

Solid Waste Management

Q.1 Which of the following industry does not produce hazardous solid waste?

- (a) Cotton mills (b) Pulp and paper
(c) Rubber goods (d) Pharmaceuticals

Q.2 Match List-I (Type of municipal solid waste) with List-II (Usual range of density) and select the correct answer using the codes given below the lists:

List-I	List-II
A. Garbages	1. 50-400 kg/m ³
B. Rubbish	2. 450-900 kg/m ³
C. Ashes	3. 700-850 kg/m ³

Codes:

A	B	C
(a) 3 2 1		
(b) 1 2 3		
(c) 2 1 3		
(d) 1 3 2		

Q.3 Consider the following activities:

1. Waste generation
2. On-site handling, storage and processing
3. Disposal
4. Transport
5. Collection
6. Processing and recovery

which is the correct sequence in which these activities are performed in management of solid waste?

- (a) 1-2-4-5-6-3 (b) 1-5-2-4-3-6
(c) 1-2-5-4-6-3 (d) 1-2-4-5-3-6

Q.4 Which of the following methods are used for solid waste disposal?

1. Open dumping
2. Controlled tipping

3. Shredding

4. Barging it out into the sea

Select the correct answer using the codes given below:

- (a) 3 only
(b) 3 and 4
(c) 1, 3 and 4
(d) 1, 2, 3 and 4

Q.5 The depth of the final cover of good earth over the top most lift is about

- (a) 0.15 m (b) 0.3 m
(c) 0.6 m (d) 0.75 m

Q.6 Consider the following types of bacteria:

1. Aerobic bacteria
2. Anaerobic bacteria
3. Facultative bacteria
4. Methanogenic bacteria

Which of these bacteria decompose the refuse in land filling operation?

- (a) 1 and 2
(b) 1, 2 and 3
(c) 2 and 3
(d) 1, 2, 3 and 4

Q.7 To kill all the pathogens, weeds and seeds during the composting process, the temperature must be maintained between

- (a) 30 to 40°C (b) 60 to 70°C
(c) 80 to 90°C (d) 90 to 100°C

Q.8 Sea depth for disposal of refuse by barging it out into the sea, at the point of disposal, should not be less than

- (a) 30 m (b) 10 m
(c) 40 m (d) 20 m

Q.9 Consider the following statements:

1. C/N of the input material in the compost heap is an important factor for the bacterial activity to continue.
2. Composting of refuse is a biological method of decomposing solid waste.

Which of these statements are incorrect?

- (a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

Q.10 Match List-I (Methods of solids waste disposal) with List-II (Terms pertaining to the methods) and select the correct answer using the codes given below the lists:

List-I

- A. Incineration
- B. Sanitary landfill
- C. Composting
- D. Salvage by sorting

List-II

1. Requires pre-sorting and grinding and turning
2. Limited special wastes and selected materials
3. High operational and maintenance cost
4. Tractor
5. Rat and fly breeding

Codes:

A	B	C	D
(a) 2 5 4 3			
(b) 1 4 2 3			
(c) 3 4 1 2			
(d) 3 5 4 2			

Q.11 The respective tolerance limits of BOD, COD total suspended solids and pH value for waste water effluents to be discharge into marine coasts as per BIS specification are

- (a) 100 mg/l, 250 mg/l, 100 mg/l and 5.5 to 9
(b) 250 mg/l, 100 mg/l, 100 mg/l and 5.5 to 9
(c) 150 mg/l, 250 mg/l, 100 mg/l and 5.5 to 9
(d) 250 mg/l, 100 mg/l, 150 mg/l and 5.5 to 9

Q.12 Leakage in house plumbing system is tested by:

1. air test
2. hydraulic test
3. smoke test

Which of these statements are correct?

- (a) Both 1 and 2 (b) Both 1 and 3
(c) Both 2 and 3 (d) 1, 2 and 3

Q.13 Which one of the following solid waste disposal method is ecologically most acceptable?

- (a) Sanitary landfill (b) Incineration
(c) Composting (d) Pyrolysis

Q.14 Which of the following materials are used as landfill sealants for the control of gas and leachate movements?

