

Content-4: Chemical information sources - Safety Data Sheet (SDS)

Orientation

What can this unit help you with?

You may use this unit if you

- Have to know what is Safety Data Sheet (SDS), its significance and uses;
- Have to know about the standard sections of a Safety Data Sheet (SDS) and how to read them;
- Are asked to extract necessary information about any chemical from different sections of a Safety Data Sheet (SDS).

Intended results of the unit

- Students can have an idea about all the 16 standard sections and learn to find out information about a chemical from the Safety Data Sheet (SDS);
- Students are capable of ensuring good practices in chemical handling and storage using the information found in Safety Data Sheet (SDS);
- Students can find out the hazards associated with a substance or mixture from the Safety Data Sheet (SDS);
- Students can assess what necessary measures are required to take for a particular chemical for the protection of human health, society and the environment from the Safety Data Sheet (SDS);
- Students can give suggestions on how to respond in case of emergencies and how to dispose of chemicals from the Safety Data Sheet (SDS).

Input

What is the Safety Data Sheet (SDS)?

Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) is an essential document which provides comprehensive information about chemicals for use in the workplace. The SDS is the key source of information of chemicals in a company for chemical management.

An SDS provides information about chemical name, composition, the hazards associated with it. It also guides safe handling and storage of the chemical, necessary measures to take to protect human health, safety at the workplace, society and the environment. Moreover, it gives information on emergency measures as well as the safe disposal of chemicals. The bottom line is that SDS provides all sorts of information required for safe chemical management. All the information provided by the Safety Data Sheet makes it essential for the industry and the users.

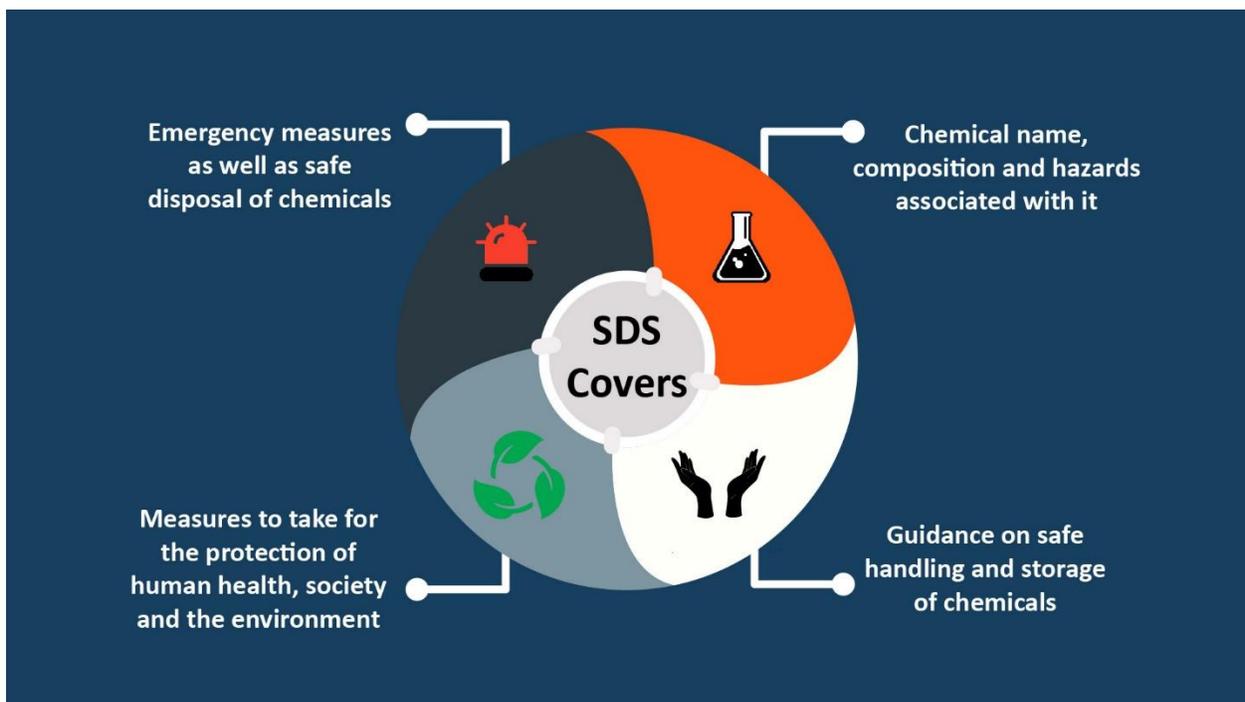


Figure 1: SDS provides all sorts of information required for safe chemical management. Image courtesy: Kazi Farhan Hossain Purba.

