



DEPARTMENT OF HUMAN RESOURCES

Study Guide Treatment Plant Operator I

- This booklet contains SAMPLE QUESTIONS ONLY. Studying this booklet will not necessarily improve your exam score.

NOVEMBER 2019

PURPOSE AND CONTENT OF THIS EXAM PREPARATION GUIDE

This guide was developed to help you prepare to take the written examination for Treatment Plant Operator I. It contains general test-taking advice and also provides specific information related to the exam content. This information includes the subject areas covered by the exam, the kinds of questions to expect, strategies for approaching the questions, and sample questions. Though this information cannot guarantee a higher exam score, it can give you direction for your examination preparation that will assist you in doing your best.

PREPARING TO TAKE THE EXAMINATION

Before the Day of the Examination

- Review this guide to get familiar with the content of the examination. Knowing about the topics and kinds of questions that will be in the exam will ensure that you will not be surprised by the content of the examination or the manner in which it is presented. This can improve your ability to demonstrate your job potential.
- Make sure that you know where the examination will be administered and all of the relevant details, such as where to park, where to report for the exam, and what identification is required.

On the Day of the Examination

- Make sure that you are well rested and have eaten. These things will help your concentration during the examination.
- Plan your day to allow plenty of time to get yourself prepared and get to the exam site. Allow enough time to cope with weather, traffic, parking, etc. Hurrying creates anxiety, so do not put yourself in the position of having to hurry.
- Listen carefully to all instructions from the examination administrator. Make sure that you understand the instructions and carry them out correctly. Ask questions at the proper time before the exam begins if you are unsure of any aspect of what you should do during the exam.

GENERAL EXAM TAKING TIPS

- Use your time carefully. The time limit should provide you with more than enough time if you move through the exam steadily and do not spend too much time on any one question.
- Read questions and answer choices carefully. Read all of the answer choices before you select an answer.
- If you come to a question that is especially difficult, skip that question and come back to it later if you have time.
- Answer every question. Scores are based on the number of correct answers. You will receive no credit if you leave an answer space blank. It is to your advantage to use your best judgment to make a choice among the answer choices provided.

TREATMENT PLANT OPERATOR I WRITTEN EXAMINATION

The written examination for Treatment Plant Operator I is based on a job study that identified the most important knowledge, skills, and abilities required to perform the job successfully. These areas include:

- your knowledge of workplace safety practices
- your knowledge and understanding of mechanical concepts
- your ability to read and interpret gauges and scales
- your knowledge and understanding of treatment plant operations
- Your knowledge of pump operation and maintenance

All of the examination questions are presented in a multiple-choice format. Each question is identified by a question number that is followed by a question statement. After the question statement, there are between two and four answer choices. You should read all of the answer choices and then choose the best answer. **Each question has only one correct answer.**

EXAMINATION SECTION 1: WORKPLACE SAFETY

This examination section contains twenty (20) questions about performing physical tasks and responding appropriately to safety concerns. An effective strategy for answering questions in this part of the exam is to create a picture in your mind of the situation described in each question and its answer choices. This should help you to clarify what types of hazards might be associated with the situation and how they would be affected by the action choices.

Examples of these types of questions are shown below. The sample questions are followed by brief explanations of their correct answers.

1. When an employee observes a potentially hazardous condition that might cause injury or property damage or could interfere with operations, he or she should:
 - A. report it promptly to a superior.
 - B. immediately call OSHA or the person responsible for plant safety.
 - C. immediately take whatever action is likely to correct the condition.
 - D. insist that work operations in the area be stopped until the condition is corrected.

Answer: The correct answer to sample question #1 is answer choice "A". Reporting a potentially hazardous condition to higher level personnel is the appropriate action. Taking direct action to attempt a remedy or directly contacting those outside of your supervisory chain would be wrong. Similarly, personal efforts to shut down plant operations would be unacceptable.

2. The characteristic of hydrogen sulfide (H₂S) that is most important to remember with regard to detection of its presence is that it:
 - A. has the appearance of white smoke.
 - B. has an almond odor and is lighter than air.
 - C. can be simply and safely detected with an oxygen monitor.
 - D. in low concentrations, has a rotten egg odor that quickly dulls the sense of smell.

Answer: The correct answer to sample question #2 is answer choice "D". None of the other answer choices are true with respect to hydrogen sulfide. It is colorless, is heavier than air, and its presence cannot be detected with an oxygen monitor.

