PRACTICE EXAM 10: RED SEAL STEAMFITTER/PIPEFITTER SIMULATION (130 QUESTIONS)

1. Which class of fire extinguisher is required for a fire involving energized electrical equipment?

A. Class C

B. Class A

C. Class K

D. Class D

2. A worker must enter a trench 1.5 m deep to install piping. What is the primary hazard that protective systems address?

A. Soil collapse burying the worker

B. Excess noise from nearby equipment

C. Poor lighting at the trench bottom

D. Difficulty carrying tools down

3. What does a yellow WHMIS-style label band on a gas cylinder typically help identify?

A. The cylinder's manufacturing date

B. The contents or hazard of the gas

C. The cylinder's empty weight

D. The supplier's delivery region

4. When using a four-gas monitor before confined space entry, an oxygen reading of 23.5% indicates:

A. A normal, safe atmosphere

B. A slightly low oxygen level

C. An oxygen-enriched atmosphere

D. A toxic gas is present

5. What is the correct hand protection when handling hot pipe during steam work?

A. Lightweight cotton work gloves

B. Heat-resistant gloves rated for the temperature

C. Disposable nitrile examination gloves

D. Fingerless mechanic's gloves

6. A tool's electrical cord is found with the ground pin missing from the plug. The correct action is to:

A. Use the tool only on a dry surface

B. Tape the cord and continue working

C. Connect it through an extension cord

D. Remove the tool from service for repair

7. What is the main reason for keeping the work area clean and free of debris during a job?

A. To improve the appearance for inspection

B. To reduce slip, trip, and fall hazards

C. To make material counting easier

D. To speed up the cleanup at day's end

8. Which type of saw blade is most appropriate for cutting thin-wall stainless steel tubing?

A. A coarse-tooth wood blade

B. A standard carbon masonry blade

C. A fine-tooth bi-metal blade

D. A diamond grit abrasive blade

9. When two trades must work in the same area, coordination is best achieved by:

A. Each trade working its own shift only

B. Avoiding any verbal contact to save time

C. Letting the senior trade decide everything

D. A planning meeting to sequence the work

10. A micrometer is used in pipe fitting primarily to:

A. Measure the length of a pipe run

B. Check the angle of an elbow

C. Measure precise outside diameters or thicknesses

D. Mark the centerline for cutting

11. What is the purpose of a torque wrench when assembling flanged joints?

A. To cut the bolts to the correct length

B. To measure the flange face diameter

C. To detect leaks in the gasket

D. To apply a specified, controlled bolt tension

12. A fitter must determine the correct drill bit size for tapping a 1/2" NPT thread. The best resource is:

A. The pipe's published pressure rating

B. The welding procedure specification

C. A tap drill chart for the thread size

D. The site's confined space permit

13. Why should a grinding wheel be allowed to run freely for a moment before bringing it to the work?

A. To warm up the grinder's motor bearings

B. To confirm the wheel is sound and balanced

C. To clear dust from the previous job

D. To set the correct rotation speed

14. Which fabrication method joins thermoplastic pipe such as PVC?

A. Oxy-acetylene brazing

B. Threaded compression

C. Solvent cement welding

D. Magnetic particle bonding

15. A spool piece is fabricated 6 mm shorter than the drawing dimension. The most likely consequence is:

A. The spool will have a higher pressure rating

B. The threads will not engage properly

C. The fit-up gap will be too large to weld correctly

D. The pipe wall will be thinner than specified

16. Using the expansion formula ($L \times \Delta T \times$ coefficient), a longer pipe run subjected to the same temperature rise will:

A. Expand a greater total amount

B. Expand the same amount as a short run

C. Expand less than a short run

D. Not expand at all if anchored

17. What is the function of a swage (swaged nipple) in piping?

A. To provide a flexible connection

B. To reduce from one pipe size to another

C. To allow disassembly of a joint

D. To prevent backflow in a line

18. A weld must be made on pipe carrying a high-pressure service. The welder's qualifications must match:

A. The colour of the pipe coating

B. The brand of the welding machine

C. The length of the pipe section

D. The applicable welding procedure and code

19. Which fitting allows two sections of threaded pipe to be joined and later separated without cutting?

A. A 45° elbow

B. A union

C. A coupling

D. A cap

20. The primary purpose of a pipe identification colour-coding system is to:

A. Identify the contents and flow direction

B. Indicate the pipe's installation date

C. Show which welder fabricated the line

D. Match the architectural colour scheme

21. A globe valve is selected over a gate valve for a service because the application requires:

A. The lowest possible pressure drop

B. A fully unobstructed bore

C. Quick quarter-turn operation

D. Throttling and flow regulation

22. Heat tracing on a sprinkler-adjacent water line is installed mainly to:

A. Increase the water pressure in the line

B. Detect leaks along the pipe

C. Prevent the water from freezing

D. Measure the flow rate of the water

23. What is the purpose of a backing ring in some pipe welds?

A. To support the root pass and ensure full penetration

B. To increase the pipe's external diameter

C. To act as a permanent gasket

D. To mark the location for inspection

24. When laying out a rolling offset, the true length of the diagonal travel is found using:

A. Only the vertical rise measurement

B. Only the horizontal run measurement

C. The hypotenuse of the combined offsets

D. The pipe's nominal diameter

25. A valve packing gland is adjusted to:

A. Control leakage around the valve stem

B. Increase the valve's flow capacity

C. Change the valve's pressure rating

D. Reverse the direction of flow

26. Which non-destructive examination method uses X-rays or gamma rays to reveal internal weld defects?

A. Radiographic testing

B. Magnetic particle testing

C. Liquid penetrant testing

D. Visual inspection

27. A bell-and-spigot cast iron joint is sealed using:

A. A threaded compression nut

B. A welded fillet around the bell

C. A press-fit O-ring only

D. Oakum and lead, or a rubber gasket

28. What is the main purpose of a thermal expansion loop in a long straight pipe run?

A. To increase the system pressure

B. To absorb thermal expansion and contraction

C. To reduce the pipe's wall thickness

D. To measure the fluid temperature

29. A fitter selects Schedule 80 pipe over Schedule 40 for a service. The reason is that Schedule 80:

A. Has a larger inside diameter

B. Has a thicker wall for higher pressure

C. Is lighter and easier to handle

D. Costs less per metre

30. Before threading pipe, cutting the pipe square is important because:

A. A square cut ensures full, even thread engagement

B. A square cut reduces the pipe's weight

C. A square cut increases the pipe diameter

D. A square cut is required for painting

31. A two-leg sling is rated 2,000 kg per leg at a 60° angle from horizontal. Reducing the angle to 30° from horizontal will:

A. Decrease the capacity of the lift

B. Increase the capacity of the lift

C. Have no effect on the lift capacity

D. Double the capacity of the lift

32. The capacity of a sling used in a choker hitch compared with a vertical hitch is:

A. Greater than the vertical hitch

B. Equal to the vertical hitch

C. Unrelated to the hitch type

D. Reduced from the vertical hitch rating

33. What does the "design factor" (safety factor) of rigging equipment represent?

A. The weight of the rigging hardware itself

B. The number of legs in the sling assembly

C. The age limit before mandatory replacement

D. The ratio of breaking strength to working load limit

34. A load weighs 4,000 kg and is lifted with a single vertical sling. The sling's working load limit must be at least:

A. 1,000 kg

B. 2,000 kg

C. 4,000 kg

D. 8,000 kg

35. When using a come-along (lever hoist) to move a load, the operator must ensure:

A. The hook latch is closed and the load is within the rated capacity

B. The device is operated as fast as possible

C. The load exceeds the rated capacity slightly

D. The hook latch is removed for easier rigging

36. A critical lift plan must account for the crane's capacity at the:

A. Actual radius and boom configuration of the lift

B. Shortest possible boom length only

C. Manufacturer's showroom rating

D. Maximum rated capacity regardless of radius

37. Why must outrigger pads be placed on stable ground for a crane lift?

A. To improve the operator's line of sight

B. To reduce wear on the crane tires

C. To prevent the crane from tipping due to ground failure

D. To lower the crane's fuel consumption

38. A wire rope sling shows a kink that has permanently deformed the rope. The correct action is to:

A. Straighten the kink with a hammer and reuse

B. Reduce the rated load by 25% and use it

C. Use it only for non-critical lifts

D. Remove the sling from service permanently

39. When hand-signalling a crane operator, the signal for "stop" should be:

A. Given only after the load is set down

B. A clear, agreed-upon signal recognized by both

C. Whatever signal the rigger prefers

D. A verbal shout without hand motion

40. A spreader beam differs from a lifting beam in that a spreader beam primarily carries:

A. Compressive loads along its length

B. Bending loads at its center

C. Torsional loads at the ends

D. No load at all during the lift

41. What is the purpose of softeners (corner protectors) on a synthetic sling?

A. To increase the sling's rated capacity

B. To protect the sling from sharp load edges

C. To add colour coding to the sling

D. To make the sling float in water

42. During a tandem lift, if one crane takes more than its share of the load, the result can be:

A. A reduced total lift time

B. Improved load stability

C. Overloading of that crane

D. Lower fuel use on both cranes

43. A low pressure steam system's pressure must not exceed:

A. 350 kPa (50 psi)

B. 103 kPa (15 psi)

C. 700 kPa (100 psi)

D. 50 kPa (7 psi)

44. The latent heat of vaporization in a steam system refers to the heat:

A. Absorbed to change water to steam without a temperature change

B. Required to raise the water temperature by one degree

C. Lost through the pipe insulation

D. Generated by the boiler's combustion

45. A bucket steam trap that is blowing live steam continuously most likely indicates:

A. The condensate load has decreased

B. The trap has lost its water prime/seal

C. The steam pressure is too low

D. The strainer is completely clean

46. What is the purpose of a vacuum breaker on a steam heating coil?

A. To increase the steam pressure to the coil

B. To filter condensate from the coil

C. To admit air and allow condensate to drain when vacuum forms

D. To measure the coil's heat output

47. A boiler's safety relief valve is sized based on the:

A. Maximum steam generating capacity of the boiler

B. Colour of the boiler jacket

C. Length of the steam main

D. Number of radiators served

48. Using Btuh = gpm × 500 × ΔT rearranged, if a system must deliver 250,000 Btuh with a 25°F drop, the required flow is:

A. 25 gpm

B. 20 gpm

C. 50 gpm

D. 12.5 gpm

49. What causes "steam binding" in a condensate return system?

A. Excess condensate flooding the trap

B. The pump impeller running backward

C. Flash steam preventing condensate from entering the pump

D. The return line being oversized

50. A pressure reducing valve in a steam system is failing to maintain downstream pressure, which keeps rising. The likely cause is:

A. The valve seat is worn and passing steam

B. The downstream load has increased sharply

C. The upstream pressure has dropped

D. The pilot line is correctly connected

51. What is the function of a hartford loop in a low-pressure steam boiler connection?

A. To increase the boiler's steam output

B. To filter the returning condensate

C. To raise the steam pressure setting

D. To protect against low water if a return line leaks

52. Superheated steam differs from saturated steam in that it:

A. Contains more entrained moisture

B. Is heated above its saturation temperature

C. Is always at a lower pressure

D. Cannot be used for heating

53. A high-pressure steam line must be blown down periodically to:

A. Remove accumulated sludge and sediment

B. Increase the steam temperature

C. Raise the boiler water level

D. Test the safety relief valve

54. What is the primary risk of rapidly opening a valve to admit steam into a cold line?

A. The steam will lose pressure too slowly

B. Severe water hammer from sudden condensation

C. The line will overheat the insulation

D. The trap will discharge too much air

55. A gauge glass on a boiler appears completely full of water with no visible level. This may indicate:

A. The boiler is operating normally

B. The water level is dangerously low

C. The gauge glass is plugged or the level is above the glass

D. The safety valve has opened

56. The purpose of boiler water treatment is primarily to:

A. Increase the steam pressure

B. Control scale, corrosion, and carryover

C. Change the colour of the water

D. Reduce the boiler's firing rate

57. A flash tank in a high-pressure condensate system operates at:

A. The same pressure as the high-pressure source

B. A pressure higher than the boiler

C. Atmospheric pressure only

D. A lower pressure where condensate flashes to steam

58. What does a steam trap's "subcooling" refer to?

A. Heating the condensate above steam temperature

B. The trap closing before any condensate forms

C. Cooling the trap body with external water

D. Holding condensate until it cools below saturation before discharge

59. A hydronic system's circulator is mounted to pump away from the expansion tank connection. This placement:

A. Increases the system's total flow rate

B. Reduces the need for an air separator

C. Keeps most of the loop under positive pressure

D. Eliminates the need for a check valve

60. The "point of no pressure change" in a hydronic system is located at the:

A. Expansion tank connection point

B. Highest point of the system

C. Boiler outlet flange

D. Farthest radiator from the pump

61. What is the purpose of a primary-secondary piping arrangement in a hydronic system?

A. To eliminate the need for a boiler

B. To hydraulically decouple two circulating loops

C. To increase the system operating pressure

D. To remove the expansion tank

62. A glycol concentration that is too high in a hydronic loop will:

A. Improve the heat transfer efficiency

B. Lower the freezing point excessively with no downside

C. Reduce heat transfer and increase pumping requirements

D. Have no effect on system performance

63. Process piping for a corrosive acid requires a material selected for:

A. Resistance to chemical attack from the acid

B. The lowest possible material cost

C. The brightest surface finish

D. The lightest weight per metre

64. An industrial wastewater neutralization system adjusts the effluent's:

A. Flow velocity

B. Colour and clarity

C. Temperature only

D. pH to an acceptable range

65. In a hydraulic system, an accumulator is used to:

A. Filter contaminants from the fluid

B. Cool the hydraulic fluid

C. Increase the fluid's viscosity

D. Store energy and absorb pressure surges

66. A refrigeration system's metering device (expansion valve) functions to:

A. Compress the refrigerant vapour

B. Reduce pressure and meter refrigerant into the evaporator

C. Reject heat to the outdoor air

D. Store excess refrigerant charge

67. Why must fuel gas piping be tested for leaks before being placed in service?

A. A leak presents a fire and explosion hazard

B. A leak reduces the gas pressure slightly

C. A leak changes the gas colour

D. A leak increases the pipe's weight

68. Medical gas piping joints are brazed using a nitrogen purge to:

A. Cool the joint faster after brazing

B. Increase the brazing temperature

C. Prevent internal oxide scale from forming

D. Add moisture to the gas stream

69. A compressed air system's receiver tank serves to:

A. Increase the compressor's speed

B. Store air and dampen pressure fluctuations

C. Filter oil from the air supply

D. Reduce the air temperature directly

70. What is the purpose of a desiccant dryer in a compressed air system?

A. To increase the air pressure

B. To filter solid particles only

C. To add lubricant to the air

D. To remove moisture from the compressed air

71. A pneumatic control valve fails to move when signalled. A likely first check is:

A. The colour of the valve actuator

B. The age of the control panel

C. The brand of the air compressor

D. The supply air pressure to the actuator

72. Chilled water piping that "sweats" heavily despite insulation most likely has:

A. Excessive flow velocity in the line

B. A damaged or missing vapour barrier

C. Water that is too warm

D. An oversized circulator pump

73. A reduced-pressure-zone (RPZ) backflow assembly provides protection against:

A. High-hazard cross-connections

B. Excessive water velocity only

C. Low water pressure events

D. Sediment in the supply line

74. A geo-exchange system's coefficient of performance (COP) of 4.0 means:

A. Four units of heat are delivered per unit of energy input

B. The system uses four compressors

C. The loop is buried four metres deep

D. Four litres per second flow through the loop

75. A horizontal closed-loop geo-exchange field is generally chosen over a vertical field when:

A. Adequate land area is available

B. The site has very limited surface area

C. The water table is extremely deep

D. Only cooling is required

76. A solar thermal system's drainback design protects the collector by:

A. Keeping the collector permanently flooded

B. Adding glycol to the collector loop

C. Draining fluid from the collector when the pump stops

D. Increasing the collector pressure at night

77. In a solar heating system, an over-temperature condition is typically managed by:

A. Increasing the solar radiation captured

B. Sealing the collector completely

C. Removing the storage tank

D. A heat dump or dissipation loop

78. A heat recovery ventilator's effectiveness is reduced if the:

A. Core or heat exchanger becomes fouled or blocked

B. Outdoor air is colder than indoor air

C. Building is fully occupied

D. Supply and exhaust flows are balanced

79. A flue gas economizer must be designed to avoid cooling the flue gas below its:

A. Maximum rated firing temperature

B. Combustion ignition point

C. Acid dew point, to prevent corrosion

D. Atmospheric reference pressure

80. A heat recovery system that captures waste heat from a chiller's condenser can use it to:

A. Cool the building's supply air

B. Preheat domestic or process hot water

C. Lower the chiller's refrigerant charge

D. Increase the cooling tower fan speed

81. During commissioning, a system's design intent is verified against the:

A. Contractor's personal preference

B. Lowest-cost equipment available

C. Building occupants' opinions

D. Project specifications and drawings

82. Before energizing a newly installed circulator pump, the fitter should confirm:

A. The pump is painted the correct colour

B. The warranty card has been mailed

C. The pump is properly aligned and the system is filled and vented

D. The building permit number is posted

83. A hydrostatic pressure test holds the system at test pressure to:

A. Increase the pipe's wall thickness

B. Warm up the system before service

C. Flush debris from the lines

D. Verify there are no leaks at the rated pressure

84. What is the purpose of a commissioning checklist sign-off?

A. To document that each verification step was completed

B. To record the workers' daily wages

C. To select the equipment colours

D. To schedule the cleaning crew

85. During start-up, abnormal pump vibration most likely indicates:

A. The pump is operating at peak efficiency

B. The expansion tank is oversized

C. The insulation is too thick

D. Misalignment, cavitation, or a mechanical fault

86. Flushing velocity during system cleaning must be high enough to:

A. Carry debris out of the piping

B. Increase the system pressure rating