GHS Safety Data Sheet

Various forms of safety documents were available, previously known as Material Safety Data Sheet or MSDS. Nowadays, the most acceptable method is known as GHS or Globally Harmonized System.

The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) not only harmonises the hazard pictograms, labelling and classification of chemicals but also outlines the structure and contents of Safety Data Sheets. According to GHS, a standard Safety Data Sheet has 16 sections.

Each section provides different information about the chemical that lets the users know how to manage the chemical properly in the workplace. In the following learning cards, we will know more about each section.

16 sections		GHS Safety Data Sheet
• Section 1	Identification of the substance or mixture and of the supplier	
• Section 2	Hazard identification	
• Section 3	Composition/information on ingredients	
• Section 4	First-aid measures	
• Section 5	Fire-fighting measures	
• Section 6	Accidental release measures	
• Section 7	Handling and storage	
• Section 8	Exposure controls/personal protection	
• Section 9	Physical and chemical properties	
• Section 10	Stability and reactivity	
• Section 11	Toxicological information	
• Section 12	Ecological information	
• Section 13	Disposal consideration	
• Section 14	Transport information	
• Section 15	Regulatory information	
• Section 16	Identification of the substance or mixture and of the supplier	

Figure 2: 16 sections of GHS Safety Data Sheet. Image courtesy: Kazi Farhan Hossain Purba



Figure 3: GHS SDS Section 1-3. Image courtesy: Kazi Farhan Hossain Purba.

Section 1: Identification

Section 1 tells the name of the chemical. Whether it is the commercial name or generic name of the chemical, any other name can also be found in this section. This section also provides name, address and emergency contact number of the producer of the chemical. So, section 1 can help a user identify the chemical used in the workplace.

Section 2: Hazard (s) Identification

Section 2 informs about the chemical hazards through the appropriate warning information associated with those hazards. This section includes hazard classification of the chemical (e.g., flammable liquid, category), Signal word, hazard statement(s), Pictograms to inform the users about the hazards associated with the chemical.

From this section, the user can learn about the various hazards of the chemical through the hazard statements and hazard symbols and take necessary measures to avoid any physical, health or environmental damage by the chemical through the precautionary statements.

Section 3: Composition/Information on Ingredients

If we want to know the components present in a chemical, we must look up to section 3. Here we can usually find the percentage of each component in the chemical.

This section will find a unique identification number like the Chemical Abstract Service, commonly known as CAS, to find more information about the chemical online.



Figure 4: GHS SDS Section 4-6. Image courtesy: Kazi Farhan Hossain Purba.

Section 4: First Aid Measures

Section 4 on a Safety Data Sheet provides recommendations on minimising the effects of accidental exposure to a chemical product. Instructions on how to respond in case of ingestion, inhalation, skin and eye contact can be found here. The recommendations should describe measures that first aiders can safely use at the accident scene before obtaining medical assistance.

Section 5: Fire-fighting Measures

Fire in chemical stores is a common scenario. In many cases, it causes severe damage to human lives and other properties. It is very important to know the temperature-related properties like upper and lower limit, auto-ignition temperature, and combustion temperature to avoid catching fire by the chemicals. We can read this section to find recommendations for suitable extinguishing equipment or agents and procedures to extinguish the fire. Special protective equipment or precautions for firefighters is also available in this section. So, we need to find ways to tackle fire in the chemicals with the information of this section.

Section 6: Accidental Release Measures

Section 6 provides recommendations on the appropriate response to spills, leaks, or releases, including containment and clean-up practices to prevent or minimise exposure to people, properties, or the environment. It may also include recommendations distinguishing between large and small spills where the spill volume significantly impacts the hazard. We can find methods and means for containment and clean-up of the released chemicals. We can also find information to detect the chemicals. Health, safety and environmental precautions can also be found here to avoid hazards of the chemicals.



Figure 5: GHS SDS Section 7-9. Image courtesy: Kazi Farhan Hossain Purba

Section 7: Handling and Storage

Section 7 provides guidance on the safe handling practices and conditions for safe storage of chemicals. It recommends the design and location of the storage facility for the chemical. We can also find the ideal parameters for suitable storage conditions like temperature, humidity, sunlight for the chemical.

The compatibility of materials, means which chemicals are allowed to keep beside the particular chemical, is also mentioned here in this section. So, we can make safe storage of chemicals and avoid unexpected situation using the information provided in this section.

Section 8: Exposure Controls/Personal Protection

To save the users from the chemical hazard, section 8 provides information about the exposure limits, engineering controls, and personal protective measures that can be used to minimise workers' exposure. We can find out the engineering control measures, suitable personal

protective equipment and materials that can resist the chemical to minimise exposure while working with the chemical.

