

TEST YOUR KNOWLEDGE

Each quarter in *The Digester*, a list of sample exam questions is included to refresh your mind and serve as a study tool for those who may be about to take an operator exam. Below you'll find the answers to exam questions for the past several issues. If you have any questions about any of these sample exam questions, please contact Barbara Smith at basmith@msdeng.com

Summer 2011

1. B 300–500 feet
2. C National Pollutant Discharge Elimination System
3. C 6 hours
4. A Ammonia fumes should be used to identify leaks – do not use liquid ammonia directly on fittings or valves. Should create a white puff of smoke.
5. D Liquid chlorine weighs 1.5 times more than water is amber-colored liquid with a pungent and irritating odor. It is 2.5 times heavier than air. The maximum solubility in water is 1.0%.
6. B Chlorine one tone containers are manufactured with liquid chlorine under pressure. Because of evaporative temperatures of chlorine, some of the liquid is always being converted to gas inside of the container. After moving a container it should rest for at least 30-minutes prior to withdrawing gas from the top valve or liquid from the bottom valve.
7. B The act or process of absorbing or sucking in anything. The act or process of being absorbed and made to disappear.
8. B Dissolved, typically 80% of the overall total solids concentration.
9. A Volatile solids are the solids that burn up (become vapor) in a muffle furnace (550*). What is left over is considered non-volatile or fixed solids.
10. A TKN stands for Total Kjeldahl Nitrogen and is the combination of ammonia-nitrogen and organic-nitrogen. Typically, the majority of TKN in domestic raw wastewater is in the ammonia form.
11. C About 100 to 150 gallons per capita per day. The term hydraulics reflects a flow or gallons answer. Per capita is the same as per person.
12. B 0.8 to 1.2 is the range. It takes approximately one pound of oxygen to convert or oxidize one pound of CBOD₅.
13. B In one direction only.
14. D Ultimately frequent starts and stops will result in premature failure of the motor winding insulation
15. D Wastewater leaking from a collection system pipe is called exfiltration. Water seeping into a collection system pipeline is called infiltration. Aliquot is a portion of a sample and cavitation is air trapped in the volute of a pump.

16. D All the above may be found in any sewer line.
17. C The minimum velocity of 2 ft/sec is needed to keep the solids from settling out in the sewer system. When the velocity can no longer be obtained a lift station is designed to lift the wastewater to a higher point where it can again flow at a 2 ft/sec velocity.
18. B 1,118 lbs/day
 Supply – Demand = Residual (or) Demand = Supply – Residual
 = 13.5 mgd x 2.5 mg/L x 8.34 lbs/gal
 = 281.47 lbs/day
 = 1,400 lbs/day – 281.5 lbs/day
 = 1,118.5 lbs/day
19. A 19.3 lbs/day/ft²
Total lbs/day Entering the Secondary Clarifier
 Total Clarifier Surface Area
 lbs entering sec. clarifier = (5.5 mgd + 2.75 mgd) x 2,200 mg/L x 8.34 lbs/gal
 = 151,371 lbs/day
 = Clarifier surface area = (3.14 x 50' x 50')
 = 7,850 ft²
 = (151,371 lbs/day) / (7,850 ft²)
20. C Rotifer is the higher life form. In order from lowest life form to highest is amoeba, flagellate, free swimming ciliate, stalked ciliate (these are all protozoan forms and are single celled). A rotifer is a multi-celled microorganism and is part of the metazoan microlife.
21. B High aeration DO. Denitrification is an anoxic reaction, high dissolved oxygen levels in the aeration tank will typically reduce denitrification efficiency.
22. C Autotrophic bacteria are responsible for conversion of inorganic ammonia to nitrogen. There are two main groups of autotrophic bacteria. The first is nitrosomonas, known as the ammonia-oxidizing bacteria that convert ammonia to nitrite. The second group, nitrobacter, known as the nitrite-oxidizing bacteria convert nitrite to nitrate.
23. D All the above
24. B Aluminum
25. D All the above may sign the monthly reports, MRO, DMR, CSO monitoring
26. C An exceptional incident in which there is unintentional and temporary noncompliance with any wastewater quality standards or requirements because of factors beyond the reasonable control of the personnel
27. C A person caught cheating on the test will not be allowed to take the test for 2 years
28. D 30 days is the amount of time to notify IDEM of a change in the certified operator
29. B The deadline for the application to postmarked for the exam is 45 days prior to the exam

30. D A minimum of 70% from the technical category and a maximum of 30% from the general category
31. A Yes the instructor may receive contact hours
32. B False, partial credit is not given for any contact hours
33. A Records of training must be maintained for 3 years
34. B You have 90 days following a course to seek approval from IDEM for contact hours
35. A Disinfection is the destruction, neutralization, inhibition, inactivation or removal of pathogenic microorganisms by chemical, physical or biological means.

