



ANGLAIS

Treatment and Conditioning of Solid Waste

During the operation of a nuclear power plant, various types of dry solid wastes containing radioactive materials are generated. Depending on the physical nature and further treatment methods, dry solid waste is usually classified and segregated into four main categories: combustible, non-combustible, compactible, and non-compactible waste. However, each facility usually has its own level of classification according to the prevailing conditions.

One of the essential purposes in the treatment of solid waste is to reduce as much as possible the waste volumes to be stored and disposed of, and to concentrate and immobilize as much as possible the radioactivity contained in the waste. As solid radioactive waste at nuclear power plants consists of a large variety of materials and forms, no single technique can adequately treat this waste; a combination of processing techniques is generally used.

The basic and most common technique used for processing most voluminous portions of solid waste has been based on compaction. This method reduces the storage and disposal volume requirements by a reasonable amount, but achieves little in terms of improvement of the waste properties from the viewpoint of longer-term management.

Incineration of burnable waste represents a substantial advance over simple compaction. It can help achieve very high volume reduction and mass reduction. However, incineration is only suitable for combustible waste. Incineration facilities have now been installed at nuclear power plants in the USA, Japan, Canada, and other countries. More advanced incineration facilities that can treat waste with relatively high specific activity are installed at centralized waste treatment facilities that can accept waste from many plants in the country and from abroad. **Such facilities** are operating in Sweden, Belgium, France, and other countries.

As a pre-treatment step for compaction or incineration, cutting, shredding, and crushing are used to reduce the physical size of individual waste items. Paper, plastic, cloth, cardboard, wood, and metals can be shredded into ribbon-like pieces, while brittle materials such as glass or concrete blocks can be crushed into smaller fragments. **These techniques** can also be used as separate processes for volume reduction of solid waste.

Adapted from *IAEA Bulletin*, April 1989, pp. 40-42

I. READING COMPREHENSION (10 marks)

A) Quote from paragraphs #1 and 2 to decide whether the following statements are TRUE or FALSE. (03 marks)

1. There is a total of four levels of classification of dry solid wastes in treatment facilities.

2. The reason why solid wastes are treated is to limit the storage space they occupy.

3. Very frequently, more than one treatment technique is used to process solid wastes.

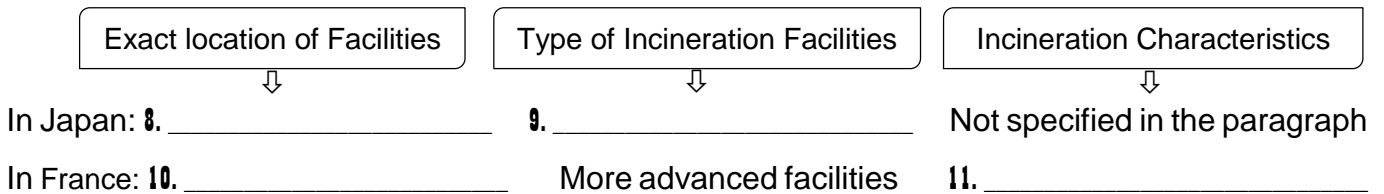
B) Complete the table below with information from paragraphs #3 and 4.

(02 marks)

Waste Treatment Method	Advantage(s)	Disadvantage(s)
Compaction	4.	5.
6.	Helps achieve very high volume reduction and mass reduction	7.

C) Read paragraph #4 again and complete the following flow chart about incineration facilities.

(02 marks)



D) Read all the text again and indicate which paragraph corresponds to which idea in the list.

(03 marks)

Main Idea	Paragraph#
12. Why Different Treatment Techniques Are Used in Plants	
13. Wastes Treatment before Compaction and Incineration	
14. Solid Wastes: Generation and Categorization	

II. LINGUISTIC and COMMUNICATIVE COMPETENCE (06 marks)

E) Complete this paragraph on waste treatment with words from the box below.

(02 marks)

radioactive ☼ disposal ☼ shredding ☼ contaminated ☼ phases

Pre-treatment of nuclear waste prepares the waste for processing and may include sorting and segregation to separate out (15) _____ items from non-contaminated ones. Sometimes, it is necessary to reduce the size of the waste, for example, by cutting or (16) _____ it to optimize its downstream processing. Decontamination techniques reduce the volume of waste requiring treatment, which in turn, minimizes the cost of its (17) _____. Once the waste is suitably prepared, the next step is treatment to increase its safety and reduce the costs of additional management (18) _____, such as storage and disposal.