3. Which of the following would be most appropriate for use on an electrical fire, for example, one involving motors or breakers?
- A. Water.
 - B. A foam extinguisher.
 - C. A dry chemical extinguisher.
 - D. Water with appropriate wetting agents.

Answer: The correct answer to sample question #3 is answer choice "C". Of the choices provided, only the extinguishing agent in a dry chemical extinguisher is a nonconductor of electricity and will effectively smother an electrical fire. The other extinguishing agent choices conduct electricity and can shock or electrocute a person applying them to an electrical fire. In addition, their use may enable the fire to spread by conducting electricity throughout the room and potentially igniting flammable materials.

EXAMINATION SECTION 2: MECHANICAL CONCEPTS

This examination section contains twenty (20) questions designed to assess your knowledge and understanding of tools and mechanical principles, including the classic simple machines that are components of larger mechanical devices. A good approach to answering these questions is to carefully read each question and make sure you know what is being asked. Then, you should be better able to draw upon your knowledge of these topics and thoughtfully consider the answer choices. Depending on your current knowledge and experience, additional assistance toward doing your best would be to review some references on these topics prior to taking the examination.

Examples of these types of questions are shown below. The sample questions are followed by brief explanations of their correct answers.

4. One of the important advantages of using pipe unions rather than pipe coupling when installing pipe with threaded fittings is that:
- A. connections made with pipe unions are less likely to leak.
 - B. the use of pipe unions enables future repairs to be made more easily.
 - C. pipe union connections are stronger and are preferred for joining pipes carrying high-pressure liquids.
 - D. the use of unions greatly reduces the level of precision required when determining the length of pipes to be joined.

Answer: The correct answer to sample question #4 is answer choice "B". Of the choices provided, this is the only true statement about pipe unions. Since they have more threaded parts, they are more likely to leak. So, high-pressure or dangerous liquids are often moved through pipes joined by other methods. And the use of a pipe union does not tolerate less careful measuring of pipe lengths.

5. In Figure A below, if Gear A turns in a counterclockwise direction, which of the other gears will turn in the same direction?
- A. Only Gear B.
 - B. Only Gear C.
 - C. Only Gears C and D.
 - D. Gears B, C, and D.

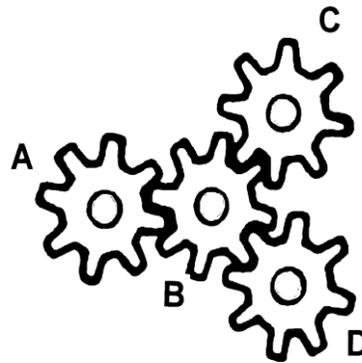


Figure A

Answer: The correct answer to sample question #5 is answer choice "C". When Gear A turns in a counterclockwise direction, it pushes upward on the teeth it meshes with on Gear B. This turns Gear B in a clockwise direction. This pushes on the teeth it meshes with on Gears C and D, causing both of them to turn in a counterclockwise direction.

6. Which of the following describes an appropriate use for a monkey wrench?
- A. To turn metal pipe.
 - B. To turn nuts and bolts.
 - C. To turn hard-to-reach pipe fittings.
 - D. To turn any round pipe, tubing, or conduit.

Answer: The correct answer to sample question #6 is answer choice "B". The jaws of a monkey wrench are both oriented at 90 degrees to the handle, that is, they are parallel, and have small, if any, serrations. This wrench was not designed to grip and turn round objects. These characteristics of a monkey wrench make all of the other answer choices incorrect.

EXAMINATION SECTION 3: INTERPRETING GAUGES AND CHARTS

This examination section contains twenty (20) questions designed to assess your ability to read and understand gauges, scales, and other measuring or reporting devices. The questions will involve looking at drawings of these various devices. A good strategy to use for these types of questions is to first look carefully at the drawing and determine what kind of information it is providing.

Next, note the range of numbers presented and the direction in which the values ascend: from left to right or right to left; clockwise or counterclockwise. Note the units between the scale values shown, for example: tenths or eighths of a unit, 5 or 10 units, etc.. Then, carefully read each question and identify the information for which the question is specifically asking. Now, looking back at the drawing, determine the value to which the question is referring and find it among the answer choices provided.

Examples of these types of questions are shown below. The sample questions are followed by brief explanations of the correct answers.

