

Module 24:  
Wastewater Collection Systems – Part II  
Answer Key



Exercises Unit 1 – Overview of Pumping Stations

1. List three types of pumping stations and explain when each is used.
    - a. wet well/dry well – for high flows.
    - b. submersible – for low flows and high heads.
    - c. vacuum – not typical in PA – used mostly in flat coastal areas of southern U.S.
  
  2. What is the difference between a centrifugal pump and a positive displacement pump?

A centrifugal pump produces high velocity kinetic energy and converts it to pressure. A positive displacement pump produces pressure by applying force directly to the fluid.
  
  3. List three types of valves and explain when each is used.
    - a. Gate valves are located immediately before and after pumps to facilitate maintenance by isolating the pump from the wet well and the force main.
    - b. Plug valves are less susceptible to clogging and are also used to isolate the pump from the wet well and the force main.
    - c. Check valves are typically installed in the discharge of each pump and prevent the force main from draining back into the wet well.
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## Exercise Unit 2 – Management and Operations of Pumping Stations

1. Routine annual inspection of electrical equipment should include:
  - a. an examination
  - b. replacement of worn and expendable parts
  - c. operational checks and tests
  - d. all of the above
  
2. List 4 items that should be part of the records for a sanitary sewer line.
  - a. Main line inventory
  - b. Maintenance records
  - c. Televising records
  - d. Stoppage reports
  
3. A permit is required to install and operate a pump station.
  - a. True
  - b. False

This is true, a WQM Part II Permit is required to install (construct), modify and operate a pump station. A WQM permit is also needed to upgrade pump stations. For example, sometimes municipalities or private entities will change impellers within pumps to increase capacity – this would require a permit. Maintenance, including the replacement of parts and whole pumps that does not change capacity, would be covered under the existing permit they have.

4. List 4 important maintenance procedures for compressors and indicate how often they should be done.
    - a. Maintenance of a compressor involves inspecting the suction filter regularly and cleaning or replacing filters every 3 to 6 months.
    - b. The cylinder or casing fins should be cleaned weekly and safety valves should be tested weekly.
    - c. Condensate from the air receiver should be drained daily.
    - d. The compressor should be cleaned thoroughly monthly.
- for more information, see page 2-7

5. Pump bearing failure may be preceded by cavitation sounds, unusual noises or vibration.

- a. True
  - b. False
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### Exercise

1. Which of the following is not part of a traffic control zone?
  - a. A termination area.
  - b. An advance warning area.
  - c. An emergency pull-off.
  - d. A transition area.
  
2. Which of the following does not define a confined space?
  - a. It is large enough and so configured that a person can bodily enter it.
  - b. It is not designed for continuous occupancy.
  - c. It does not provide sufficient natural light.
  - d. It has limited or restricted means for entry.
  
3. Which of the following is a major hazard of entering a manhole?
  - a. Toxic exposure.
  - b. Physical injuries.
  - c. Psychological trauma.
  - d. Infection and disease.
  - e. All of the above.
  
4. No smoking is permitted inside or within 10 feet of a confined space.
  - a. True
  - b. False
  
5. Prior to beginning any excavation work, underground utilities need to be contacted and their respective lines located.

6. Work on electrical equipment should only be done by qualified and trained workers.

- a. True      b. False

7. OSHA requires that a protective system be used in trenches 5 feet or deeper.

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