C. Reduce the pump's electrical load

D. Lower the water temperature

87. A functional test of a control sequence verifies that:

A. The equipment colour matches the spec

B. The permit fees were paid on time

C. The wiring is the correct gauge only

D. Outputs respond correctly to changing inputs and setpoints

88. When turning over a steam system, the operator must be trained on:

A. The paint manufacturer's data

B. Safe start-up, operation, and shutdown procedures

C. The supplier's delivery schedule

D. The colour code of the gauges

89. Air binding discovered during hydronic start-up is corrected by:

A. Increasing the boiler firing rate

B. Venting air from high points and problem zones

C. Draining the entire system permanently

D. Removing the expansion tank

90. A pre-start inspection of a boiler must confirm the:

A. Water level and safety controls are functional

B. Boiler jacket is freshly painted

C. Nameplate matches the architect's drawings

D. Insulation colour matches the piping

91. As-built drawings differ from design drawings in that as-builts:

A. Show only the original design intent

B. Are required only for electrical systems

C. Contain no dimensional information

D. Reflect the system as it was actually installed

92. Why is documenting test results important during turnover?

A. It provides a record proving the system meets requirements

B. It increases the system's operating pressure

C. It replaces the need for any drawings

D. It determines the workers' pay rate

93. During commissioning of a hydronic system, balancing is performed to:

A. Increase the pump speed to maximum

B. Set each circuit to its designed flow rate

C. Raise the boiler above its rated pressure

D. Remove the air separator from service

94. A safety relief valve must be tested during commissioning to confirm it:

A. Matches the colour of the boiler

B. Reduces the system's flow rate

C. Increases the boiler's efficiency

D. Opens at its set pressure to relieve overpressure

95. The acronym LAWL refers to the:

A. Lowest available water line in a building

B. Local authority work limit

C. Lowest allowable water level in a boiler

D. Liquid air-water level sensor

96. A piping system is to be insulated after commissioning. Insulation should be applied only after:

A. Pressure tests are completed and joints are confirmed leak-free

B. The system has run for one full year

C. The building is fully occupied

D. The paint on the pipe has fully cured

97. What does the term "turndown ratio" describe in a boiler?

A. The angle of the steam main slope

B. The range between maximum and minimum firing rates

C. The boiler's maximum operating pressure

D. The number of safety valves installed

98. A check valve installed backward in a pump discharge line will:

A. Prevent flow through the line entirely

B. Increase the pump's flow rate

C. Reduce water hammer in the system

D. Improve the pump's efficiency

99. When sizing pipe for a given flow rate, an undersized pipe will result in:

A. Lower fluid velocity and reduced noise

B. Excessive velocity, high friction loss, and possible erosion

C. A larger pressure rating

D. Reduced material cost with no drawbacks

100. A vacuum heating system maintains sub-atmospheric pressure to:

A. Increase the boiler firing rate

B. Lower the steam temperature for gentler heating and faster circulation

C. Eliminate the need for steam traps

D. Increase the water hammer in the system

101. A welded pipe joint shows incomplete penetration on radiographic film. This defect:

A. Increases the joint's strength

B. Is acceptable on all pressure piping

C. Weakens the joint and must be repaired

D. Only affects the pipe's appearance

102. The purpose of a sacrificial anode in a piping or tank system is to:

A. Increase the flow rate through the system

B. Filter sediment from the water

C. Corrode preferentially to protect the protected metal

D. Heat the water before distribution

103. A pipe carrying steam expands 25 mm over its run. The support system must:

A. Allow the expansion while supporting the pipe weight

B. Rigidly prevent all movement of the pipe

C. Increase the pipe's wall thickness

D. Reduce the steam pressure to limit expansion

104. What is the function of a strainer's blowdown valve?

A. To increase the flow through the strainer

B. To remove accumulated debris without disassembly

C. To measure the pressure drop across the strainer

D. To change the strainer's mesh size

105. A gate valve used for throttling instead of isolation will likely:

A. Provide excellent fine flow control

B. Increase the valve's service life

C. Reduce the pressure drop to zero

D. Erode the seat and gate from high-velocity flow

106. When two dissimilar metals are joined in a wet system without isolation, the result over time is:

A. Increased flow rate at the joint

B. Improved pressure rating

C. A stronger, fused connection

D. Galvanic corrosion of the more active metal

107. A pressure gauge on a system reads 0 kPa while the system is known to be pressurized. The most likely cause is:

A. The system pressure is correct at zero

B. A faulty gauge or a closed/blocked gauge cock

C. The pipe wall is too thick

D. The fluid temperature is too high

108. Pipe supports for a vertical riser must be designed to:

A. Allow the riser to rotate freely

B. Carry the weight of the vertical pipe and contents

C. Reduce the riser's diameter at the top

D. Increase the fluid velocity in the riser

109. A condensate return line should be pitched to:

A. Run perfectly level for uniform flow

B. Rise toward the receiver to slow the flow

C. Drain toward the collection point by gravity

D. Trap condensate at each elbow

110. What is the primary purpose of an air gap in a drainage connection?

A. To increase the drainage flow rate

B. To reduce noise in the drain line

C. To prevent backflow contamination of potable supply

D. To filter solids from the wastewater

111. A pipe must penetrate a fire-rated wall. The penetration must be:

A. Left open for ventilation

B. Sealed with ordinary insulation only

C. Made as large as possible for clearance

D. Firestopped with an approved rated system

112. When a steam coil produces uneven heating, a common cause is:

A. The steam pressure is too high everywhere

B. A failed trap causing condensate to back up in the coil

C. The coil is over-insulated

D. The supply valve is fully open

113. A relief valve that "chatters" (rapidly opens and closes) is often caused by:

A. The valve being correctly sized for the load

B. The downstream piping being too short

C. The valve being oversized for the relieving capacity

D. The valve being painted the wrong colour

114. The minimum bend radius for a given tube is specified to:

A. Prevent kinking, flattening, or weakening of the tube

B. Increase the tube's pressure rating

C. Reduce the amount of fittings needed

D. Change the tube's colour code

115. A pump operating far to the right of its curve (high flow, low head) risks:

A. Cavitation and motor overload

B. Running at peak efficiency

C. Eliminating the need for a check valve

D. Reducing the system pressure to zero

116. What is the function of a balancing damper in an air-side system associated with hydronic terminals?

A. To increase the water flow to the coil

B. To filter the supply air

C. To adjust and set the airflow through the unit

D. To heat the air before the coil

117. A fitter must determine the correct gasket for a 600 psi steam flange. The selection is governed by the:

A. Colour preference of the operator

B. Length of the bolt threads

C. Flange rating, temperature, and service media

D. Brand of the flange manufacturer

118. When commissioning a fuel oil system, the supply lines must be:

A. Left partially filled with air

B. Painted before any testing

C. Connected to the steam supply

D. Tested for leaks and properly primed

119. A steam trap selected with too small a capacity for the condensate load will:

A. Discharge condensate faster than it forms

B. Back up condensate and cause water hammer or poor heating

C. Improve the steam quality downstream

D. Increase the steam pressure in the main

120. The purpose of a thermometer well (thermowell) in a pipe is to:

A. Increase the fluid velocity past the sensor

B. Reduce the pipe's pressure rating

C. Allow a temperature sensor to be inserted without breaching the system

D. Filter debris from the fluid

121. A pipe run requires an anchor at a specific point. The anchor's purpose is to:

A. Allow free movement in all directions

B. Reduce the pipe's wall thickness

