

**(SCHOOL DISTRICT)**  
**Testing for Maintenance and Operations Employees**

**SECTION I: BOILER OPERATIONS/REPAIR**

1. Steam and hot water boilers are divided into two groups that indicate the location of the water inside the vessel. What are these two designations?
  - a. fire box and bent tube
  - b. fire tube and water tube
  - c. gas fired and oil fired
  - d. sectional and welded
  - e. atmospheric and power burner
  
2. The number of passes a boiler has indicates what?
  - a. whether it is a power burner
  - b. whether it has a blower motor
  - c. how many times the hot gas goes through the boiler before it is vented
  - d. none of the above
  - e. all of the above
  
3. The water column on a boiler will indicate what about the boiler?
  - a. if the boiler is a steam boiler
  - b. if the boiler is a hot water boiler
  - c. the level of water in the boiler
  - d. the pressure inside the boiler
  
4. A pressure gauge reads 10 PSIG. The gauge is reading the pressure where?
  - a. inside the supply piping
  - b. inside the return piping
  - c. at the pumps which supply the building
  - d. inside the boiler itself
  - e. all of the above
  
5. The introduction of cold feed water into a hot boiler may cause what stress to occur?
  - a. expansion of the boiler
  - b. thermal shock
  - c. conductive stress
  - d. an explosion
  - e. none of the above
  
6. What is the function of the shot feeder on a supply/return line?
  - a. add water to the system
  - b. add a water testing valve to the system
  - c. add circulation to the system
  - d. add boiler water treatment to the system

7. When weather warms in the spring, what should you do with the burner control?
  - a. move the potentiometer dial to manual position
  - b. shut off one pump
  - c. shut off the potentiometer
  - d. set it back to lower fire
  - e. none of the above
  
8. What is the full function of the low-water cutoff on a steam boiler?
  - a. add water to the boiler and re-start it
  - b. add feed water to the boiler
  - c. to re-start the boiler when it fails
  - d. send an alarm to the boiler operator
  - e. provide a place to blow down the column
  
9. What would govern the number of times a boiler would have to be "blown down?"
  - a. the boiler treatment water test
  - b. how much solids there are in the boiler
  - c. how much the boiler is being used
  - d. all of the above
  - e. none of the above
  
10. In a steam boiler system, the steam in the radiators cools and turns to?
  - a. sludge
  - b. vapor
  - c. rust
  - d. condensation
  - e. all of the above
  
11. In a fully pneumatically controlled boiler room, the functions are controlled by which of the following?
  - a. the programmer for the power burner on the boiler
  - b. the night setback controller
  - c. the pneumatic air compressor and time clock
  - d. the outside air temperature sensor
  - e. all of the above
  
12. What is the function of a pre-purge cycle on a burner?
  - a. allows air pressure to build up for more efficient burning
  - b. clears the flue of built-up soot
  - c. clears the fire tube and flues of residual gases
  - d. clears the burner of any built-up gas
  - e. all of the above

13. The large round tank which is mounted above the boiler is called what?
- supply tank
  - expansion tank
  - make-up water tank
  - air eliminator tank
  - none of the above
14. During the night, the air compressor for the pneumatic system breaks down and loses pressure. If the boiler system is programmed to "fail safe", what will the boiler's function be?
- shut off all systems
  - shut down boiler
  - open all the pneumatic heat valves in the building
  - set boiler to night setback
  - set off an alarm in the boiler room
15. As the number of times a boiler is blown down increases, what effect will this have on the water inside the boiler?
- no effect
  - it will required addition of more boiler treatment
  - will produce steam with less condensation in it
  - the steam produced will be hotter
  - the water will become cleaner
16. The normal operating level on a steam boiler gauge glass is what?
- full
  - 1/2 full
  - manually adjustable
  - sea level and pressure adjusted
  - none of the above
17. The abbreviation BTU means which of the following?
- the heat needed to boil water
  - the heat needed to produce steam
  - British Thermal Unit
  - Basic Thermal Utilized
  - Bryan Turbilating Unit
18. A boiler which heats swimming pool water does not allow the pool water and the boiler water to mix. The boiler will heat the pool water by which method?
- fire tube heating
  - water tube heating
  - indirect coil heating
  - direct coil heating
  - none of the above

