicable to the storage and transport of dangerous goods; take out the transport part which won't apply to you, which leaves you with storage.

The days of storing in alphabetical order and liquids and solids , are or should be long gone. The dangerous goods system of classifying chemicals by their physical and or chemical properties is used internationally across all forms of transport , road , rail , sea and air. The reason behind the dg system is to ensure safe transport of nasty and reactive chemicals and the same as far as storage goes. Your school will only have minor amounts of dangerous goods but the potential reactions are only different from the large users in scale. A fire in your lab caused by 500 mL of a class 3 flammable liquid is no less dangerous than a fire on a ship or in a warehouse. It's all a matter of scale. and we don't want ANY chemicals reactions caused by incorrect storage practices in your laboratory do we?

Physical properties include flash point, phase ie liquid solid or gas, boiling point, corrosive properties including to metal as well as humans, toxic properties (chronic ie over a long exposure and acute ie immediate after exposure). Chemical properties are usually specific but can be grouped such as dangerous when wet, class 4.2 , the possible reactions can include an emission of a toxic or flammable gas or propensity to catch fire . Either way the dangerous goods in your lab , in my factory on that truck driving past to the warehouse or factory are classified by their physical /chemical properties . The chemicals that are a dangerous good are bad enough, ie flammable liquid (class 3) , a toxic substance, (class 6) a corrosive liquid, (class 8), a compressed gas in a cylinder I(class 2) , a radioactive substance that requires shielding (class 7) , some filthy material that catches fire in contact with air or water (class 4.2) or some solid salt that makes a fire ten times as worse or explodes because it is a source of oxygen. (class 5.1) You need to be protected from such chemicals as do visitors and workers to the lab. Protection is achieved by knowledge of what you have and possible reactions, followed by storage in appropriate cabinets.

There is more, as usual. Many dangerous goods also don't like each other in that reactions involving them can be significantly more dangerous resulting in explosions, vigorous emission of corrosive gases and vapours, a huge increase in the intensity of a fire and sometimes runaway reactions. A good example here is the reaction involving a class 3 flammable liquid and a solid oxidiser class 5.1, specifically petrol or thinners or similar common flammable liquid and calcium hypochlorite which is commonly used as a swimming pool steriliser. When these two dangerous goods react a spectacular column of flame and sparks results even using as little as 100 mL of the flammable liquid. You can expect something similar with virtually any flammable liquid and oxidising solid, remembering oxidising solids include any nitrate or nitrite and any chlorate or perchlorate. Hydrogen peroxide is one of the few oxidising liquids encountered in school labs, as is nitric acid which as a second dg class 5.1, Its primary class is 8.

Acids and alkalis which are both class 8s (an anomaly in the Dangerous Goods regulations that remains unchanged to this day in the latest version) are also incompatible for storage because mixing a strong mineral acid with a strong alkali will without fail result in a most vigorous reaction that produces hot acid or alkaline liquid splashes or fumes sometimes explosively. Not good in a school lab. There are other examples of the reactions once can expect if two incompatible dangerous goods classes are allowed to react. I have been to a school after a fire in the lab caused by a bottle of white phosphorus which had lost its layer of water and was stored in the flammable liquids storage cabinet. Classes 4.3 and 3 are not compatible for storage . The fire which was very hot because of the phosphorous did a lot of damage especially to the upper walls and ceiling of the lab.

How do you know if two dangerous goods are compatible for storage or not? You consult a compatibility chart and you can find one on our web site, ***www.envirostore.com.au,*** in the For Schools section, within the notes for chemical management in the school laboratory, about the eighth page . Simply run the two classes down from the left and top of the chart until they meet and see if you get a O for yes or N for not compatible. If they are indeed compatible you can safely store the two classes in the same cabinet. You will note that there is not much compatible with the 5.1 items but plenty with the toxics, class 6. The class 9 miscellaneous chemicals are compatible with all the other classes. If you get a N then you must ***segregate*** ie you cannot store these two classes in the same cabinet or next to each other on the shelf if that is how you are storing. This is the other way to segregate, by distance , with usually the spaces between the incompatibles taken up with either non dg classes (ie Zone 0) or compatible classes usually class 6 and 9. The use of individual dg class cabinets is also demonstrating the use of a **segregation device**, commonly a purpose built cabinet or anything that achieves another layer of protection such as a larger container within which you have one of the incompatible classes. Another point to mention is that for those dangerous goods that have more than one dg class, you must take into account both the primary and secondary class when checking compatibility. Nitric acid's primary class is 8 , it's secondary 5.1. This will make it incompatible with class 3 flammable liquids because of its secondary dg class.

Elemental mercury is a class 8 dangerous good because it is corrosive to many metals (aluminium for example making it usually prohibited for transport by air -airplane fuselage is aluminium) Iodine is a class 8 because it sublimes, ie passes from a solid to a vapour without a liquid stage, the vapour is mildly corrosive.

Whats all this to do with waste I hear you asking? It's because chemical waste is also subject to the dg rules and regulations. Those pesky physical and chemical properties don't go away just because a chemical is a waste. Therefore storage of your waste chemicals also has to take account of dangerous goods class if any

As always, send any comments to either myself or the editor Samantha Gunning as well as any questions or clarifications.

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