Section 9: Physical and Chemical Properties

Section 9 helps users know about physical properties like state, colour, odour, viscosity, boiling point, melting point etc. And the chemical properties like oxidation properties, vapour pressure, molecular weight, specific gravity, solubility parameters etc. of the chemical.



Figure 6: GHS SDS Section 10-12. Image courtesy: Kazi Farhan Hossain Purba

Section 10: Stability and Reactivity

If we want to know about the reactivity and stability, we need to look up to the section 10. Here we can know the physical conditions to avoid excessive temperature, pressure, and light shock to maintain chemical stability in this section. Any stabilisers that may be needed to maintain chemical stability is also mentioned here. We need to find the list of incompatible chemicals that may react with the particular chemical and hazardous decomposition, if any, to handle the chemical safely.

Section 11: Toxicological Information

Section 11 identifies toxicological and health effects information or indicates that such data are not available. It mentions the potential routes of entry of particular concern chemical. Acute and chronic health effects for both short and long-term exposure to the chemical are also

mentioned in this section. We can find the lethal concentration of the chemical in this section. We can find it here if the chemical is Carcinogenic, teratogenic, mutagenic or safe from these. Many chemicals may result in interaction from medication, tobacco or alcohol; this information is also mentioned here in this section. So, we need to be aware of the toxicity of a chemical by reviewing this section.

Section 12: Ecological Information

Section 12 gives users the information about the potential route for releasing the chemical after being used, the chemical's effects on flora and fauna which are very important for the ecology, and its effects on water bodies, air and soil. This section also talks about the biodegradability, persistence and eco-toxicity of the chemical. Overall, this section helps users to be careful about the environment.

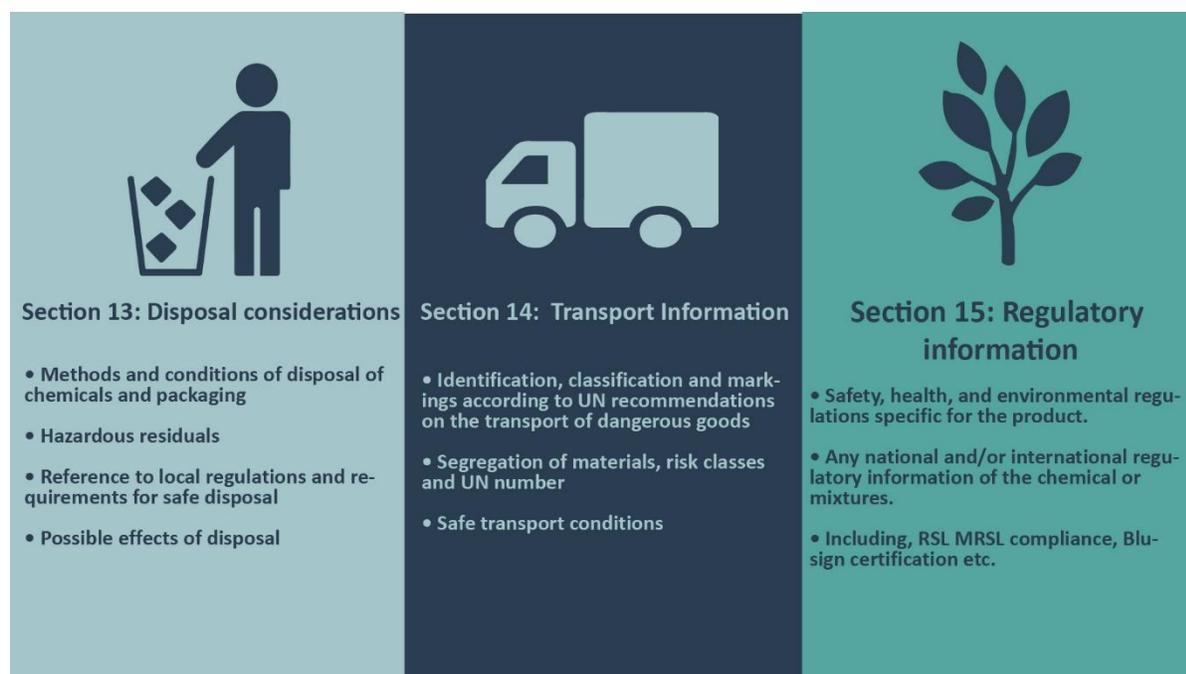


Figure 7: GHS SDS Section 13-15. Image courtesy: Kazi Farhan Hossain Purba

Section 13: Disposal considerations

Section 13 provides information about the proper methods and conditions of disposal of the chemical. It also talks about the hazardous residuals for the chemical and the possible effect of disposal. The local regulations and requirements for safe disposal of the chemical can be found in this section for the application. So, this section helps users to make safe disposal and save the environment.