19. Heat is transferred through metal by what method?
- a. convection
  - b. conduction
  - c. radiation
  - d. absorption
  - e. vertical aluminum fins

## **SECTION II: CARPENTRY/GENERAL CONSTRUCTION**

1. If you were working with sole plates and headers, what would you be building?
- a. floor framing
  - b. stairs framing
  - c. roof framing
  - d. wall framing
  - e. any of the above
2. How do you determine which end is the top of a new flush wood door?
- a. door will be stamped at the top
  - b. all wood doors are universal
  - c. you sight the edge of the door
  - d. all of the above
  - e. none of the above
3. When hanging drywall onto a wood stud wall, you install the first layer horizontally. This is done to:
- a. help eliminate imperfections in the studs
  - b. help eliminate or reduce butt joints in the wall
  - c. give more rigidity to the wall
  - d. all of the above
  - e. none of the above
4. At 16" on center, how many studs will it take for a wall section 26'-0" long?
- a. 22 pieces
  - b. 20 pieces
  - c. 24 pieces
  - d. 21 pieces
5. When figuring the number of equal pieces you can get out of a sheet of plywood, what must you add to the width of each cut?
- a. thickness of the plywood
  - b. width of the saw blade
  - c.  $\frac{1}{2}$  width of the saw blade
  - d. one-half of an inch
  - e. the thickness of your pencil mark

6. The two blades of a standard framing square are what lengths?
  - a. 12" and 24"
  - b. 16" and 24"
  - c. 16" and 30"
  - d. 12" and 30"
  - e. none of the above
  
7. Before pouring concrete into a wooden form, to avoid having the concrete cure too fast you should:
  - a. place re-rod or wire reinforcing into the pour
  - b. make sure the concrete is wet coming from the mix truck
  - c. dampen the forms and the earth within the forms with water
  - d. spray the forms with fuel oil to avoid sticking
  - e. finish with a steel trowel only
  
8. When looking at a set of prints, you see a point marked as the Bench Mark. What significance does this mark have to your lay-out?
  - a. it is the point where the surveyor starts his work
  - b. it is the corner of the site
  - c. it is the point where all elevations are taken
  - d. it is where you set-up the sewers from
  
9. When installing a door closer, the end of the box is marked "Hand -Universal". What does this mean?
  - a. it cannot be used on a door with an automatic opening system
  - b. it can be used for only wood doors
  - c. it can be used for only metal doors
  - d. it can be used for any hand door
  
10. What is a fire damper?
  - a. a device for holding a door open and closing it during fire
  - b. a louver which provides a fire stop between building areas
  - c. a device which provides Type ABC extinguishing during a fire
  - d. a device which will sound a fire alarm when closed
  - e. all of the above
  
11. You are forming a concrete pad 10' x 10'. How do you make sure the forms are square?
  - a. with a framing square
  - b. measure corner to corner
  - c. the three, four, five method
  - d. a and c
  - e. b and c
  - f. all three of the above
  - g. none of the above

12. You are making a formica top on a counter. What is the least number of coats of adhesive you would use on each new piece of wood and formica to be laminated?
- one coat on each piece
  - two coats on each piece
  - one on the wood and two on the formica
  - two on the wood and one on the formica
13. What is the purpose of the coating on an arc welding rod?
- cools the rod
  - provides flux to the work
  - cleans the metal
  - indicates areas which might be sub standard
  - all of the above
14. You have welded a number of beads on the bottom of a skid shoe on a snow plow with barium rod. Why was this done?
- strengthen the shoes
  - provide a wearing surface
  - prevent snow build-up
  - harden the shoes
  - break up ice build-up on the shoe
15. What is the one key setting you would need on a welding machine to weld overhead and horizontally?
- AC and DC
  - reverse polarity
  - adjustable power settings
  - all of the above
16. What is the difference between a stationary level and a transit level?
- no difference
  - the stationary level is for masons only
  - a transit can adjust vertically and horizontally
  - a stationary level cannot be adjusted once set
17. As you are working on a metal door, you notice there is a metal tag nailed to the butt stile and it indicated the door is a "B" label door. What does this indicate?
- this is the hinge side of the door
  - this is the lock side of the door
  - this door is used for handicapped access
  - all of the above
  - none of the above