C. Increase the fluid temperature

D. Fix the pipe at that point and direct expansion elsewhere

122. A welder must preheat certain alloy pipe before welding to:

A. Speed up the cooling rate after welding

B. Increase the pipe's diameter

C. Change the pipe's colour

D. Reduce the risk of cracking from rapid cooling

123. When a hydronic zone fails to heat while others work, a likely cause is:

A. The boiler is undersized for the whole building

B. The expansion tank is too large

C. A closed valve, air lock, or failed zone circulator

D. The supply water temperature is too high

124. A pipe expansion joint of the bellows type accommodates movement by:

A. Rigidly anchoring the pipe at both ends

B. Increasing the pipe's pressure rating

C. Flexing the corrugated metal element

D. Reducing the fluid flow rate

125. The purpose of a drip leg (drip pocket) on a steam main is to:

A. Increase the steam velocity in the main

B. Collect condensate and direct it to a trap

C. Reduce the steam pressure in the main

D. Add moisture to the steam supply

126. A pressure-temperature relief valve on a water heater protects against:

A. Low water pressure conditions only

B. Excessive water flow rate

C. Both excessive pressure and excessive temperature

D. Sediment accumulation in the tank

127. When a fitter encounters an unfamiliar valve during maintenance, the best first reference is:

A. A guess based on similar valves

B. The opinion of the nearest worker

C. The colour of the valve body

D. The manufacturer's documentation or system drawings

128. A correctly installed steam trap should be located:

A. At the low point where condensate collects, below the equipment

B. At the highest point of the steam main

C. On the steam supply side before the equipment

D. Inside the heated space being served only

129. During final turnover, the owner is provided with maintenance schedules so that:

A. The installer can avoid all future liability

B. The warranty period can be shortened

C. The system can be operated at higher pressure

D. The equipment is serviced at proper intervals to maintain reliability

130. The most important reason to follow the commissioning sequence in order is to:

A. Reduce the total project cost only

B. Satisfy the paint manufacturer's terms

C. Match the building's colour scheme

D. Ensure each system is verified safe and functional before the next step

Practice Exam 10: Answer Key and Explanations

1. A — A Class C extinguisher is rated for fires involving energized electrical equipment because its agent is non-conductive. Using a water-based (Class A) extinguisher on live equipment risks electric shock to the operator. Matching the extinguisher class to the hazard prevents both fire spread and electrocution.

2. A — Protective systems such as shoring, sloping, or trench boxes guard against soil collapse, which is the leading cause of trench fatalities. A cave-in can bury a worker in seconds with enough force to cause suffocation or crushing. This is the primary hazard any trench protection addresses.

3. B — A colour band or label on a gas cylinder helps identify the contents or hazard class of the gas. This lets workers quickly recognize what is inside and the precautions required. Correct identification prevents dangerous mix-ups between gases.

4. C — A reading of 23.5% oxygen is above the normal 20.9% and indicates an oxygen-enriched atmosphere. Enriched oxygen dramatically increases fire and combustion risk and must be corrected before entry. Both low and high oxygen readings are unsafe conditions.

5. B — Heat-resistant gloves rated for the working temperature protect the hands when handling hot pipe. Ordinary cotton or nitrile gloves offer little thermal protection and can fail quickly. PPE must be matched to the specific hazard, here high surface temperature.

6. D — A tool with a missing ground pin must be removed from service until repaired, because the grounding path that protects against shock is gone. Bypassing or taping the defect leaves the user exposed to a fault energizing the housing. Defective electrical tools cannot be used safely.

7. B — Keeping the work area clean and clear reduces slip, trip, and fall hazards, a leading cause of jobsite injury. Tools, debris, and spills create footing dangers in busy work zones. Good housekeeping is a basic and effective safety control.

8. C — A fine-tooth bi-metal blade is suited to cutting thin-wall stainless tubing, giving clean cuts without tearing or grabbing. Coarse or masonry blades would catch and damage thin material. Tooth pitch must match the material thickness.

9. D — Coordinating overlapping trades is best achieved through a planning meeting that sequences the work. This prevents conflicts, duplicated effort, and safety hazards from crews working over one another. Communication and scheduling are the core of multi-trade coordination.

10. C — A micrometer measures precise outside diameters and thicknesses to fine tolerances. This precision is needed for fit-up and verifying machined or tube dimensions. Tapes and squares cannot achieve micrometer accuracy.

11. D — A torque wrench applies a specified, controlled tension to flange bolts. Correct torque seats the gasket evenly and prevents leaks from under- or over-tightening. Controlled bolt loading is essential to a reliable flanged joint.

12. C — A tap drill chart gives the correct drill size for a given thread, here 1/2" NPT. Using the charted size ensures the tapped threads have proper depth and engagement. The chart is the standard reference for thread tapping.

13. B — Running a grinding wheel freely for a moment confirms it is sound and balanced before it touches the work. A cracked or unbalanced wheel will reveal vibration or noise and can shatter under load. This brief test is a safety check before grinding.

14. C — Thermoplastic pipe such as PVC is joined by solvent cement welding, which chemically fuses the surfaces. The solvent softens the plastic so the joint bonds into a continuous material. Brazing and threading are not used on this pipe.

15. C — A spool fabricated short leaves a fit-up gap too large for a proper weld. Excessive root gap makes full penetration and a sound weld difficult or impossible. Accurate spool dimensions are critical for field fit-up.

16. A — From $L \times \Delta T \times$ coefficient, expansion is directly proportional to length, so a longer run expands more for the same temperature rise. The total movement increases with the length being heated. This is why long runs need expansion provisions.

17. B — A swaged nipple reduces from one pipe size to another in a compact fitting. It transitions the bore between two sizes where a coupling or reducer is needed. It is a size-change fitting, not a flexible or check device.

18. D — A welder's qualifications must match the applicable welding procedure and code for the service. This ensures the weld meets the required quality and pressure standards. Codes govern who may weld what on pressure piping.

19. B — A union joins two threaded pipe sections and allows them to be separated later without cutting. Its three-part design unscrews to break the joint for maintenance. Couplings and caps do not provide this feature.

20. A — Pipe colour-coding identifies the contents and the direction of flow. This lets workers quickly recognize what a line carries and which way it moves. Identification supports both safety and efficient maintenance.

21. D — A globe valve is chosen when throttling and flow regulation are required, because its seat design allows fine control. Gate valves are for on/off service and regulate poorly. The application's need to throttle drives the selection.

22. C — Heat tracing on a water line is installed mainly to prevent the water from freezing in cold conditions. The trace adds heat to offset losses and keep the line above freezing. Frozen lines can burst and disrupt service.

23. A — A backing ring supports the root pass and helps ensure full penetration on the weld. It provides a base for the molten metal at the joint root. This improves weld quality on certain pipe welds.

24. C — The true travel of a rolling offset is the hypotenuse of the combined vertical and horizontal offsets. Both offsets are resolved into a single diagonal length. This three-dimensional geometry sets the pipe length needed.

25. A — A packing gland is adjusted to control leakage around the valve stem. Tightening compresses the packing against the stem to seal it while still allowing the stem to move. Proper adjustment balances sealing against free operation.