Fall 2011

1. A To insure ice does not form it is not advisable to draw more than 40 pounds of chlorine from any one 100 to 150lb cylinder in a 24-hour period. With ton containers, the limit of chlorine gas is about 8lbs of chlorine per day per degree F ambient temperature. When evaporators are provided, these limitations do not apply.
2. D
 - = 5MGD x 1,000,000
 - = 5,000,000 gpd / 480 ft
 - = 10,420 gpd/ft
3. C
 - = 60' x 20' x 12' = 14,400cuft
 - = (2.4mgd) x (1,000,000gpd) = 2,400,000 gpd
 - = (14,400cuft) x (7.48 gal/cuft) = 107,712.00 gal
 - = (107,712 gal) x (24 hr/day) = 2,585,088 gal/hour/day
 - = (2,585,088 gal/hour/day) / (2,400,000 gal/day)
 - = 1.07 or 1.1 hr
4. C
 - = (Flow, MGD) (BOD mg/L)(8.34 lb/gal)
 - = (1.5 mgd)(150 mg/L)(8.34 lb/gal) = 1876.5
 - = 1876.5 - (.30 x 1876.5)
 - = 1313.55 or 1315 lb/d
5. A The fusible plug is set to melt between 158 to 165 degrees F.
6. B D.O. residual will be reduced when a high organic load reaches the plant because the microorganisms will use the oxygen quicker when eating.
7. C A good disaster plan is constantly being updated and practiced so confusion is at a minimum when a disaster strikes.
8. D Finely divided solids (colloids) can cause turbidity.
9. C Hydrogen sulfide is commonly associated with wastewater.

10. B Paper waste products can be treated by biological treatment processes.
11. C Ventilation of a lift station helps to minimize the presence of harmful gases.
12. C A transformer is used to reduce the voltage.
13. C Increasing the velocity (or flow) through a pipe will create pipe friction loss.
14. B The standard BOD sample is incubated for 5 days at 20* C.
15. A The four types of pollution are, organic, inorganic, thermal and radioactive.
16. C
 - = 42" / 12" = 3.5 ft
 - = 0.785 x 3.5ft x 3.5ft = 9.62 ft²
 - = 9.62ft² x 6.5 ft/sec
 - = 62.5 or 62 ft³ / sec
17. D Over lubrication of a horizontal centrifugal pump can cause overheating and possible failure of bearings.

Winter 2011/12

1. B - The goals of the state regarding water quality are to restore and maintain the chemical, physical and biological integrity of the waters of the state. In furtherance of this primary goal:
 - (a) It is the public policy of the state that the discharge of toxic substances in toxic amounts be prohibited; AND
 - (b) It is the public policy of the state that the discharge of persistent and bioconcentrating toxic substances be reduced or eliminated.
2. D - Full-body contact recreation / aquatic.
3. B - Concentrations of dissolved oxygen shall average at least five (5.0) milligrams per liter per calendar day and shall not be less than four (4.0) milligrams per liter at any time.
4. D - As soon as possible, but within two (2) hours of discovery, communicate a spill report to the Department of Environmental Management, Office of Environmental Response: Area Code 1-888-233-7745 for in-state calls (toll free), (317) 233-7745 for out-of-state calls. If new or updated spill report information becomes known that indicates a significant increase in the likelihood of damage to the waters of the state, the responsible party shall notify the department as soon as possible but within two (2) hours of the time the new or updated information becomes known.
5. D - The purpose is to prevent the excessive hydraulic and/or organic overloading of POTW's or semipublic facilities resulting in the subsequent discharge or bypassing of insufficiently treated sewage. Source: 327 IAC 4-1-1
6. A - It is a sewer designed and employed to receive both water-carried and/or liquid wastes and storm and/or surface water. Source: 327 IAC 4-1-2(1)
7. B - It is a sewer that conveys liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions; and to which storm, surface, and ground waters are not intentionally allowed to enter.
8. B - Ninety percent (90%) / Hydraulic / Organic design capacity

9. C - Any discharge of pollutants into waters of the state as a point source discharge, except for exclusions made in 327 IAC 5-2-4, is prohibited unless in conformity with a valid NPDES permit obtained prior to the discharge. (Note: Discharges exempted from requiring an NPDES permit may be subject to permits or approvals under other laws.) Source: 327 IAC 5-2-2
10. C - A permit shall be issued for a fixed term not to exceed five (5) years. Permits of less than five (5) years duration may be issued in appropriate circumstances at the discretion of the commissioner. A permit may be modified, revoked and reissued, or terminated prior to the expiration of the term for cause, as specified in 327 IAC 5-2-16, or in accordance with conditions set forth in the permit (as in a reopening clause). In no event may the term of a permit be extended beyond five (5) years from its original effective date by modification, extension, or other means, except as provided in 327 IAC 5-2-6(b). Source: 327 IAC 5-2-6(a)
11. B – Total solids represents the material remaining from a water sample that has been evaporated and dried at 103 to 105°C. It is critical that the sample aliquot poured out for analysis be representative of the whole sample. It may be necessary to stir samples when subsampling or to avoid the inclusion of large particles floating on the surface.
12. B – Total suspended solids represents the material that is retained on a filter and dried to a constant weight at 103 to 105°C. Excessive amount of residue (greater than 200 mg) on the filter may trap moisture, therefore, the amount of sample filtered may be reduced to ensure complete drying.
13. C – The dishes should be made from porcelain or high silica glass, thoroughly cleaned, dried in the oven at 103 to 105°C for at least one hour and stored in a desiccator before use.
14. D – In this example, the sample volume of 50 ml met the method criteria for providing at least 2.5 mg of dried residue and no more than 200 mg
15. D – The density of the sludge. Primary sludges are usually denser than secondary sludges.