18. In a school class room, what is the one key element common to all lock sets found on hallway exit door?
- they are "panic" doors
  - they all have door closers
  - you cannot lock yourself in the room
  - they are all keyed alike
19. What is the function of a masonry or steel lintel?
- it is used to level block work
  - it is always 1-1/2 times the length of the opening
  - it is used to carry the load above it
  - it is a H-type construction
  - all of the above

### **SECTION III: PLUMBING**

1. On PVC piping, there is a schedule stamped on the pipe (i.e., SCH 30). The number 30 designates what about that pipe?
- it is only used as sewer pipe
  - it is only used as water pipe
  - it indicates the thickness of the pipe wall
  - it indicates the inside diameter of the pipe
  - it can stand 30 pounds of internal pressure
2. A piece of boiler equipment has a PRV rated at 150 lbs. @ 210 degrees. What does PRV stand for?
- a power release valve
  - a pressure relief valve
  - a pop-off relief vent
  - a pressure reverse vent
3. Where would you install a Di-Electric Union?
- in the electrical panel
  - on cold water piping next to the water heater
  - between a galvanized pipe and a copper pipe
  - between black iron pipe and copper pipe
  - where you are going to ground an electrical panel
4. You have fitted a number of pieces of copper pipe for installation. Explain the steps you would use to prepare the joints for sweating.
- flux, heat, solder with rosin core solder
  - flux, heat, solder with lead free solder
  - sand, flux, heat, solder, wipe with rag
  - sand, flux, heat, solder with 60/40 solder, wipe with rag
  - sand, flux, heat, solder with silver solder, wipe with rag

5. True or False? You are installing a drain tile. Near by is a sanitary sewer. You may tap this catch basin for the drain water.
  - a. True
  - b. False
  
6. What is the function of a P-trap?
  - a. a place to hold waste water
  - b. to stop sewer gasses from coming back into the room
  - c. to stop anything from being flushed down the drain
  - d. all of the above
  
7. What is the function of a check valve?
  - a. to allow air to escape from a heating system
  - b. to prevent water from flowing in the wrong direction
  - c. to keep the water level in a boiler even
  - d. all of the above
  
8. You are running a water line to a lavatory. What piece of material would you put above the T fitting to the supply for this lavatory?
  - a. air eliminator
  - b. air chamber
  - c. di-electric fitting
  - d. the shut off valve for the supply pipe
  
9. In the laying of a 4" drain line you are using PVC. What steps would be used to prep and fit the pieces of pipe together?
  - a. file edges smooth, glue both pieces and fit
  - b. file edges smooth, install rubber gasket, lube and fit
  - c. file edges smooth, flux, prime, glue and fit
  - d. file edges smooth, use primer/cleaner, glue and fit
  
10. A sign states "This water is not potable." What should you NOT do with this water?
  - a. do not flush this water into the sewer
  - b. do not use it for drinking
  - c. it is treated boiler water
  - d. dispose of it in a storm sewer only
  - e. all of the above
  
11. You are installing a hot water heater. On the top of the unit is a fitting marker "inlet". At this fitting you would do which of the following?
  - a. install the vent for the flue gasses
  - b. place the pipe for the hot water to the building
  - c. place the pipe for the cold water from the supply
  - d. hook up the gas line supply

12. A boiler feed water pump has what type of pump packing?
  - a. encapsulated asbestos fiber type
  - b. high temperature and pressure type
  - c. fiber reinforced or ceramic type
  - d. rubber impregnated type
  
13. In a centrifugal pump, what is the function of the impeller?
  - a. provide force for the outlet hose
  - b. provide just suction for the pump
  - c. provide suction and discharge for the pump
  - d. all of the above
  