26. A — Radiographic testing uses X-rays or gamma rays to reveal internal defects in a weld. The radiation passes through and images flaws like porosity or lack of fusion. It detects subsurface defects that visual inspection cannot.

27. D — A bell-and-spigot cast iron joint is sealed with oakum and lead, or with a rubber gasket in modern systems. The packing fills the bell around the spigot to make the joint watertight. This is the traditional cast iron jointing method.

28. B — A thermal expansion loop absorbs the expansion and contraction of a long pipe run. The loop flexes to take up the movement that would otherwise stress the pipe and anchors. It is a designed allowance for thermal growth.

29. B — Schedule 80 pipe has a thicker wall than Schedule 40, giving it a higher pressure rating for the same nominal size. The thicker wall reduces the inside diameter slightly but withstands greater pressure. Wall thickness is selected for the service pressure.

30. A — Cutting pipe square ensures full, even thread engagement when the pipe is threaded. An angled cut produces uneven threads and a poor, potentially leaking joint. A square cut is the foundation of a good threaded connection.

31. A — Lowering the sling angle from 60° to 30° from horizontal increases leg tension and decreases the safe lift capacity. Flatter angles multiply the force in each leg for the same load. Capacity drops sharply as the angle approaches horizontal.

32. D — A choker hitch reduces the sling's rated capacity compared with a vertical hitch. The bend and choking action at the choke point lower the effective strength. Capacity tables apply a reduction factor for choker configurations.

33. D — The design (safety) factor is the ratio of the rigging's breaking strength to its working load limit. It provides a margin against overload, wear, and dynamic forces. A higher factor means a larger safety margin built into the gear.

34. C — A 4,000 kg load lifted on a single vertical sling requires a sling with a working load limit of at least 4,000 kg. The WLL must equal or exceed the actual load for a vertical lift. Selecting below the load weight would overload the sling.

35. A — A lever hoist (come-along) must be used with the hook latch closed and the load within its rated capacity. The closed latch keeps the load from slipping off, and staying within capacity prevents failure. These are basic safe-use requirements.

36. A — A crane's lifting capacity must be evaluated at the actual radius and boom configuration of the lift. Capacity decreases as radius increases, so the real geometry governs what can be lifted. The lift plan uses the load chart for those exact conditions.

37. C — Stable ground under the outriggers prevents ground failure that could let the crane tip. If a pad sinks, the crane loses its stable base and can overturn. Proper bearing surface is essential to crane stability.

38. D — A wire rope sling with a permanent kink must be removed from service permanently. A kink crushes and distorts the wires, creating a weak point that can fail under load. Damaged wire rope cannot be repaired for safe use.

39. B — The stop signal, like all crane signals, must be a clear, agreed-upon gesture recognized by both rigger and operator. Standardized signals prevent dangerous misunderstandings during the lift. Mutual recognition is the key requirement.

40. A — A spreader beam carries compressive loads along its length, holding the sling tops apart. This keeps sling angles favorable while the beam resists the inward compression. Its design differs from a lifting beam that handles bending.

41. B — Corner protectors (softeners) protect a synthetic sling from sharp load edges that could cut the webbing. A cut sling can fail suddenly under load. Edge protection preserves the sling's integrity during the lift.

42. C — If one crane in a tandem lift takes more than its share, that crane can be overloaded beyond its rated capacity. Uneven load sharing is a serious hazard in coordinated lifts. This is why tandem lifts require careful planning and communication.

43. B — A low pressure steam system must not exceed 103 kPa (15 psi); above this it is classified as high pressure. The 15 psi limit is the defining boundary for low-pressure steam. Operating above it changes the code and equipment requirements.

44. A — Latent heat of vaporization is the heat absorbed to change water to steam with no change in temperature. This large quantity of energy is what makes steam such an effective heat carrier. It is released when the steam condenses at the load.

45. B — A bucket trap blowing live steam continuously has usually lost its water prime or seal. Without the water seal the bucket cannot operate the valve correctly, so steam passes through. Re-priming restores proper function.

46. C — A vacuum breaker admits air into a steam coil when a vacuum forms, allowing condensate to drain. Without it, the vacuum holds condensate in the coil and impairs heating. Breaking the vacuum lets the trap discharge properly.

47. A — A boiler's safety relief valve is sized to the maximum steam generating capacity of the boiler. It must relieve at least as much steam as the boiler can produce to prevent overpressure. Undersizing would allow dangerous pressure buildup.

48. B — Rearranging Btuh = gpm × 500 × ΔT gives gpm = 250,000 ÷ (500 × 25) = 250,000 ÷ 12,500 = 20 gpm. The required flow is found by dividing the load by 500 times the temperature drop. This sizing ensures the loop delivers the design heat.

49. C — Steam binding occurs when flash steam in the condensate prevents liquid from entering the pump. The vapour blocks the pump suction, causing loss of flow. Proper venting and pump design prevent this condition.

50. A — A pressure reducing valve whose downstream pressure keeps rising usually has a worn seat passing steam. The leak lets pressure build past the setpoint even when demand is low. A worn or fouled seat is a common PRV failure.

51. D — A Hartford loop protects a low-pressure steam boiler against low water if a return line develops a leak. It maintains a minimum water level by the way the return connects to the boiler. This prevents the dangerous low-water condition.

52. B — Superheated steam is heated above its saturation temperature at a given pressure, so it carries no entrained moisture. The extra heat keeps it dry, which benefits turbines and long-distance distribution. It contrasts with saturated steam at the boiling point.

53. A — High-pressure steam systems are blown down periodically to remove accumulated sludge and sediment. This keeps heat-transfer surfaces clean and maintains water quality. Regular blowdown is part of boiler maintenance.

54. B — Rapidly admitting steam into a cold line causes severe water hammer from sudden condensation. The steam collapses against cold pipe and condensate, producing damaging pressure shocks. A slow warm-up prevents this.

55. C — A gauge glass showing no level and appearing full of water may indicate it is plugged or the level is above the glass. The operator cannot assume the reading is normal and must verify the true level. A blocked gauge gives a dangerously false indication.

56. B — Boiler water treatment controls scale, corrosion, and carryover. Treating the water protects heat-transfer surfaces and maintains efficiency and safety. It is essential to reliable boiler operation.

57. D — A flash tank operates at a lower pressure than its source, where the hot condensate flashes into usable steam. The pressure drop releases the recoverable energy as low-pressure steam. This captures heat that would otherwise be lost.

58. D — Subcooling means the trap holds condensate until it cools below saturation temperature before discharging. This recovers additional sensible heat and reduces flash steam. Some traps are designed to subcool for efficiency.