Section 14: Transport Information

Section 14 provides guidance to transport the chemical. Lack of proper safety measures can lead to a dangerous disaster while transporting dangerous chemicals. To avoid such disasters, this section provides UN recommendations for chemical transportation. This section includes information about the segregation of materials, risk classes and UN number for the chemical. All these help users to make safe transport of the chemical.

Section 15: Regulatory Information

Section 15 identifies the safety, health, and environmental regulations specific to the chemical product not indicated anywhere else on the SDS. It provides national and international regulatory information applied for the chemical. Any compliance issue like RSL-MRSL or any certification of the chemical is mentioned in this section. This helps to understand users if the products are meeting compliance issues or not.

Section 16: Other Information

Section 16 is the last section which includes other information like the date, when the SDS was prepared or when the last revision was made. This section is a key to all abbreviations or acronyms, and sources for data used to gather information for the SDS. It may also state the changes that have been made to the previous version.

Conclusion

That was all about the introduction of the Safety/ Material Safety Data Sheet. Now we know what an SDS is, its importance, and any information needed to manage any chemical or mixture from this useful document successfully.

Check the SDS of Acetone from this link: <https://www.nhsggc.org.uk/media/236208/msds-acetone.pdf> or any other SDS provided the exercise and try to find out and match all the sections that we have learnt in our learning cards. Thus we will have a concrete understanding of what we have learnt so far.

Didactical elements

Quizzes and self-tests:

True-false

1	There are 15 sections in a standard Safety Data Sheet.	
	<ul style="list-style-type: none">▪ Correct▪ False	False
2	In a standard Safety Data Sheet, GHS Pictograms can be found in Section 2.	
	<ul style="list-style-type: none">▪ Correct▪ False	Correct
3	Under Section 11 (Toxicological Information), we find information on the potential route for releasing the chemical after its use.	
	<ul style="list-style-type: none">▪ Correct▪ False	False
4	“The chemical containers are kept closed unless we are dispensing a chemical”-this is important guidance found under Section 7.	
	<ul style="list-style-type: none">▪ Correct▪ False	Correct
5	MRSL, RSL compliance-related information can be found in Section: 13.	
	<ul style="list-style-type: none">▪ Correct▪ False	False

Open Questions:

1	Why do you think it is necessary to use SDS?
<i>Open text</i>	SDS provides information about chemical name, composition, the hazards associated with it. It also provides guidance on safe handling and storage of the chemical, necessary measures to take for the protection of human health, safety at the workplace, society and the environment. Moreover, it gives information on emergency measures as well as safe disposal of chemicals. The bottom line is, SDS provides all sorts of information which are required for a safe chemical management. That's why the use of Safety Data Sheet is so important.
2	How can you find information about PPE requirements for handling a specific chemical?
<i>Open text</i>	A standard Safety Data Sheet (SDS) has 16 sections, and section 8 deals with the PPE requirements. So, I will read this section and extract information about PPE recommended for certain chemicals.

Choose multiple:

1	What can we find from Section 6 (Accidental Release Measures)? (Choose multiple)
<ul style="list-style-type: none"> ■ Storage conditions (Temperature, humidity, sunlight) ■ Methods and means for containment and cleaning up (e.g. absorption and neutralising agents) ■ Personal protective equipment ■ Environmental precautions and warnings ■ Means of detection 	<p>Answer:</p> <ul style="list-style-type: none"> ■ Methods and means for containment and cleaning up (e.g. absorption and neutralising agents) ■ Environmental precautions and warnings ■ Means of detection

Sorting tasks:

Sort the words to the correct sentences:

while	persistence	extinguishing
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1. Section 5 (Fire-fighting Measures) gives recommendations of suitable__equipment or agents and procedure to extinguish the fire.
2. 'The chemical containers are kept closed__we are dispensing a chemical'-this information can be found in Section 7.
3. Section 12 also talks about the biodegradability, __ and eco-toxicity of a chemical.

Answers:

1. extinguishing
2. while
3. persistence

Exercise 1: Know the safety data sheet

Task: Suppose, you are the chemical manager of East-West Textiles Ltd. You have received a new lot of 3 chemicals named 2-Naphthol, Acetic Acid and Sodium Hydroxide. You have also been provided with the safety data sheets of all these chemicals by the supplier.

