



## **WATER PDH WORKBOOK**

Completion of this workbook will count for 5 PDHs

Arizona Department of Environmental Quality  
Operator Certification Program  
1110 West Washington Street  
Phoenix, AZ 85007  
[www.azdeq.gov](http://www.azdeq.gov)

NAME\_\_\_\_\_

OPCERT NUMBER OP0\_\_\_\_\_

DATE\_\_\_\_\_

## DIRECTIONS

A Professional Development Hour (PDH) is equal to one contact hour of continuing education. A total of 30 professional development hours are required for each 3-year renewal period regardless of the number of certificates that are held by an individual operator.

Answer the questions in the space provided with concise and accurate answers. Submit a copy of the completed workbook along with your renewal form when you renew your certificates. It is recommended that you keep a copy of the completed booklet for your records. Completion of this workbook will earn the operator five (5) PDHs. Please print clearly. Workbooks that are illegible will not receive PDHs.

The type of PDH acceptable to the Department for certificate renewal include, but are not limited to: An approved college course, a course offered by a Certified Environmental Trainer, regulatory and tribal agency training, certain types of in-house training, technical conferences, correspondence courses, and manufacturer product training. An accredited college course is usually recorded in credit hours. In general, 1 college credit hour = 10 PDHs. If an operator has a question about a specific type of training, please contact the Operator Certification Program for approval before attending the training.

For additional training/PDHs click on the link below. This course provides 16 hours of PDH-approved training for drinking-water operators in the State of Arizona. These are available as individual lessons for credit or as a whole course.

<http://www.waterhelp.org/index.php/client/arizona>

FOR MORE INFORMATION, CONTACT:

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1. Referring to oxidation with chlorine, why would you not want to use high dosage of chlorine if the water contains a high level of organic color?

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2. Define Zeolite:

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3. Why must Hydrofluosilicic Acid be vented?

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4. Volumetric feeders and Gravimetric feeders measure chemical dosage differently. What is this difference?

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5. Total hardness is the sum of hardness caused by:

- A. Calcium and Nitrate ions
- B. Calcium and Iron ions
- C. Calcium and Magnesium ions

6. What is the purpose of backwash recovery ponds or lagoons?

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7. Define the term Decant?

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**8.** Explain whether membrane fouling is reversible or irreversible. Buildup on the surface or within the membrane will cause an effect. What is the effect?

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**9.** What is the purpose of injector water?

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**10.** Explain what cavitation is.

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**11.** Explain what Breakpoint Chlorination means. What will further addition of chlorine result in?

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**12.** What is the purpose of a Catalyst?

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**13.** What is an Air Gap, and why is it important?

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**14.** Define the following fire classes:

Define the following fire classes:

Class A

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Class B

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Class C

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Class D

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**15.** What two compounds can produce earthy and musty odors in the water?

- A. Geosmin and MIB
- B. Nitrates and Geosmin
- C. MIB and Copper
- D. Nitrates and MIB

**16.** Define the following chemical compounds:

HF \_\_\_\_\_

HCL \_\_\_\_\_

HNO<sub>3</sub> \_\_\_\_\_

H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_

NH<sub>3</sub> \_\_\_\_\_

Ca(OH)<sub>2</sub> \_\_\_\_\_

NaOH \_\_\_\_\_

**17.** While a pump is running it is necessary to have a slight-water seal leakage. Explain why and at what rate.

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**18.** The sudden stoppage of a pump can cause \_\_\_\_\_.

- A. cavitation
- B. loss of head pressure
- C. water hammer

**19.** THMs are formed in drinking water when free chlorine meets naturally occurring \_\_\_\_\_.

- A. inorganic compounds
- B. covalent compounds
- C. organic compounds

**20.** A Concentrate Control Valve is a regulating valve that is typically located in the concentrate line. This valve provides a means of \_\_\_\_\_.

- A. applying backpressure to the membrane
- B. throttling
- C. optimal pump speed

**21.** Explain what the expression “Flux” and “Flux Decline” means.

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**22.** Explain the purpose of a Jar Test. Also, explain why the results of a Jar Test may differ from the results of the treatment plant.

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**23.** An aquifer is best described as \_\_\_\_\_.

- A. a natural spring
- B. an underground layer of porous, water material
- C. an above ground storage facility

**24.** Groundwater is \_\_\_\_\_ to clean up from pollutants than surface water.

- A. easier
- B. less costly
- C. quicker
- D. harder

**25.** Explain the purpose of a Day Tank.

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**26.** What is the purpose of a Pitless Adapter?

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**27.** Explain what the term Plug Flow means.

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**28.** Why must you never use the same conveyor for quicklime and alum?

- A. They may harden
- B. It may become explosive
- C. It may reduce treatment efficiency

29. If packing is too tight on pump it will reduce\_\_\_\_\_.
- A. efficiency and score piston walls
  - B. vibration
  - C. heat
30. Friction loss (Head Loss) is a result of \_\_\_\_\_.
- A. an increase in head, pressure, and energy
  - B. turbulence by the velocity of flowing water and roughness in pipes, channels, or fittings
  - C. pump failure
  - D. poor treatment
31. Galvanization is the process of coating metal with \_\_\_\_\_.
- A. copper
  - B. nickel
  - C. aluminum
  - D. zinc
32. (True or false) Aquatic fulvic acids are major precursors of disinfection byproducts?
- A. True
  - B. False
33. Cryptosporidium is a \_\_\_\_\_.
- A. type of soil
  - B. fungi
  - C. parasite
  - D. chemical
34. Sanitary surveys are conducted to identify possible health risks that \_\_\_\_\_.
- A. have not been discovered by a jar test
  - B. have penetrated groundwater
  - C. have become airborne
  - D. have not been discovered by routine coliform sampling



35. Chemical metering pumps are a type of \_\_\_\_\_.

- A. centrifugal pump
- B. AODD pump
- C. positive displacement pump

36. List two factors that determine the recovery rate. (Hint: one effect is commonly referred to as concentration polarization)

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37. What does TON stand for?

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38. A Spectrophotometer is an instrument generally used to \_\_\_\_\_.

- A. detect pathogens
- B. measure turbidity
- C. measure color intensity of a color solution
- D. measure the amount of suspended solids

39. (True or false) Geobacter bacteria require oxygen to grow?

- A. True
- B. False

40. Which of the following is a **false** statement of Electrodialysis plastic piping and fittings.

- A. It is extremely expensive
- B. High resistance to corrosion in saline environments
- C. It allows ease of construction

41. (True or False) A positive displacement pump can be started against a closed valve without damaging the pump.

- A. True
- B. False

**42.** Which of the following could be considered a variable of a failsafe?

- A. Pressure
- B. Temperature
- C. Level
- D. Flow
- E. Chemical concentration
- F. All of the above

**43.** Referring to Modulating Control Systems, explain the difference between Closed-Loop and Open-Loop.

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