59. C — Pumping away from the expansion tank connection keeps most of the loop under positive pressure. The pump's added pressure is distributed favorably through the system. This reduces air problems and helps prevent cavitation.

60. A — The point of no pressure change is located at the expansion tank connection. The tank fixes the system pressure at that point regardless of pump operation. Pump pressure then acts relative to this fixed reference.

61. B — Primary-secondary piping hydraulically decouples two circulating loops so each pump operates independently. Flow in one loop does not interfere with the other. This allows different flow rates and temperatures in each circuit.

62. C — Excessive glycol concentration reduces heat transfer and increases the fluid's viscosity, raising pumping requirements. Too much glycol degrades performance even though it lowers the freeze point. The concentration must be matched to the climate need.

63. A — Process piping for a corrosive acid must be made of a material resistant to chemical attack from that acid. An incompatible material corrodes and fails, risking leaks and contamination. Chemical compatibility governs the selection.

64. D — A wastewater neutralization system adjusts the effluent's pH to an acceptable range. This brings acidic or alkaline discharge within regulatory limits before release. pH control is the system's primary function.

65. D — A hydraulic accumulator stores energy and absorbs pressure surges in the system. It can supply extra flow on demand and cushion shocks. This smooths operation and protects components.

66. B — The metering device (expansion valve) reduces refrigerant pressure and meters it into the evaporator. The pressure drop allows the refrigerant to evaporate and absorb heat. It controls the flow entering the low-pressure side.

67. A — Fuel gas piping must be leak-tested because a leak presents a fire and explosion hazard. Even small escapes of flammable gas can ignite with serious consequences. Verifying tightness before service is a critical safety step.

68. C — Medical gas joints are brazed under a nitrogen purge to prevent internal oxide scale from forming. The inert gas displaces oxygen so no copper oxide breaks loose into the gas stream. Clean internal surfaces protect patients.

69. B — A receiver tank stores compressed air and dampens pressure fluctuations from the compressor cycling. The stored volume meets demand peaks and steadies system pressure. It also helps moisture settle out.

70. D — A desiccant dryer removes moisture from compressed air by adsorbing water vapour onto the desiccant material. Dry air prevents corrosion and freezing in downstream equipment and controls. Moisture removal is its sole purpose.

71. D — When a pneumatic control valve fails to move, a sensible first check is the supply air pressure to the actuator. Without adequate air the actuator cannot operate. Verifying the air supply isolates a common, simple cause.

72. B — Chilled water pipe that sweats heavily despite insulation likely has a damaged or missing vapour barrier. Warm moist air reaches the cold surface and condenses. An intact vapour barrier is essential on cold lines.

73. A — A reduced-pressure-zone (RPZ) assembly protects against high-hazard cross-connections. Its design prevents contaminated water from entering the potable supply even under backpressure or backsiphonage. It is used where the contamination risk is severe.

74. A — A coefficient of performance of 4.0 means the system delivers four units of heat for each unit of energy input. COP measures heating output relative to energy consumed. A higher COP indicates greater efficiency.

75. A — A horizontal ground loop is chosen when adequate land area is available, since it is shallower but spreads out widely. Limited surface area instead favors a vertical bore field. Site space drives the loop configuration.

76. C — A drainback design protects the collector by draining fluid out of it when the pump stops. With no fluid in the collector, there is no freezing or overheating of stagnant fluid. The fluid returns to a reservoir until needed.

77. D — Solar over-temperature is managed with a heat dump or dissipation loop that sheds excess collected heat. This protects the fluid and components from overheating during high sun and low demand. It safely rejects the surplus energy.

78. A — An HRV's effectiveness drops when its core or heat exchanger becomes fouled or blocked. Dirt and debris reduce heat transfer and airflow between the streams. Regular cleaning maintains its recovery performance.

79. C — A flue gas economizer must not cool the gas below its acid dew point, or corrosive condensation forms on the surfaces. Staying above that point prevents acid attack on the metal. This limit governs how much heat can be recovered.

80. B — Waste heat from a chiller condenser can be recovered to preheat domestic or process hot water. This reuses energy that would otherwise be rejected to the atmosphere. Heat recovery improves overall plant efficiency.

81. D — Commissioning verifies the system's performance against the project specifications and drawings. These documents define the design intent that the installation must meet. Verification confirms the system delivers what was designed.

82. C — Before energizing a circulator, the fitter must confirm it is properly aligned and the system is filled and vented. Running a dry or misaligned pump causes damage and cavitation. These checks protect the pump at start-up.

83. D — A hydrostatic test holds the system at test pressure to verify there are no leaks at the rated pressure. Sustained pressure reveals weak joints or defects before service. It confirms the system's integrity.

84. A — A commissioning checklist sign-off documents that each verification step was completed. It creates an accountable record that nothing was skipped. This documentation supports a reliable, traceable handover.

85. D — Abnormal pump vibration at start-up most likely indicates misalignment, cavitation, or a mechanical fault. These conditions stress bearings and seals and shorten pump life. Vibration is an early warning that requires investigation.

86. A — Flushing velocity must be high enough to carry installation debris out of the piping. Adequate velocity entrains and removes chips, dirt, and slag before start-up. Clean lines protect pumps, valves, and controls.

87. D — A functional test confirms that outputs respond correctly to changing inputs and setpoints. It validates the control sequence under realistic operating conditions. This proves the system behaves as designed before turnover.

88. B — At turnover the operator must be trained on safe start-up, operation, and shutdown procedures. This ensures the system is run correctly and safely after handover. Operator training is a core part of the turnover process.

89. B — Air binding during start-up is corrected by venting air from high points and problem zones. Trapped air blocks circulation and prevents proper heating. Removing it restores flow through the affected zones.

90. A — A pre-start boiler inspection must confirm the water level and safety controls are functional. Operating without proper water level or working safeties risks serious damage or failure. These are critical safety prerequisites to firing.

91. D — As-built drawings reflect the system as it was actually installed, including field changes. They differ from design drawings, which show only the original intent. As-builts are essential for future maintenance and modifications.

92. A — Documenting test results provides a record proving the system meets requirements. This evidence supports acceptance, warranty, and future troubleshooting. Records are a key deliverable in turnover.

93. B — Balancing during commissioning sets each circuit to its designed flow rate. Proper balance ensures every zone receives correct heating or cooling. It optimizes comfort and efficiency across the system.

94. D — A safety relief valve is tested to confirm it opens at its set pressure to relieve overpressure. Verifying the set point ensures the boiler is protected against dangerous pressure. This is a mandatory commissioning safety check.

