Use of lead in schools

Posted by Anonymous on Thu, 2016-09-08 11:14

Use of lead in schools: Use of lead and lead salts in schools: Is lead (solid, lead shot, salts) allowed to be used in Years 7 to 10? Are lead salts banned in some jurisdictions?

On your List of Recommended Chemicals for Science in Australian Schools, you say that lead nitrate can be used in Years 7–12. They are classed as 'high risk' substances with uncertain or unpredictable risk levels in Education QLD's guidelines. I don't, therefore, understand why lead and lead salts are included on your list?

Voting:
No votes yet

Year Level:
7
8
9
10
Laboratory Technicians:
Laboratory Technicians

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Use of lead in ACT schools

Submitted by sat on 16 September 2016

Answer reviewed 9 February 2023

Lead poses a significant risk of harm to humans, and especially to children, as it accumulates in the body and can have long-term effects.[1,2] The use of lead and its salts in schools are banned in some Australian jurisdictions, and approved or restricted in others.

Variation in school policies: There are significant variations between the practices and local policies of the states and territories and educational jurisdictions with regard to chemicals used in school science. Schools should follow the policies and procedures of their jurisdictions.

Chemicals in science: In order to remove the duplication and variation that exists, Science ASSIST has developed a List of recommended chemicals for science in Australian schools.[3] The list is not intended to supersede the advice of the educational jurisdictions; schools are subject to the policies and directives of their educational jurisdiction with regard to the use of chemicals in science. It is therefore important that schools consult their school governing body to determine the policies and procedures that they are required to follow with regard to chemical use. Some school jurisdictions have set policies and some sectors allow this to be a school based decision. In the absence of any specific formal directives, schools should consider information from a chemical's Safety Data Sheet (SDS) or other advisory information to make judgements and decisions on the suitability of staff/students handling particular chemicals. They should conduct their own site specific risk assessment and could consider adopting the List of recommended chemicals for science in Australian schools.[3]

Use of lead: When Science ASSIST did a comparison between different jurisdictions, lead **metal** was permitted in all jurisdictions although it was noted as being a high risk substance in Queensland.[4] There was much variation between jurisdictions regarding the use of lead **salts**, from being approved, restricted to year 11 and 12 through to being banned. Science ASSIST considers that although there are health hazards associated with lead, by implementing appropriate controls such as restricting the number of lead-containing substances used in science and ensuring safe handling procedures, the risks can be safely managed within the school setting.

Lead-containing substances: We have included only three lead-containing substances: lead metal, lead nitrate (in solution for students) and lead (II) oxide. These are included because we consider that they allow for some worthwhile demonstrations and activities and that their associated hazards can be reduced to an acceptable level with safe practices.

Lead metal has been included on the List of Recommended Chemicals,[3] so that it may be used to demonstrate the difference in its malleability compared with that of other metals. Elemental lead also has applications in physics activities, which employ its high density compared with that of other metals, also lead shot is used in determinations of specific heat.[5]

Lead metal is not readily absorbed through the skin,[2] however, there is the risk of lead ingestion from eating or touching the mouth after handling lead. To minimise exposure, pieces of lead metal can be wrapped in plastic clingwrap or provided in a zip-lock plastic bag prior to handling. Students should be instructed to wash their hands well after handling lead.

Lead nitrate in solution is included on the List of Recommended Chemicals in order that the reaction of lead nitrate and potassium iodide to give a yellow precipitate of lead iodide may be conducted. This reaction gives a dramatic colour change and is effective on a microscopic scale; using one drop each of the reactants on a white tile, spotting tile or flat acrylic sheet. Making a precipitate in a test tube is not recommended because of the difficulty in cleaning up the only very slightly soluble lead iodide. A teacher demonstration of this reaction is also a good alternative.

Lead nitrate in solution may also feature in senior chemistry activities such as the demonstration of displacement reactions and qualitative inorganic analysis, although the use of lead salts is not strictly necessary in any of these activities. The amount of heavy metal waste produced from displacement reactions can be minimised by using spotting tiles[6] or on a microscale.[7] Lead salts are not necessarily required as unknowns in inorganic analysis activities. Lead salts are also not necessary as reagents in these activities; barium chloride can be used to indicate the presence of sulfate ions and silver nitrate can be used to indicate the presence of iodide ions.

Lead monoxide, PbO, is included for the purpose of demonstrating its facile reduction to lead metal when heated in the presence of carbon.[8] This reaction is best conducted in a fume cupboard and as a teacher demonstration. Students could then perform the less hazardous extraction of iron from iron oxide on a match head.[9,10]

Safe procedures: for handling solutions would include using small quantities for short amounts of time, wearing appropriate PPE such as gloves and safety glasses as well as good laboratory hygiene such as cleaning up any spills, no eating or drinking in laboratories and washing hands at the end of all laboratory sessions. When making up solutions from the solid chemicals the additional control of conducting this in an operating fume cupboard should be used. Schools may prefer to purchase some chemicals in solution form, rather than prepare the solution on site.

It is recommended that any reactions using lead or its compounds be conducted on a conservative, scale and that other materials be substituted for lead where possible.

Disposal: As lead is not biodegradable and persists in the environment, waste lead and lead compounds should not be disposed of in the general waste and should be stored for collection by a licenced waste disposal contractor.

References

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