14. On the discharge piping from a sump pump, what would be installed in the discharge line above the pump?
  - a. a relief valve
  - b. a union fitting
  - c. a di-electric valve
  - d. a gate valve
  - e. a back-flow preventor
  
15. When a toilet is flushed, what causes the water and waste to be moved into the sewer line?
  - a. a vent line will allow air to force the water down
  - b. the flow and weight of the water into the bowl
  - c. the Sloan valve diaphragm opens to allow flushing
  - d. all of the above
  - e. none of the above
  
16. Your project requires that you solder a **potable** water line. The solder you will use must be which of the following types?
  - a. 60% silver and 40% lead
  - b. 60% lead and 40% tin
  - c. lead free
  - d. 100% silver solder
  - e. any of the above
  
17. Why do you drain the water from a line which you have to solder?
  - a. to reduce the water pressure
  - b. to provide an even clean surface for the solder joint
  - c. the water in the line will boil and make it impossible to get the pipe hot enough to apply the solder
  - d. the solder will not stick to a wet pipe and may leak
  - e. none of the above

18. The pressure that water exerts on a given body or surface is given in PSI. What is the name given to this type of water pressure?
- hydrostatic
  - hydraulic
  - static
  - pneumatic
  - systolic
19. A piping repair project has just been completed by you. Since this line is for drinking water, what is the approved method for cleaning this line and rendering the water safe for drinking?
- call the Health Department
  - flush for 24 hours
  - flush with water until clear
  - flush with a germicidal disinfectant
  - chlorinate for 24 hours and flush

#### **SECTION IV: HEATING, VENTILATING AND AIR CONDITIONING**

1. Refrigeration lines are sweat together with what type of solder?
- 60/40 solder
  - rosin core solder
  - silver solder
  - lead free
  - any of the above
2. What do the fins on fin-tube radiation provide?
- surface for heat dissipation
  - surface for heat absorption
  - intake area for air flow to pass
  - all of the above
3. A switch in a unit ventilator has an EP switch. What do the letters EP stand for?
- enthalpic position
  - either position
  - electric / pneumatic
  - electronic / pressure
4. What consideration would have to be given to the HVAC configuration prior to the installation of an exhaust fan?
- location of the other roof vents
  - size of the unit vent damper
  - electric panel breaker sizes
  - amount of air supply introduced into the room
  - all of the above

5. At what point in a hot water supply piping scheme would you place an air eliminator?
  - a. boiler room
  - b. high point of the system
  - c. expansion tank in boiler room
  - d. at the unit vents
  - e. in the roof top units
  
6. In the air eliminator mentioned in #5, what prevents the water from leaking out of the vent?
  - a. vent valve
  - b. an internal float
  - c. back check valve
  - d. the boiler working pressure
  - e. any of the above could be utilized
  
7. In a pneumatic piston actuator, what causes the extension/retraction of the arm?
  - a. an aluminum rod
  - b. electricity
  - c. air pressure
  - d. static air pressure
  
8. A boiler re-set schedule is controlled by what temperature?
  - a. water supply temperature
  - b. outdoor air temperature
  - c. water return temperature
  - d. the night backset thermostat
  
9. The aligning of the driver and driven pulleys is done with a:
  - a. framing square
  - b. ruler
  - c. straight edge
  - d. allen wrench
  - e. channel lock pliers
  
10. In an air conditioning system, the cooling of the air is done through the use of a direct expansion coil. This coil does which of the following?
  - a. removes the heat using freon coils and exhausts it outdoors
  - b. passes the air over a freon filled cooling coil into the room
  - c. brings in outside air and cools it with freon
  - d. none of the above
  - e. all of the above
  
11. What is the name of the part of a fire damper which controls the release of the damper in case of a fire?
  - a. actuator linkage
  - b. fire and flame sensor
  - c. fusible link
  - d. a scanner electronic eye

12. Why are there large dampers which open directly to the outside air in a boiler room?
  - a. to provide combustion air for the boiler power burners
  - b. to provide make-up air for the unit vents
  - c. to vent excess heat build-up
  - d. to provide supply air for the venting of flue gasses
  