1. Lime
2. Sand
3. Bentonite
4. Fly ash
5. Butyl rubber

Select the correct answer using the codes given below:

- (a) 1, 2 and 3 (b) 4 and 5
(c) 3 and 5 (d) 1, 2 and 4

Q.15 Allowable disposable rate of application of sludge on land is determined by

- (a) carbon content of sludge
(b) nitrogen content of sludge
(c) phosphorus content of sludge
(d) potassium content of sludge

Q.16 The term 'biological magnification' indicates which one of the following?

- (a) Likelihood of increasing size of animals during evolution
(b) Magnification pertaining to microscopy
(c) Accumulation of pollutants in soil
(d) Accumulation of pollutants in successive consumers

Q.17 A primary sludge having volume of 14 m³ and moisture content of 94% was dewatered to have a solid content of 16%. What is its final volume?

- (a) 2.38 m³ (b) 3.50 m³
(c) 5.25 m³ (d) 7.00 m³

Q.18 The description of solid waste collected is as follows:

Garbage	50 t
Rubbish	35 t
Debris	15 t
Night soil	60 t

The inorganic solids in the above composition is

- (a) 50 t (b) 15 t
(c) 110 t (d) 75 t

Q.19 In a sanitary landfill, decomposition and chemical changes within organic content of the solid waste goes on consequential changes within landfill can be

1. temperature changes within landfill
2. production of gases like H_2S , CO , CO_2 and CH_4
3. destruction of pathogens.
4. production of other gases like SO_2 and NO_2

Which of these statements are correct?

- (a) 1, 2, 3 and 4 (b) 1, 2 and 3
(c) 1 and 4 (d) 2 and 3

Q.20 Which one of the following methods conserve energy most efficiently in the form of gas or oil?

- (a) Incineration with heat recovery
(b) Combusting
(c) Fluidized bed incineration
(d) Pyrolysis

Q.21 A solid waste sample has been segregated and one of the components has been subjected to elemental analysis. The result of analysis in percent by mass revealed C(40%), H(6.0%), O(44%), N(0.3%). What is the likely waste component?

- (a) Food waste (b) Paper and cardboard
(c) Plastic waste (d) Leather waste

(v) Asphalt : Modified asphalt, asphalt-covered polypropylene fabric, asphalt concrete.

(vi) Others : Gunite concrete, soil cement, plastic soil cement.

The sealant material should be more impermeable than the soil. So sand will not be a suitable material. Flyash and lime themselves produce pollutants which dissolve in water. Therefore these materials cannot be used as sealants.

15. (b) Design loading rates for land application of biosolids can be limited by heavy metals or nitrogen. The annual loading rate is usually limited by nitrogen loading rate. The long-term loading rate is limited by heavy metals.

17. (c) Moisture content, $p_2 = 100 - 16 = 84\%$

We know that

$$V_1(100 - p_1) = V_2(100 - p_2)$$

$$\Rightarrow V_2 = 14 \times \left(\frac{100 - 94}{100 - 84} \right) = 5.25 \text{ m}^3$$

18. (a) In the given composition of solid waste, only rubbish and debris are the inorganic components.

So inorganic solids = $35t + 15t = 50t$

Answers Solid Waste Management

1. (a) 2. (c) 3. (c) 4. (d) 5. (c) 6. (d) 7. (b) 8. (a) 9. (d) 10. (c)
11. (a) 12. (d) 13. (c) 14. (c) 15. (b) 16. (d) 17. (c) 18. (a) 19. (b) 20. (d)
21. (a)

Explanations Solid Waste Management

7. (b) If properly conducted, it is possible to kill all the pathogens, weeds and seeds during the composting process. To do this, the temperature must be maintained between 333 K and 343 K (60-70°C) for 24 hours.

8. (a) The sea depth at disposal point should not be less than 30 m to 50 m, and the direction of currents should be such as not to bring it back towards the shore.

13. (c) The leachate from sanitary landfill tend to pollute ground water. Incineration and pyrolysis release

air pollutants. Composting does not have any harmful effect.

14. (c) Sealants are used for control of gas and leachate movement

Classification types	Representative
(i) Compacted clay	Bentonites, illites, kaolinites.
(ii) Inorganic chemicals	Sodium carbonate, silicate or pyrophosphate
(iii) Synthetic chemicals	Polymers, rubber latex
(iv) Synthetic membrane	PVC, butyl rubber, hypalon, polythene, nylon reinforced liners.