Questions 7 and 8 are based on the gauge in Figure B below. These questions ask about the values indicated by the arrows labeled "K" and "L".

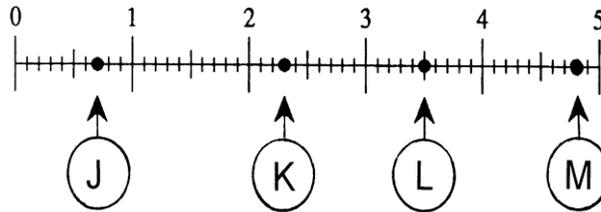


Figure B

7. Which of the following values is closest to the value indicated by the arrow labeled "K" in Figure B?

- A. $2\frac{1}{4}$
- B. $2\frac{3}{10}$
- C. $3\frac{7}{10}$
- D. $3\frac{7}{8}$

Answer: The correct answer to sample question #7 is answer choice "B". The scale values range from zero through 5, ascending from the left to the right. The space between each pair of adjacent scale values is marked off into ten (10) intervals. Therefore, the scale is marked off in tenths of a unit. Arrow K is indicating the value that is 3 intervals to the right of 2, or $2\frac{3}{10}$. This is answer choice "B" in sample question #7.

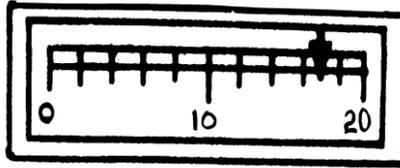
8. Which of the following values is closest to the value indicated by the arrow labeled "L" in Figure B?

- A. 3.40
- B. 3.45
- C. 3.50
- D. 4.50

Answer: The correct answer to sample question #8 is answer choice "C". It has been determined that the scale ranges from zero through 5 and is marked off into intervals that are equal to one tenth of a unit. Arrow L is indicating the value that is 5 intervals to the right of 3, or $3\frac{5}{10}$, which is also expressed as 3.50. This is answer choice "C" in sample question #8.

9. Which of the following values is closest to the value indicated by the gauge below?

- A. 10.70
- B. 13.50
- C. 17.00
- D. 22.00



Answer: The correct answer to sample question #9 is answer choice "C". The scale values range from zero through 20, ascending from the left to the right. The scale values shown are ascending 10 units at a time with 5 intervals between each pair of adjacent scale values (zero and 10; 10 and 20). This means that the scale is marked off in 2-unit intervals, that is, 10 units divided by 5 intervals. The needle on this gauge is pointing to the value that is $3\frac{1}{2}$ intervals to the right of 10. Therefore, the value being indicated is 10 plus $3\frac{1}{2}$ times 2, or 10 plus 7, or 17. This is the answer choice "C" in sample question #9.

10. Which of the following values is closest to the value indicated by the gauge in Figure C?

- A. 0.5
- B. 8.0
- C. 8.5
- D. 9.5



Figure C

Answer: The correct answer to sample question #10 is answer choice "D". The gauge is designed to show values ranging from zero through 10. These values ascend in a counterclockwise direction starting from zero at the top of the circular gauge. There are 10 intervals of 1 unit each between the scale values shown. The needle on the gauge is indicating the value that is approximately one half of an interval counterclockwise from the scale value of 9, or $9\frac{1}{2}$ or 9.5. This is answer choice "D" in sample question #10.

EXAMINATION SECTION 4: PLANT OPERATIONS

This examination section contains twenty (20) questions designed to assess your knowledge and understanding of wastewater treatment plant operations. The exam content includes the various treatment processes and equipment, what they accomplish, how they work, and problem indicators and solutions. An effective approach to assist you in doing your best on this section is to prepare before the examination by reviewing the areas described above. Then, when taking the exam, carefully read each question and make sure you know exactly what is being asked. With a clear understanding of the question, you then should be better able to draw upon your knowledge of these topics and thoughtfully consider the response choices.

Examples of these types of questions are shown below. The sample questions are followed by brief explanations of the correct answers.

11. The most effective point for chlorine application for disinfection purposes is:
 - A. after wastewater leaves the primary clarifier.
 - B. after all of the conventional treatment processes.
 - C. at a point on the main intercepting sewer before the junction of all feeder sewer lines.
 - D. at the entrance to the treatment plant, ahead of settling units and prior to the addition of other chemicals.