13. In a building with an above-ceiling plenum system, are there any return air ducts?
  - a. no
  - b. there can be in certain areas
  - c. yes
  - d. only if there are no fire walls
  
14. In a roof top HVAC unit, the face and bypass dampers will allow:
  - a. air to pass over the heating coils
  - b. air to be diverted around the coils
  - c. the air conditioning coils to operate
  - d. none of the above
  - e. all of the above
  
15. In order to evacuate the refrigerant from a AC system your will use a:
  - a. suction diffuser
  - b. refrigeration recovery manifold
  - c. vacuum pump
  - d. pneumatic refrigerant recovery unit
  - e. any of the above
  
16. In order to perform the above recovery on a high pressure or very high pressure system, you would need which type of certification?
  - a. Type I
  - b. Type II
  - c. Type III
  - d. Core rating
  - e. Any of the above
  
17. True or false? All types of refrigerant available and in use today are a threat to the Ozone layer of the atmosphere.
  - a. True
  - b. False
  
18. True or false? When recovery of refrigerant is possible, this material can be used again regardless of its type or class.
  - a. True
  - b. False

19. True or false? With the production of CFC free refrigerants, systems evacuated of the old CFC containing materials can be replaced with CFC free products.
- a. True
  - b. False

### **SECTION V: ELECTRICAL**

1. How do you reverse a three phase motor?
- a. lift the ground from the motor frame and bond it
  - b. switch the white and the green
  - c. switch any two leads
  - d. rewind the armature
  - e. you would have to get a different motor
2. National Electrical Code refers to the identified conductor as being what color?
- a. white
  - b. black
  - c. green
  - d. any color
3. To operate a single light from three different locations, what type of switches must be used?
- a. two three-way switches and one four-way switch
  - b. three three-way switches
  - c. one three-way and two four-way switches
  - d. three two-pole switches and one three-way switch
  - e. three thermally protected switches
4. What is the difference between AC and DC voltage?
- a. AC has polarity
  - b. DC has polarity
  - c. AC has a negative leg
  - d. DC has a negative leg
  - e. none of the above
5. In a 480 Volt 3 phase system, how many volts will be measured from any leg to ground?
- a. 120 volts
  - b. 220 volts
  - c. 240 volts
  - d. 160 volts
6. When installing a duplex plug receptacle, the white wire is always installed on which lug of the plug?
- a. it will depend on the plug style and UL classification
  - b. you will use the brass lug
  - c. you will use the silver lug
  - d. you may use either the brass or silver lug

7. When you install a new plug into an existing wall you fish in the service line. This would be done using which of the following:
  - a. romex shielded cable
  - b. PVC rigid conduit
  - c. flexible aluminum conduit
  - d. SJ service cord
  - e. any of the above installation methods
  
8. What is the minimum wire size allowed in commercial and/or public use buildings?
  - a. #10 THHN
  - b. #12
  - c. #12/3 with a ground
  - d. #16
  - e. SJ service cord
  
9. When remodeling existing buildings, does the new wiring installation in have to be in conduit or equal protection?
  - a. yes
  - b. no
  - c. does not apply to remodeling
  - d. should match existing wiring only
  
10. The minimum number of wires you would need to run service to a 220 volt motor would be:
  - a. four
  - b. three
  - c. two and a ground
  - d. it would depend on the number of phases the motor is

## **SECTION VI: GENERAL QUESTIONS**

1. Asbestos is:
  - a. a man made substance
  - b. a naturally occurring substance
  - c. similar to sand
  - d. a known toxin
  - e. banned from use by OSHA
  
2. A swimming pool deck can be washed/scrubbed with \_\_\_\_\_ to remove the build-up of dirt and stains in the grout:
  - a. scouring powder
  - b. muriatic acid
  - c. quaternary disinfectant
  - d. bleach

3. When you spray a classroom with an over-the-counter bug spray what additional step(s) must you perform:
  - a. do not reoccupy the room for at least six hours
  - b. you must post a sign on the door to alert others
  - c. you cannot spray without being certified
  - d. you must spray after 3:30 PM
  - e. all of the above
  