Now, find out the

- CAS number
- Hazard classification
- PPE to be used for these chemicals.

And prepare a document as the format below.

Information from SDS	Chemical Name	2- Naphthol	Acetic Acid	Sodium Hydroxide
1.	CAS Number			
2.	Hazard Classification			
3.	PPE to be used			

Exercise 2: Imagine the situation below:

Sodium hydroxide was stored in a food container in East-West Textiles Ltd. A worker has accidentally swallowed some Sodium hydroxide from that container.

Tasks:

1. Recommend first aid steps for him from the SDS of Sodium hydroxide.
2. Consult technical measures for storage from the SDS.

Hotspots

Which icon represents the Section 13 of a standard SDS?

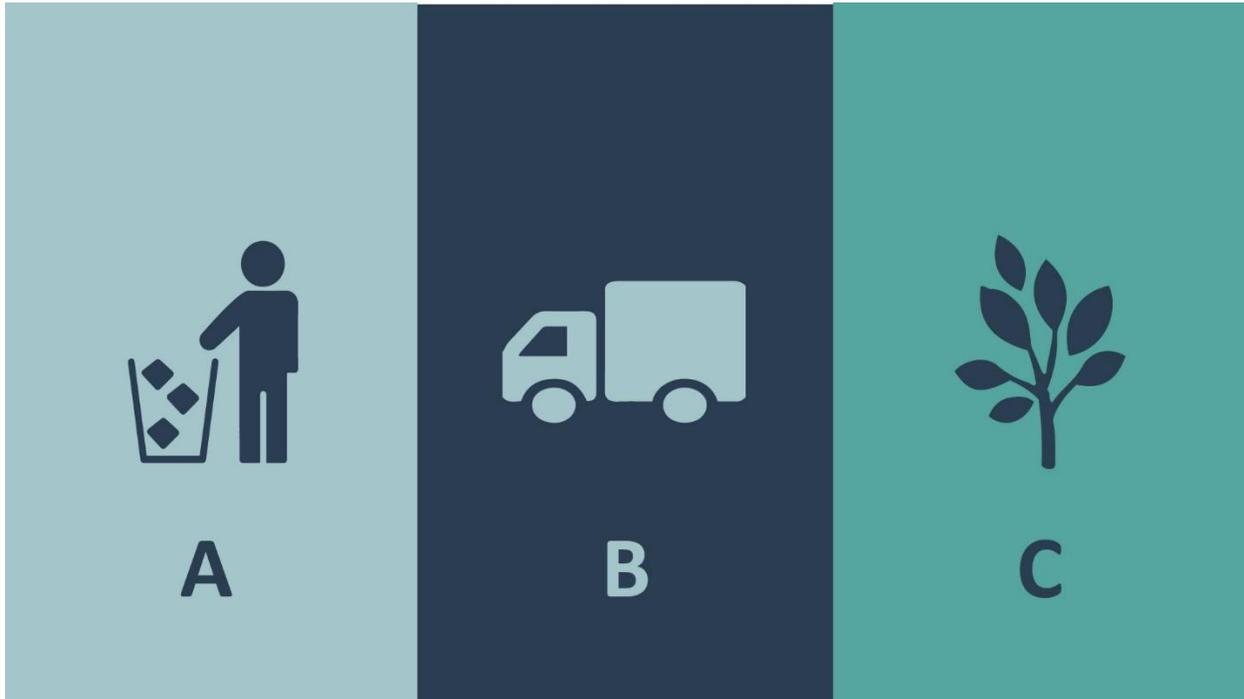


Figure 8: Hotspot. Picture courtesy: Kazi Farhan Hossain Purba.

Answer: A

References/additional literature/links

1. To know more about GHS, you can go to this link: <http://www.oecd.org/chemicalsafety/risk-management/50500627.pdf>
2. More information on the basics of SDS can be found here: <https://www.msdsonline.com/sds-search/>
3. More information on the minimum information required for each section of SDS set by GHS can be found here: https://www.chemsafetypro.com/pdf/Minimum_Info_GHS_SDS_Safety_Data_Sheets.pdf
4. To follow along a generic SDS, you can visit this link: https://www.msdsonline.com/wp-content/uploads/2017/10/class_3_acetone_sample_sds_us.pdf. The study of a generic sample of SDS will help you a lot to understand any SDS you come across.
5. To read a real SDS of Acetone, you can visit this link: <https://www.nhsggc.org.uk/media/236208/msds-acetone.pdf>. This SDS will help you to practise extracting necessary information from an SDS.

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How did the didactical structure of the learning unit work for you? Do you have any comments or suggestions to make it better?

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