Answer: The correct answer to sample question #11 is answer choice "B". The focus of the question is the application point that produces the most effective disinfection of wastewater. The typical treatment plant may, at times, apply chlorine at all of the points described by the other answer choices. However, while the purposes are varied, none is generally focused on disinfection. Chlorine application in the collection system, at the entrance to the plant, and during treatment processes is used for odor and corrosion control, to aid sedimentation and sludge thickening, and to prevent sludge bulking, digester foaming, and filter flies. In most cases, these chlorine applications are considered as temporary or emergency measures.

12. The most likely cause of strong septic odors and floating sludge in a primary clarifier or sedimentation tank is that:
- A. the pretreatment of toxic industrial wastes has been inadequate.
 - B. unusual amounts of greases and oils are in the incoming wastewater.
 - C. sludge is not being removed frequently enough or at a high enough rate.
 - D. an excessively high weir flow rate is pulling settled solids away from the sludge collector mechanism.

Answer: The correct answer to sample question #12 is answer choice "C". When sludge is not removed frequently enough, the organic matter in the sludge decomposes to form foul-smelling products and gas bubbles that cause large clumps of the settled sludge to rise and float on the water surface. None of the other answer choices describes circumstances that produce septic odors or floating sludge in primary clarifiers or sedimentation tanks.

13. In order to avoid hazardous splashing when combining water and concentrated acids or bases, correct technique always requires:
- A. putting the acid into the water.
 - B. putting the water into the acid.
 - C. combining them slowly while stirring vigorously.
 - D. mixing the water and acid in a Pyrex glass container.

Answer: The correct answer to sample question #13 is answer choice "A". Acids and bases must be slowly added to water with constant stirring. If water is added to an acid or base, hazardous spattering and splashing will occur.

EXAMINATION SECTION 5: PUMP OPERATION AND MAINTENANCE

This examination section contains twenty (20) questions designed to assess your knowledge and understanding of concepts related to the operation and maintenance of pumps. Exam content includes pump characteristics, uses, trouble shooting, terminology, and related components. An effective approach to assist you in doing your best on this section is to prepare before the test by reviewing the areas described above. Then, when taking the test, carefully read each question and make sure you know exactly what is being asked. With a clear understanding of the question, you then should be better able to draw upon your knowledge of these topics and thoughtfully consider the response choices.

Examples of these types of questions are shown below. The sample questions are followed by brief explanations of the correct answers.

14. There is a small amount of water leakage from the stuffing box of a centrifugal pump when the pump is running. This leakage:
- A. will cause excessive end thrust.
 - B. will damage the packing material.
 - C. may cause uneven wear of the impeller shaft.
 - D. is necessary to cool and lubricate the packing.

Answer: The correct answer to sample question #14 is answer choice "D". Satisfactory operation of a stuffing box requires that there is controlled leakage. In operation, the function of stuffing box leakage is to assist in lubrication and to carry off the generated heat.

15. Which one of the following types of electric motors is most frequently used in wastewater treatment plants to operate the pumps?
- A. Split-phase motors.
 - B. Synchronous motors.
 - C. Wound-rotor induction motors.
 - D. Squirrel cage induction motors.

Answer: The correct answer to sample question #15 is answer choice "D". These motors require relatively little attention and, under average operating conditions, factory lubrication will last approximately one year.

16. Which of the following is the primary reason that a centrifugal pump should never be started unless it is filled with liquid?
- A. The presence of the liquid is required to provide cooling and lubrication.
 - B. The presence of the liquid is required to prevent creation of a vacuum within the pump.
 - C. The presence of the liquid is required to prevent liquid from the discharge piping to flow back into the pump.
 - D. In the absence of a liquid, the impeller can start rotating in the wrong direction and be damaged when the liquid rushes in.

Answer: The correct answer to sample question #16 is answer choice "A". The liquid in the pump keeps the surfaces separated and prevents rubbing and seizing of the surfaces.

17. The type of lubricant most commonly used for the bearings on electric motors is:
- A. oil.
 - B. silicone.
 - C. grease.
 - D. graphite.

Answer: The correct answer to sample question #17 is answer choice "C". Most electric motors are designed with grease-lubricated, antifriction, rolling-element bearings. Grease provides a film that prevents harsh metal-to-metal contact between the rotating element and races.

ADDITIONAL ASSISTANCE

If you feel that you would benefit from more practice, your local library or relevant Internet web sites may have reference materials that can be helpful. This is true for all of the subject areas covered by the Treatment Plant Operator I written examination.