95. C — LAWL stands for lowest allowable water level in a boiler. Operating below it exposes heating surfaces and risks overheating and failure. The term defines the minimum safe water level.

96. A — Insulation should be applied only after pressure tests are completed and joints are confirmed leak-free. Insulating first would hide leaks and require removal to repair them. Testing before insulating avoids costly rework.

97. B — Turndown ratio describes the range between a boiler's maximum and minimum firing rates. A higher turndown lets the boiler modulate down efficiently to match low loads without short-cycling. It reflects how low the boiler can fire while still operating stably.

98. A — A check valve installed backward in a pump discharge will prevent flow through the line entirely. The disc seats against the intended flow direction and blocks it. Correct orientation per the flow arrow is essential.

99. B — An undersized pipe produces excessive velocity, high friction loss, and possible erosion. The high velocity wastes pump energy and can wear the pipe wall. Correct sizing balances velocity, noise, and pressure loss.

100. B — A vacuum heating system lowers steam temperature for gentler heating and promotes faster circulation. The sub-atmospheric pressure lets steam move readily at lower temperatures. This improves comfort and responsiveness.

101. C — Incomplete penetration revealed on radiographic film weakens the joint and must be repaired. The unfused root reduces strength and can fail under pressure. Such defects are not acceptable on pressure piping.

102. C — A sacrificial anode corrodes preferentially to protect the more noble metal of the tank or piping. The anode is consumed instead of the protected component. This is the basis of cathodic protection.

103. A — A support system for an expanding steam pipe must allow the movement while still carrying the pipe weight. Rollers or slides accommodate the 25 mm growth without building damaging stress. Supports must permit thermal movement.

104. B — A strainer's blowdown valve removes accumulated debris without disassembling the strainer. Opening it flushes trapped dirt from the basket while the line stays in service. This simplifies routine strainer maintenance.

105. D — Using a gate valve to throttle erodes the seat and gate from high-velocity flow across the partially open disc. Gate valves are designed for fully open or closed service only. Throttling damages them and shortens their life.

106. D — Joining dissimilar metals in a wet system without isolation causes galvanic corrosion of the more active metal. The electrochemical cell consumes the anodic metal at the joint. Dielectric isolation prevents this attack.

107. B — A gauge reading zero on a pressurized system most likely has a faulty gauge or a closed/blocked gauge cock. The instrument is not seeing the true pressure. The reading must be verified rather than trusted.

108. B — Supports for a vertical riser must carry the weight of the vertical pipe and its contents. The riser load is transferred to the structure at support points. Proper support prevents the riser from sagging or overstressing joints.

109. C — A condensate return line is pitched to drain toward the collection point by gravity. The slope keeps condensate moving out of the line and prevents pooling. Proper pitch avoids water hammer and backup.

110. C — An air gap in a drainage connection prevents backflow contamination of the potable supply. The physical break in the line stops wastewater from siphoning back. It is a simple, reliable backflow safeguard.

111. D — A pipe penetration through a fire-rated wall must be firestopped with an approved rated system. The firestop restores the wall's fire resistance around the pipe. This maintains the fire separation required by code.

112. B — Uneven heating from a steam coil is commonly caused by a failed trap letting condensate back up in the coil. The flooded portion of the coil cannot transfer heat effectively. Restoring the trap clears the condensate and the heating.

113. C — Relief valve chatter is often caused by the valve being oversized for the relieving capacity. The valve relieves too quickly, pressure drops, it reseats, and the cycle repeats rapidly. Correct sizing prevents the damaging chatter.

114. A — A minimum bend radius is specified to prevent kinking, flattening, or weakening of the tube. Bending tighter than the limit deforms the cross-section and reduces strength. Respecting the radius preserves the tube's integrity.

115. A — A pump running far right of its curve (high flow, low head) risks cavitation and motor overload. The operating point draws excessive current and can starve the suction. Pumps must operate near their design point.

116. C — A balancing damper adjusts and sets the airflow through an air-side unit. It fine-tunes the air distribution to match design requirements. This is the air-side counterpart to a water balancing valve.

117. C — Gasket selection for a 600 psi steam flange is governed by the flange rating, temperature, and service media. The gasket must withstand all three to seal reliably. Matching the gasket to these conditions prevents failure.

118. D — Fuel oil supply lines must be tested for leaks and properly primed during commissioning. Leak-free, air-free lines ensure safe, reliable fuel delivery to the burner. Both checks are required before placing the system in service.

119. B — A steam trap with too little capacity backs up condensate, causing water hammer or poor heating. The undersized trap cannot discharge condensate as fast as it forms. Correct trap sizing matches the condensate load.

120. C — A thermowell lets a temperature sensor be inserted into a pipe without breaching the pressurized system. The sensor reads through the well wall while the system stays sealed. It also allows sensor removal without draining the line.

121. D — An anchor fixes the pipe at a specific point and directs expansion toward loops or joints elsewhere. By holding that point, it controls where and how the pipe grows. Anchors are key to managing thermal movement.

122. D — Preheating certain alloy pipe before welding reduces the risk of cracking from rapid cooling. The slower cooling lowers residual stress and avoids hard, brittle zones. Preheat is specified in the welding procedure for such materials.

123. C — A single hydronic zone failing to heat while others work points to a closed valve, air lock, or failed zone circulator. The problem is local to that zone, not the whole system. These are the common single-zone failures to check.

124. C — A bellows-type expansion joint accommodates movement by flexing its corrugated metal element. The bellows compresses and extends to absorb thermal growth. It must be installed with proper anchoring and guiding to work correctly.

125. B — A drip leg collects condensate from a steam main and directs it to a trap. Positioned at low points and ahead of equipment, it captures water before it causes hammer. It is essential for proper main drainage.

126. C — A pressure-temperature (P-T) relief valve protects a water heater against both excessive pressure and excessive temperature. It opens if either limit is exceeded, preventing a dangerous rupture or explosion. It guards two hazards at once.

127. D — For an unfamiliar valve, the best first reference is the manufacturer's documentation or system drawings. These give accurate information on operation and maintenance. Relying on guesses or appearance risks errors.

128. A — A steam trap should be located at the low point where condensate collects, below the equipment it drains. Gravity carries condensate to the trap for discharge. Correct placement ensures effective drainage.

129. D — Maintenance schedules are provided at turnover so the equipment is serviced at proper intervals to maintain reliability. Scheduled servicing prevents premature failures and sustains performance. It supports the long-term operation of the system.

130. D — Following the commissioning sequence in order ensures each system is verified safe and functional before the next step. Skipping ahead can mask faults or create hazards in dependent systems. The ordered process builds verified reliability.