

DW Module 16:
DE Filtration
Answer Key Revised 2/12/16



Exercise

Unit 1 – Exercise

Part 1: Multiple Choice – Choose the best answer

1. Diatomaceous Earth is a good media filter because of its ____ permeability
- a. very low
 - b. low
 - c. medium
 - d. high

Answer: d. - high

2. D.E. Filtration can remove Giardia and Cryptosporidium at _____ levels if the filter is operated properly.
- a. very low
 - b. low
 - c. medium
 - d. high

Answer: d. - high

3. Diatomaceous earth is composed of skeletons of microscopic _____
- a. chemicals
 - b. plants
 - c. sand

Answer: b - Plants

4. Intake screening devices can prevent the entry of.
- a. Cryptosporidium
 - b. Giardia
 - c. Fish
 - d. Color
 - e. Disinfection Byproducts

Answer: c. - Fish

5. In _____% of the measurement taken, the filtered water turbidity for D.E. filtration must be less than or equal to _____ ntu.

- a. 95%, 0.3 ntu
- b. 95%, 1.0 ntu

Answer: b. – 95%, 1.0 ntu.

Part 2 – Case Study

What is the best answer for Question #2?

Source	Qualities Present	Challenges for D.E. Filtration	Ideal for D.E. Filtration
Water A - Ground Water	<ul style="list-style-type: none"> • Low turbidity (2 to 3 ntu) • Low particulates • High hardness • High iron content • Low color • Consistent quality 	<ul style="list-style-type: none"> • Softening may be needed • Should treat for iron to remove some of it 	<ul style="list-style-type: none"> • Consistent quality • Low particulates • Low turbidity • Low color
Water B - Mountain Spring	<ul style="list-style-type: none"> • Low turbidity (3 to 6 ntu) • Particles mostly sand-like with some degraded vegetation • Low color • Low to medium hardness • Occasional turbidity spikes up to 30 ntu 	<ul style="list-style-type: none"> • Only possible challenge may be medium hardness, but that depends on how low customers demand hardness • "Medium" hardness is acceptable to many 	<ul style="list-style-type: none"> • Low turbidity • Turbidity spikes remain low enough (below about 40 ntu) • Low color • Mostly non-deforming particles (ie sand-like) • Low hardness
Water C – Major River	<ul style="list-style-type: none"> • Turbidity 5 to 15 ntu • Particles mixture of sand-like and organic • Medium to high color • Occasional high iron and manganese • Turbidity spikes up to 150 ntu • Occasional taste and odor problems 	<ul style="list-style-type: none"> • Turbidity above 10 ntu • Very high turbidity spikes • Occasional iron and manganese may require treatment • Occasional taste and odor (will get complaints if not removed) • High color should be treated to remove 	<ul style="list-style-type: none"> • Particles are a mixture of deforming and organic (not extremely difficult to remove, but organic portion will be more challenging than if not present)
Water D - Reservoir	<ul style="list-style-type: none"> • Turbidity 3 to 10 ntu • Particles mostly organic • High algae concentrations in summer • Occasional taste and odor problems • Low hardness • Occasional high color • Turbidity spikes to 30 ntu 	<ul style="list-style-type: none"> • Algae more difficult to remove • Organics more difficult to remove (compressible) • Occasional high color should be treated to remove 	<ul style="list-style-type: none"> • Turbidity within recommended guidelines • Turbidity spikes within recommended guidelines. • Low hardness

1. Discuss the following raw water sources and the applicability of D.E. filtration for each. Note which of the listed qualities may present a challenge for each source, and which qualities are ideal for D.E. filtration. (*answers are in the above table*)
2. Which source would be the best candidate for D.E. filtration?
Answer: Water B

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Exercise

Unit 2 – Exercise

Match the D.E. filtration component terms with their definitions.

- | | |
|---|-----------------------------|
| ___E_ 1. A finely ground, non-compressible material that is used to capture particles in the water. | A. Vessel |
| ___H_ 2. A screen with small openings that retains the filter media. | B. Element |
| ___B_ 3. The filtering unit, used to support the septum and provide a chamber into which the filtered water drains. | C. Pumps |
| ___A_ 4. The containment unit for the filter elements and the water being filtered. | D. Precoat Recycle Tank |
| ___G_ 5. A tank in which the media for precoating is slurred with clean water to prepare for the precoat operating mode. | E. Media |
| ___D_ 6. A tank that is often used in large pressure filters; it is used to hold recirculating water during the precoat operating mode. | F. Mixers |
| ___I_ 7. Used for feeding the Body Feed, either in slurry form or dry form. | G. Precoat Slurry Tank |
| ___F_ 8. A device that keeps slurry from settling. | H. Septum |
| ___C_ 9. Used to transfer slurries. | I. Body Feed Hopper or Tank |

Multiple Choice - Choose the best answer for each question.

10. The diatomaceous earth filter media is deposited on the filter _____.

- a. eductor
- b. septum
- c. hopper
- d. gauge

Answer: b. septum

11. The filter elements are usually arranged in the _____ direction in municipal water treatment plants.

- a. horizontal
- b. vertical
- c. diagonal

Answer: b. - vertical

12. Two types of filter media commonly used in D.E. filtration are _____ and _____. (Choose all that apply)

- a. Perlite
- b. Sand
- c. Gravel
- d. Diatomaceous Earth

Answer: a. and d. – Perlite and Diatomaceous earth



Exercise

Unit 3 – Exercise

Put the following tasks in the order in which they occur during the precoat process.

- __3__ Feed Precoat Slurry
- __5__ Completed Precoat
- __1__ Fill Vessel and Piping with Clean Water
- __4__ Bridging Process
- __2__ Begin Recirculation

Multiple Choice: Select the best answer

1. The D.E. precoat is first mixed with _____ water.

- a. raw
- b. filtered
- c. waste

Answer: b.- filtered

2. Effluent _____ must be monitored and recorded to meet drinking water regulations and is an indicator of how well the filter is performing.

- a. color
- b. softening
- c. turbidity

Answer: c – turbidity

3. The body feed is continuously added to the filter media to prevent _____ of the filter media.

- a. Clogging
- b. Contamination
- c. Collection
- d. Drying

Answer: a. - clogging

4. It is advantageous to obtain a continuous record of head loss and flow rate during D.E. filtration to determine when it is best to backwash the filter; a good instrument to use for this purpose is a _____.

- a. filter element
- b. body feeder
- c. chart recorder
- d. pressure gauge

Answer: c – chart recorder

5. D.E. Filtration is best for treating source waters with _____ turbidity and ____ color.

- a. high turbidity and low color
- b. low turbidity and high color
- c. low turbidity and low color
- d. high turbidity and high color

Answer: c. – low turbidity and low color

True or False: Select the best answer

6. Cleaning and precoat cycles should not be completely automated.

- a. True
- b. False

Answer: a. – True – Cleaning and precoat cycles should not be completely automated because visual inspection of the filter by the operator is important to ensure that these stages are being performed correctly.

7. One concern about reducing the flow through the filter is that the media cake can fall off.

- a. True
- b. False

Answer: a. – True

8. The maximum recommended filtration rate is 2.5 gpm/sf.

- a. True
- b. False

Answer: b. – False – the maximum recommended filtration rate is 1.5 gpm/sf.

9. Personnel should wear protective clothing, such as goggles, gloves, and a respirator, when handling the diatomaceous earth media.

- a. True
- b. False

Answer: a. – True