4. As you are using chemicals for killing weeds, you spill some on your pant leg. To ascertain if this may be harmful to you, check:
  - a. materials safety data sheet
  - b. the container label
  - c. the poison control "hot line"
  - d. all of the above
  
5. Below the fuel tank on a tractor is a glass bowl. This is called:
  - a. the fuel supply bowl
  - b. the dirt interceptor
  - c. the sediment bowl
  - d. the fuel shut-off bowl
  
6. An implement run off a tractor with a live PTO shaft will:
  - a. stop when the clutch is pushed in
  - b. raise up when the clutch is pushed in
  - c. continue running when the clutch is pushed in
  - d. it will depend on the make and model of the tractor
  - e. none of the above
  
7. The fuel on a diesel engine tractor is introduced into the cylinders by:
  - a. fuel injection
  - b. a carburetor
  - c. a turbo charger
  - d. a constant velocity receptor system
  
8. The gas/oil mixture used in an engine will indicate it is a:
  - a. four cycle engine
  - b. fuel injected system
  - c. snow blower engine
  - d. two cycle engine
  
9. When cutting off the bottom of a wood fire rated door, the type of blade the saw should have is a:
  - a. bayonet blade
  - b. carbide-tipped blade
  - c. rip-tooth blade
  - d. cross-cut tooth blade

10. You install a key and knob lockset and find the key way is upside down. To correct this you would:
  - a. purchase the correct lockset
  - b. release the knob and turn it over
  - c. turn the cylinder until the key way is correct
  - d. obtain a reverse-bevel key and knob set
  
11. Fertilizer that is applied in the fall would:
  - a. be higher in nitrogen than phosphorus and potash
  - b. be equal in nitrogen to phosphorus and potash
  - c. be lower in nitrogen than phosphorus and potash
  - d. have no nitrogen at all
  - e. you cannot apply fertilizer without certification
  
12. A selective herbicide will:
  - a. kill all weeds and grasses
  - b. kill only weeds
  - c. kill only weeds identified on the label
  - d. only last for one year
  - e. will last for two years
  
13. The carry over listed on a bag of herbicide will tell you that:
  - a. the chemical has a long shelf life
  - b. its effects last for two years
  - c. its effects last three years
  - d. none of the above
  - e. all of the above
  
14. Factors that will affect fertilizer and herbicides are:
  - a. if the grass/weeds are wet
  - b. if it is hot
  - c. if it is overcast
  - d. if there is a wind
  - e. all of the above

ANSWER KEY

**Section I**

- 1. b
- 2. c
- 3. c
- 4. e
- 5. b
- 6. d
- 7. e
- 8. a
- 9. a
- 10. d
- 11. c
- 12. c
- 13. b
- 14. c
- 15. b
- 16. b
- 17. c
- 18. c
- 19. b

**Section II**

- 1. d
- 2. a
- 3. d
- 4. d
- 5. b
- 6. b
- 7. c
- 8. c
- 9. d
- 10. b
- 11. e
- 12. b
- 13. b
- 14. b
- 15. b
- 16. c
- 17. e
- 18. c

19. c

**Section III**

- 1. c
- 2. b
- 3. c
- 4. c
- 5. b
- 6. b
- 7. b
- 8. b
- 9. d
- 10. b
- 11. c
- 12. c
- 13. c
- 14. e
- 15. b
- 16. c
- 17. d
- 18. b
- 19. e

**Section IV**

- 1. c
- 2. a
- 3. c
- 4. d
- 5. b
- 6. b
- 7. c
- 8. b
- 9. c
- 10. a
- 11. c
- 12. b
- 13. a
- 14. b
- 15. c
- 16. b
- 17. f
- 18. f
- 19. f

**Section V**

- 1. c
- 2. a
- 3. a
- 4. b
- 5. c
- 6. c
- 7. c
- 8. b
- 9. a
- 10. a

**Section VI**

- 1. b
- 2. b
- 3. b
- 4. d
- 5. c
- 6. c
- 7. a
- 8. d
- 9. b
- 10. b
- 11. c
- 12. c
- 13. d
- 14. e