Adapted from <https://www.iaea.org/topics/processing>

F) Below is Dr. Kumar’s answer to the question ‘What makes a good waste management strategy?’ But his words are not in the right order. Rearrange them correctly to restore the initial order.

(02 marks)

19. technology and good public participation. / requires selection of appropriate / Making a good waste management strategy

☞ _____
 _____ .../...3

20. everyone has to play a part for / Firstly, the technology selected has to / good waste management. / fit the local circumstances and secondly,



Adapted from <https://flores.unu.edu/en/news/news/effective-waste-management-begins-at-home-interview-with-dr-sunil-kumar.html?i=xHj0tNG>

G) Match each of the statements (21-24) in Column X to the notion(s) it expresses in Column Y. (02 marks)

Column X: Statements	Column Y: Notions
21. Considering the relatively small quantities of combustible wastes, compaction should be the preferred volume reduction method.	a) Necessity/Addition b) Addition/Obligation c) Prohibition/Cause d) Cause/Obligation e) Comparison/Condition
22. Incineration is technically much more complicated and should only be considered if large quantities of combustible wastes can be incinerated in a continuous operation mode.	
23. Unstable and explosive compounds have to be eliminated, as well as combustible metals like lithium, magnesium, etc.	
24. Furthermore, all strong oxidizing agents representing a high fire hazard should be eliminated...	

Adapted from https://inis.iaea.org/collection/NCLCollectionStore/_Public/23/068/23068175.pdf

Answer Box			
21.	22.	23.	24.

III. WRITING (04 marks)

Choose **ONE** topic and write between 150 and 200 words about it.

Topic 1: African countries are not much engaged in the development of nuclear power plants. Does that mean that the continent is safe from any nuclear hazards? Support your opinion with specific examples.

Topic 2: Uranium is produced in countries like Niger, D.R. Congo, Gabon, South Africa, etc. In Asia, a country like Iran is now facing economic sanctions imposed by the USA and the European Union, on accusations of military nuclear proliferation. Do you think that one day, an African country will obtain the right to build civil nuclear infrastructures (for example reactors to produce cheaper energy on its own)? Give arguments to support your opinion.

**ANSWER KEY****A) True/False Statements. (03 marks)**

1. False: each facility usually has its own level of classification according to the prevailing conditions.
2. True: One of the essential purposes in the treatment of solid waste is to reduce as much as possible the waste volumes to be stored
3. True: no single technique can adequately treat this waste

B) Table Completion. (02 marks)

4. Reduces the storage and disposal volume requirements by a reasonable amount.
5. Achieves little in terms of improvement of the waste properties from the viewpoint of longer-term management.
6. Incineration
7. Only suitable for combustible waste.

C) Flow Chart Completion. (02 marks)

8. At nuclear power plants
9. Normal/simple Incineration facilities
10. At centralized waste treatment facilities.
11. Can treat waste with relatively high specific activity

D) Paragraph/Title Matching. (03 marks)

12. Why Different Treatment Techniques Are Used in Plants: Paragraph #2
13. Wastes Treatment before Compaction and Incineration: Paragraph #5
14. Solid Wastes: Generation and Categorization: Paragraph #1

E) Cloze Test. (02 marks)

15. contaminated
16. shredding
17. disposal
18. phases

F) Clause Unscrambling. (02 marks)

19. Making a good waste management strategy requires selection of appropriate technology and good public participation.
20. Firstly, the technology selected has to fit the local circumstances and secondly, everyone has to play a part for good waste management.

G) Statement/Notion Matching. (02 marks)

21. ⇒ d) Cause/Obligation
22. ⇒ e) Comparison/Condition
23. ⇒ a) Necessity/Addition
24. ⇒ b) Addition/Obligation

WRITING (04 marks)

Please, grade this section according to the following scheme.

Relevance of ideas	⇒	02 marks
Coherence	⇒	01 mark
Language Use	⇒	01 mark